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SICK

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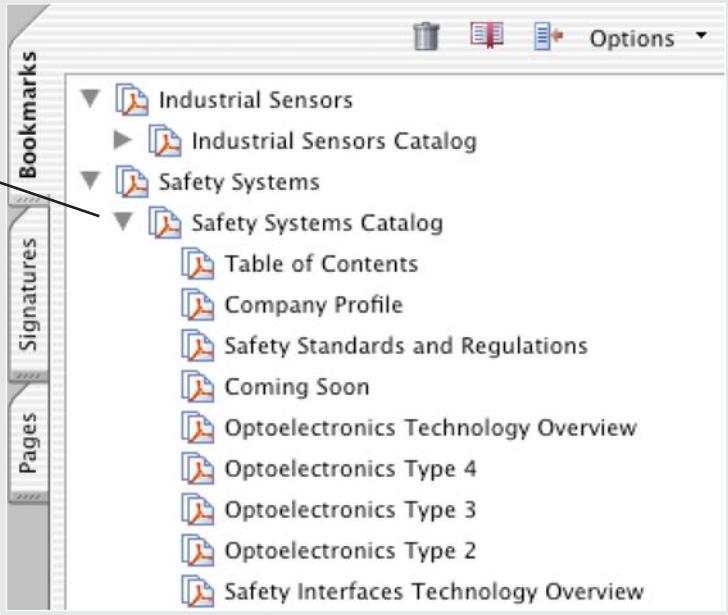
Click on arrows to display contents of each chapter folder.



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Product Catalog

Industrial Sensors

NORTH AMERICA

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Industrial Sensors
Catalog

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Corporate History

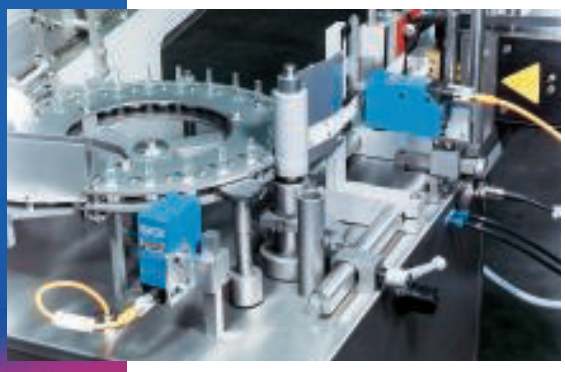
SICK was founded in Germany by Dr. Erwin Sick in 1946. Dr. Sick, a specialist in optics, applied his practical knowledge of electronics to the physics of light. As the age of automation emerged, industrial corporations faced many challenges that required new solutions. Armed with the expertise of Dr. Sick, the company began to provide these solutions. In 1951, SICK created the industry's first registration control device, which was used to control packaging foil in cheese packaging machinery. The invention of the first safety light curtain quickly followed. This successful product set the standard for industrial safety applications.

Waldkirch, Germany

SICK continues to develop the most innovative technology in the sensor industry. By constantly extending and testing various measurement principles across different systems, SICK has become a worldwide leader. The company holds more than 350 patents in industrial sensors, safety controls and bar code scanners, marking its position at the forefront of sensing technology.

Reute, Germany

With its diverse product line, from photoelectric sensors to analytical monitors, from safety controls to bar code systems, SICK offers solutions at every phase of production. The company strives to exceed current trends and standards in each product line. The strength lies in Dr. Sick's philosophy of developing "the best concept for the next ten years."



SICK strives for continuous product improvements to its line of photoelectric, inductive, magnetic and capacitive sensors to meet the growing efficiency of industrial processes. Product improvements include reduced housing sizes and increased performance and range, while still ensuring high quality production processes. The application possibilities of our complete line of sensors are virtually endless. SICK photoelectric sensors work well in nearly any application and have the features customers demand and the flexibility they have come to expect.

SICK has established itself as the leading sensor manufacturer and system partner for both large and small-scale projects in every branch of industry. As your industry moves into the future of automation, production and manufacturing you will find SICK is ready with a solution to overcome your newest challenge. Our teams of product-specific application engineers have the specialized knowledge to assist you in choosing the best product for your particular application.

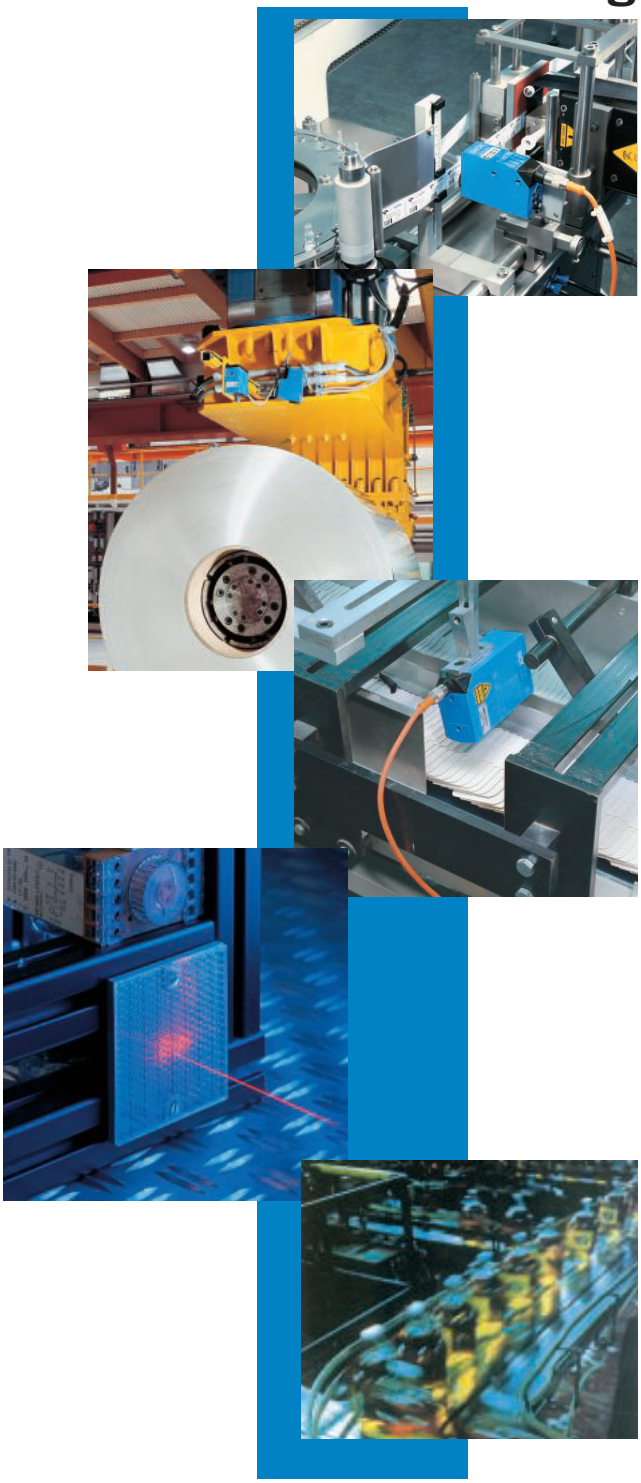
SICK

How to Use This Catalog

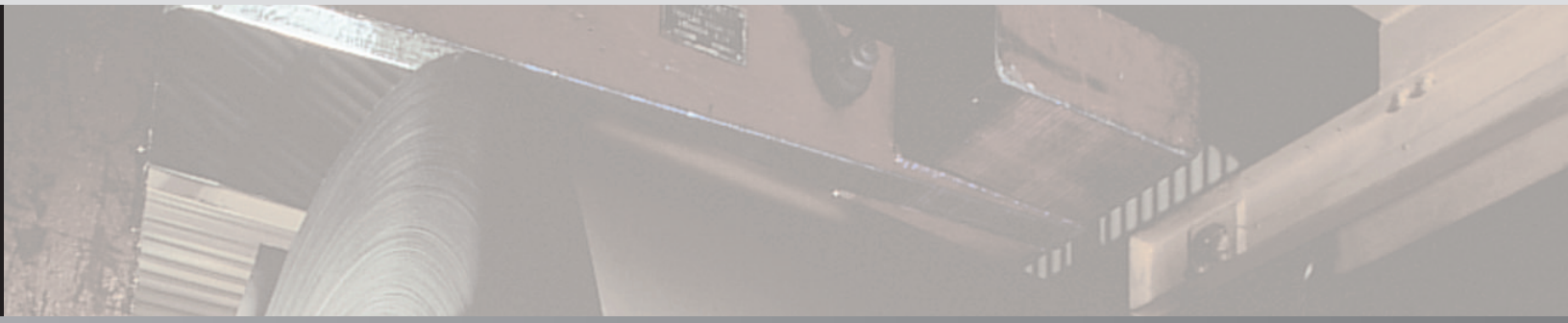
This catalog is your guide to SICK's industrial sensor offerings. Following is an overview of the layout of our catalog. The Family Overviews include descriptions of our sensor types and are followed by introductions to each series, or family, of sensors, including which models are available and their specific features. Next, selection tables give an at-a-glance overview of our sensors by sensing technology type. The chapters are arranged first by sensing technology type and then by range within each family. The beginning of each chapter includes the Theory of Operation of the sensing type, and a table of contents.

Each sensor is detailed in a two-page guide. These two pages feature dimensional drawings, connection diagrams, specification tables and a photo of the product. On each page heading, the name of the sensor will contain or will be followed by one or more of the following designations:

W	standard housing
V	barrel-shaped housing
S	separate amplifier
CS	color sensor
LUT	luminescence sensor
K	contrast sensor
N	contrast sensor
DME	distance measuring device
ABS	adjustable background suppression
FGS	adjustable foreground suppression
E	energetic proximity
D	divergent proximity
F	fixed-focus proximity
RED	visible red light source
IR	infrared light source
LONG	extended sensing range
L	laser
EXI	intrinsically safe
DC or AC	current type



At the back of this catalog you will find our accessories, reference guides and indices by both model and part numbers. If you have any questions about our sensors or specific applications, please call us at 1-800-325-7425. Our knowledgeable Application Engineers are ready to help you find the right sensor for your application needs.



Photoelectric Sensor Family Overviews

Family Overviews

W2

1.2 in (30 mm)

3.9 ft (1.2 m)

4.9 ft (1.5 m)

22 in (55 mm)

Lack of space is no longer a problem when it comes to integrating photoelectric sensors into machines. The new W 2 sub-miniature series delivers the solution. Its laser-like light source, precise optics and unique extrusion housings meet virtually all automation requirements.

The W 2 is the first sub-miniature sensor with precise background suppression for ranges of 0.6 and 1.2 in (15 and 30 mm). This means that interference caused by moving or reflective objects in the background can be largely suppressed. Furthermore, objects are reliably detected regardless of their surface colors – such as a black IC in front of a metallic background. The W 2 series also consists of a through beam photoelectric switch with a range of 39.4 in (1000 mm), reflex systems for detection distances of up to 31.5 in (800 mm) and energetic sensors with a 2 in (50 mm) range.

W150

14.8 ft (4.5 m)

6.9 ft (2.1 m)

5.1 in (130 mm)

The miniature W.150 series offers advanced functionality in a small housing for packaging, robotics, semiconductor and pick and place applications, among others. The series consists of through beam, reflex and proximity versions. The proximity sensor has energetic and background suppression types, and a reflex version with polarizing filter for detecting shiny objects. New is a reflex model with high sensitivity for detecting clear materials. The entire series is UL approved and each sensor offers PNP and NPN options and connector or cable options.

W4-2

13.1 ft (4 m)

9.2 ft (2.8 m)

5.12 in (130 mm)

The W.4-2 series is smaller than a matchbox and weighs just 0.7 ounces (20 grams). The WT 4-2 proximity sensor includes SICK's patented adjustable background suppression to protect against false readings from objects in the background. Reflex and through beam versions are also available in the same tiny housing and the W.4-2 series incorporates SICK's exclusive custom-designed ASIC (application-specific integrated circuit) making it highly reliable and flexible. Some of the benefits of this are immunity to high frequency lamps and flashing warning lights, a wide ambient operating temperature, and crosstalk protection. The family also contains two models for detection of clear materials, one reflex and one proximity.

W160

31.2 ft (9 m)

16.4 ft (5 m)

11.8 in (300 mm)

15.7 in (400 mm)

3.9 in (100 mm)

The miniature W.160 series features through beam, reflex, proximity and fiber optic versions in a compact, tough plastic housing. It also includes the WLL 160T, a fiber optic teach-in sensor with a combination of small size, fiber optic technology and an intelligent, convenient teach-in process that make it ideal for a range of industries and needs. It is excellent for clear material detection, small parts detection, registration control (even holographic web material), and for many other applications.

W160T

5.9 in (150 mm)

3.9 in (100 mm)

3.3 ft (1 m)

4.9 ft (1.5 m)

The W.160T family of sensors features ball lens technology, which provides laser-like performance from an LED source. The small light spot is ideal for detection of small objects. Background suppression, mark detection, energetic, diffuse and retro-reflective versions are all available with teach-in. The sturdy, waterproof housing withstands extreme operating conditions. The W.160T is easy to mount and fits into cramped mounting conditions. All W.160T models are available in horizontal and vertical mounting designs.

All W.160T models can be taught via external wire or OneTouch teach-in. The OneTouch feature is extremely easy to use. One press of the teach-in button and the sensor is automatically set up for your application. The sensor automatically optimizes its sensitivity to the current operating conditions at the touch of a button. No special programming is necessary.

W170

27.9 ft (8.5 m)

13.1 ft (4 m)

15.7 in (400 mm)

23.6 in (600 mm)

3.9 in (100 mm)

The miniature W.170 series is designed for applications where space is limited. The W.170 features visible red light for easy alignment, a sturdy, hybrid stainless steel/plastic housing for durability in harsh environments, and complete noise immunity. Through beam, reflex and proximity models are available, with additional options such as polarizing filters for crosstalk protection, transparent object sensing, and focussed proximity sensors. All reflex and proximity versions have a fast response time of 0.7 ms and all versions offer mounting flexibility. They are exceptional for packaging, food processing, material handling and storage and retrieval applications.

ELF

2 in (50 mm)

3.9 in (100 mm)

13.1 ft (4 m)

SICK's new ELF is the material handling and packaging industry wonder-sensor. This little ELF can sense your application and budget problems and perform sheer magic, blazing a new path for low-cost high performance photoelectric sensors. The ELF is everything you have come to expect from larger sensors and more, for less.

Three versions of the ELF are available: reflex retro-reflective, background suppression and energetic versions. The background suppression and energetic diffuse models have detection ranges up to 50 mm and 100 mm respectively. The background suppression model easily suppresses interference caused by moving or reflective objects in the background. Furthermore, objects are reliably detected regardless of their surface colors or reflectivity.

In addition to the small size, the ELF is packed with functionality including light immunity, reverse polarity protection, overload protection, and short circuit protection. Advanced LED technology and unsurpassed optical engineering arms the ELF with optical performance not offered by any other sensor in its class.

MH

2 in (50 mm)

3.9 in (100 mm)

13.1 ft (4 m)

The revolutionary MH photoelectric sensor is guaranteed to be the most competitively priced industrial photoelectric sensor available in the market today. State-of-the-art ASIC technology and creative engineering make the MH one of the smallest sensors in the industry.

Three versions of the MH are available: retro-reflective, background suppression and energetic versions. The housing measures just 10 mm x 16.3 mm.

Despite an incredibly small size, the MH is packed with functionality including outstanding light immunity, reverse polarity protection, overload protection and short circuit protection. Advanced LED technology and unsurpassed optical engineering arms the MH with optical performance not offered by any other sensor in its class. The MH is everything you have come to expect from larger sensors in a very compact housing.

Family Overviews

W9-2

9.8 in (250 mm)

0.8 in (20 mm)

59 in (1500 mm)

13.1 ft (4 m)

22.9 ft (7 m)

The W.9-2 series of sensors are versatile, compact, high performance and ideal for cramped mounting conditions. Background suppression, energetic, V-type, reflex and through beam versions are all available. All W.9-2 models have red light transmitters as a standard feature, making them easy to align quickly and precisely.

OneTouch teach-in is available in most W.9-2 models. The teach-in feature is extremely easy to use. One press of the teach-in button and the sensor is automatically set for your application. The sensor automatically optimizes its sensitivity to the current operating conditions at the touch of a button. No special programming is necessary.

Depending on the job, SICK has a W.9-2 sensor for virtually any application. The W.9-2 family is ideal for applications in the material handling, packaging and electronics industries.

W9L

5.9 in (150 mm)

39.4 ft (12 m)

164 ft (50 m)

The W.9 Laser sensor is ideal in any application where space is limited. It can be used for wafer positioning and wafer handling in the semicon industry and is ideal for inspection of small parts and presence verification applications in the packaging industry.

All W.9 Laser series sensors share the same compact housing, making standard mounting possible. The robust ABS plastic housing provides a water-resistant enclosure rating of IP 67, while each piece weighs less than an ounce.

SICK's W.9 Laser sensors are controlled using the most modern microprocessor technology, providing a laser series that has excellent performance in combination with its small size and light weight. Objects as small as hairs are detected just as reliably as fast operations are processed. Innovative Teach-in technology means the simple push of a button sets the sensor for optimum operation. The modulated Class 2 laser is focused to provide a light spot of less than 0.019 in (0.5 mm), allowing for detection of the smallest objects as well as very precise positioning of all objects – and all of this is available with a high switching frequency of 1000 Hz, for increased throughput and higher production speeds.

OneTouch™

W1000

2 in (50 mm)

4 in (100 mm)

19.7 in (500 mm)

13.8 ft (4.2 m)

3.3 ft (1 m)

5.9 in (150 mm)

34.5 ft (10.5 m)

50 years of quality products, innovative technology and world leadership all on one 3 x 4 mm chip! The W.1000 series realizes the dream of the most high-technology, feature-rich, low-cost sensor ever. With over two million gates on one 3 x 4 mm chip, the OES II provides unparalleled features, plus a huge dynamic range. The OES II silicon is even bonded directly to the circuit board to include the light receiver. The W.1000 also reduces the learning curve necessary to reap the full benefits of the sensor. This is the first Teach-in sensor you don't have to be an expert to use. One press of the Teach-in button and the sensor automatically sets itself up for your application. This is the way Teach-in was meant to work!

W12-2

65.6 ft (20 m)

23 ft (7 m)

23.6 in (600 mm)

0.54 in (13.5 mm)

11.8 in (300 mm)

1.97 in (50 mm)

The compact W.12-2 series is available in through beam, reflex and proximity versions, as well as more specialized versions to handle clear material detection, long range contrast sensing, and versions with either background or foreground suppression. The entire series also features high speed operation, a choice of cable or quick disconnect options, all in a small, die-cast metal housing. The foreground suppression versions allow the red light spot to see even very dark backgrounds such as conveyor rails or belts, by using them as a reflector.

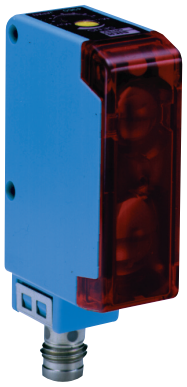
W12L-2

7.9 in (200 mm)

59 ft (18 m)

262.5 ft (80 m)

The W.12 laser series extends the functionality of the W.12 family with a full line of Class II laser sensors. Laser technology offers a much smaller light spot than conventional sensors and the through beam and reflex versions can adjust separately for sensitivity and focus. The user can set the smallest light spot at any distance within the operating range of the sensor. In addition, they offer visible red light for easy alignment. High quality and accuracy make the W.12 laser series ideal for precision positioning in assembly and production, precision edge monitoring, and detecting very small objects such as pins, grooves, holes and wires. It can even detect parts as small as 0.05 mm.



WT190

300 mm (11.8 in)

The WT 190 is a proximity sensor with background suppression. This sensor comes in a plastic housing. It has two ranges and a red light for easy alignment. This is a small sensor with a long range, an excellent choice for applications that cannot accommodate standard sized sensors, but still needs their extended sensing distance.

WT190T

300 mm (11.8 in)

300 mm (11.8 in)

The WT 190T series is composed of the photoelectric proximity sensor WTB 190T with background suppression and the WTV 190T with foreground suppression. The WT 190T stands for innovative technologies ideal for solving multifaceted tasks.

Standard system features:
Red light: The sensors can be aligned optimally and quickly on the object using the visible light spot.
Teach-in procedure at the push of a button or externally: This enables simplified and very effective alignment of equipment. Equipment parameterization at the push of a button: The scanners can be programmed conveniently via the selection mode and consequently aligned ideally for the application. When the situation requires it, a timer function can be activated with a time delay up to 10 seconds.
Display: Menu prompting is via the easily readable display.

The compact, industrial standard ABS plastic housing makes it possible to use the equipment even in difficult environmental conditions. The 4-pin M8 equipment plug or the 2 m cable are standard equipment in the same way as the 200 Hz switching frequency.

W14

16.4 ft (5 m)

3.3 ft (1 m)

19.7 in (500 mm)

The W.14 series features a tough glass-reinforced ABS housing and comes in easy to use proximity or reflex versions. The proximity sensor offers a long sensing distance and the reflex sensor with polarizing filter won't register false trips on reflective targets. New in this family is a cost effective proximity sensor with adjustable background suppression. The W.14 series also offers a protection rating of IP 65, an ambient operating range of -25 to 60°C (-13 to 140°F).

Family Overviews

W18-2

65.6 ft (20 m)

23 ft (7 m)

31.5 in (800 mm)

The sturdy W.18-2 series features a glass-fiber reinforced ABS housing. It incorporates SICK's exclusive custom-designed ASIC (application-specific integrated circuit), making it highly reliable and flexible. Some of the benefits of this are immunity to high frequency lamps and flashing warning lights, a wide ambient operating temperature, and crosstalk protection. The WT 18-2 proximity sensor offers a continually adjustable range and defined background suppression, and the WL 18-2 reflex sensor has a built in polarizing filter for detection of reflective objects. Other features include complementary switching outputs for light and dark switching, PNP and NPN versions, and short circuit protection. This sensor series also includes the WTV 18, the ultimate problem-solver, a sensor made for difficult packaging applications.

W250

72.2 ft (22 m)

42.7 ft (13 m)

19.7 in (500 mm)

The W.250 family, available in AC or DC versions, includes: a through beam sensor, a reflex sensor with a polarizing filter to prevent false readings from reflective objects; and both short (100…300 mm / 3.94…11.82 in) and long (150…500 mm / 5.91…19.70 in) range proximity sensors with adjustable background suppression. All feature red emitted light to aid in alignment, a user-friendly rotating M12 4-pin quick disconnect, or convenient 45° potted cable for easy installation at any orientation and a tough plastic housing.

W23

19.7 ft (6 m)

6.6 ft (2 m)

0.04 in (1 mm)

The W.23 reflex and proximity sensors offer tough, solid reflex sensing. The W.23s share the super-reinforced housing and high reliability of the W.27-2 series. The WL 23 is available in either an AC or DC version with a 6 m range and features a polarization filter to allow for the detection of reflective objects. New in this family is a cost effective proximity sensor with adjustable background suppression. All versions have a protection rating of IP 65 and cable or M12 quick disconnect models.

W27-2

114.8 ft (35 m)

45.9 ft (14 m)

4.9 ft (1.5 m)

The W.27-2 series, available in AC or DC, is the best choice for tough applications. The W.27-2 incorporates SICK's exclusive custom-designed ASIC (application-specific integrated circuit), making it highly reliable and flexible. Some of the benefits of this are immunity to high frequency lamps and flashing warning lights, a wide ambient operating temperature, and crosstalk protection. These leading edge features deliver consistent performance in almost any environment, and make the W.27-2 series ideal for wash-down, cold storage, and food processing applications. The W.27-2 is available in through beam, reflex, and proximity versions and comes with either a red or infrared light source for proximity sensors. The AC models are available with mini connectors.

WT27L-2

31.5 in (800 mm)

The new WT 27L-2 laser proximity sensors are available in AC or DC. These sensors are also equipped with SICK's exclusive custom-designed ASIC (application-specific integrated circuit) for immunity to high frequency lamps and flashing warning lights, a wide ambient operating temperature, and crosstalk protection. Both models feature a very small light spot for accurate detection and a red light for easy alignment.

W260

91.9 ft (28 m)

65.6 ft (10 m)

31.5 in (800 mm)

The W.260 series, in glass-fiber reinforced plastic housing, is available in through beam, reflex, proximity and fiber optic versions. All versions come with an LED status indicator to assist in setup and alignment, short circuit and reverse polarity protection, and are available in either AC or DC. Light or dark switching is selectable in all versions and on some models time delays can be set from 0.1 to 5 s. Slotted masks are also available for the through beam version to allow for small object detection or to increase operating precision.

W34

98.4 in (2500 mm)

72.2 ft (22 m)

196.9 ft (60 m)

Long ranges, flexible installation and independence from an available power supply are the highlights of the W 34 photoelectric sensor series. Although the WT 34 BGS photoelectric proximity sensor already provides sensing ranges between 3.9 and 47.2 in (100 and 1200 mm) with its red light transmitter and precise background suppression, the infrared model of the sensor has a sensing range that is twice as far at 98.4 in (2500 mm).

The WL 34 detects objects up to 72.3 ft (22 m) away, and the WS/WE 34 through beam photoelectric switch even achieves sensing ranges of up to 196.7 ft (60 m). All equipment is designed for use in rough environments. The sturdy ABS plastic housing provides enclosure rating IP 67, and the sensors can be operated in a temperature range between -40 to 140°F (-40 to 60°C). The screw connections and equipment plug can be rotated by 90° and consequently enable optimum cable feed in every installation position.

All W 34 sensors are available with DC voltage or universal voltage. Switching to the W 34 means moving up to the next highest level of innovative sensor technology for automating demanding processes.

W24-2

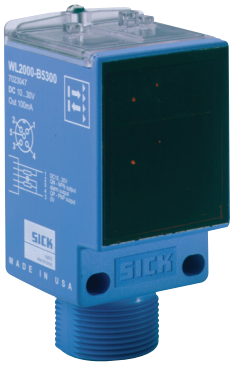
197 ft (60 m)

72 ft (22 m)

8.2 ft (2.5 m)

The W.24-2 series uses SICK's custom ASIC. The rugged zinc die cast metal housing measures just 1 x 2.6 x 3.4 inches and features a terminal chamber or rotating cable connection. Plugs can exit from either the bottom or back with a simple twist. The W.24-2 is available in AC and DC and in through beam, polarized reflex and two proximity versions, with adjustable background suppression. The W.24 Exi series has Factory Mutual (FM) approval as a family of intrinsically safe sensors for use in hazardous environments. They feature a durable die cast metal housing and long sensing ranges in the through beam, reflex, proximity and fiber optic versions. In fact, the WT 24 Exi proximity sensor even includes defined background suppression for sensing distances up to 2 m.

Family Overviews



W2000

164 ft (50 m)

59.1 ft (18 m)

11.5 ft (3.5 m)

3.3 ft (1 m)

6.9 in (175 mm)

The W.2000 series is designed to fit into existing machinery configurations. Its super-reinforced plastic housing is fully interchangeable with most standard U.S. sensors and comes in either AC or DC. The W.2000 series features SICK's exclusive custom-designed ASIC (application-specific integrated circuit), making cutting edge advances possible, such as protection against crosstalk interference and immunity to high frequency lamps and flashing warning lights. Another exceptional feature is the vertical lens orientation for a consistent and reliable switch point. This advanced, reliable technology, combined with a long sensing range, makes the W.2000 the right choice for a host of applications in almost any application environment.

W36

164 ft (50 m)

75.5 ft (23 m)

31.5 in (800 mm)

The W.36 series of heavy duty photoelectric sensors offers a durable glass-fiber reinforced plastic housing, insensitivity to ambient light and an IP 67 enclosure rating. The series is available in through beam, reflex and proximity versions and offers sensitivity control and a blinking LED signal strength indicator to detect problems with alignment or dust build-up. Other features include AC and DC versions, selectable light and dark switching, and time delays from 15 ms to 12 s.

DS60

19.7 ft (6 m)

65.6 ft (20 m)

The DS 60 is a breakthrough in long-distance sensing technology. This sensor combines a laser light source with time-of-flight measurement principles to accurately detect objects at a long range. The DS 60 is also a remarkably compact solution to long distance sensing when mounting space is limited. At just 1.5 x 3.4 x 3.7 in (38 x 87 x 93 mm) the DS 60 fits in easily, and still delivers big results. The DS 60 is available in four types; three have a sensing range of up to 19.7 ft (6 m). The fourth type is a reflex version with a sensing range of up to 65.6 ft (20 m)! The DS 60 also features background suppression or foreground suppression. The DS 60 will reject false readings from shiny objects, even those within 328 ft (100 m) of the sensor. Some DS 60 models will detect very small objects thanks to a small light spot.

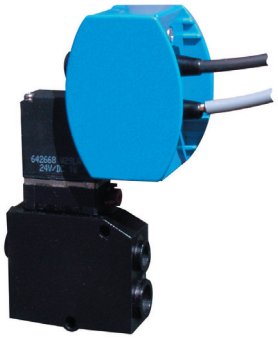
W45

1066 ft (325 m)

147.6 ft (45 m)

6.6 ft (2 m)

The W.45 series of photoelectric sensors in rugged metal housings features adjustable sensing distances and defined background suppression. Available in through beam, reflex and proximity versions, the W.45 also features sensitivity control and a blinking LED signal strength indicator to monitor problems with alignment or dirt build-up. All versions are insensitive to ambient light, available in AC and DC versions, and feature complementary output for light or dark switching. Because the W.45 is available with a dust or snow shield or cooling plates it is perfect for outdoor applications, forest products, and steel mills.



ZLM

WTR

35.4 in
(900 mm)

WLR 2100

29.5 ft
(9 m)

WLG12

4.9 ft
(1.5 m)

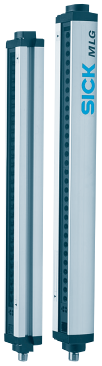
The ZLM 1 solution is a logic module designed to mount in the conveyor side frame, either under the conveying surface or on the outside. The logic module allows connection of any small sensor, which can be imbedded in the conveyor frame or side guard, protecting it from potential damage in shipping to the end user or everyday use. The ZLM 1 is an integrated ZPA control system containing the pneumatic valve, logic circuitry, daisy chain cabling and connection for remote mount sensor (sensor sold separately).

The WTR photoelectric proximity sensor is specifically designed for accumulation, loading and unloading applications on roller conveyors. The WTR features a long sensing range, zero pressure accumulation and SICK's patented adjustable background suppression. The WTR's design makes it easy to install and operate. There is no reflector to mount and the WTR's unique design allows it to rest below and between the rollers, where it is nearly invisible, won't interfere with the conveyor, and is less likely to be damaged by product loading and assembly. Plus, vertical optics reduce interference from falling debris Models featuring the integrated miniature solenoid valve can interface directly with the conveyor. Advanced technology and easy setup make the WTR the perfect choice for flawless roller conveying.

The WLR solution mounts above the rollers for a more traditional mounting configuration. The WLR uses an industry standard mounting so it fits perfectly into your existing brackets for simple replacement. The WLR is an integrated ZPA control system containing the photoelectric sensor, ZPA logic circuitry, daisy chain cabling and a cable connection for the solenoid valve (valve not included). The WLR polarized retro-reflective sensing technology has a nine meter sensing range with crosstalk immunity, so reflections from nearby sensors will not cause false triggering.

The WLG 12 photoelectric reflex light grid is a small, non-safety version of our famous light curtains. It is specifically designed for use in parts ejection applications or in any process where product positioning variations occur. The WLG 12 uses an array of eight red LEDs to monitor an area approximately 3.5 in high. It offers an operating range of 1.5 m with a resolution of 6 mm. Two models are available: one with eight separate outputs or one with a single, combined output.The WLG 12 is designed to be customized for specific applications and offers optimum sensitivity setting with its simple teach-in procedure. Individual beams can be blanked and it can be set to detect objects as small as 6 to 12.5 mm in diameter. The WLG 12 is also available with an alarm output to monitor the strength of the light beams.

Family Overviews



MLG

27.9 ft (8.5 m)

The MLG light grid is designed to meet a variety of application requirements. It offers a host of possibilities with regard to size, resolution, configuration and interfaces. The electronics are completely integrated into the compact housing. Height measurement, zone division and monitoring, object recognition, hole and crack detection, slack control and blanking control are all tasks suitable for the MLG. In addition, the multiple scan function makes it possible to detect large and small objects.

High modularity and integrated standard measuring function are distinctive features of the MLG. The following features are available:

- various beam spacings of 10, 20, 30 or 50 mm
- detection heights between 100 mm and 3140 mm
- light grid separation of 0 to 5 m or 0 to 8.5 m
- two different mounting styles

WF

0.08 / 4.72 in (2/120 mm)

The WF slot sensor looks unlike any other sensor we have. The WF is very much like a through beam sensor, but with the sender and receiver sharing one housing. The WF excels in applications in the packaging, print, and paper industries. Label detection is the star application for the WF. This sensor can sense labels even on thick backing, and cellophane presents no problem. The WF also senses overlapping sheets, preventing many packaging problems. The WF has an aluminum housing with a durable metal sensitivity adjustment. This sensor also has PNP/NPN and light or dark selectable switching in every model!

WF3T / WF5T

0.12 / 0.02 in (3/5 mm)

The WF 3T and the WF 5T extend our popular line of slot sensors; sensors that function like a through beam sensor, but in one housing. The 3T and 5T versions are push button teach-in models (the 3T has a slot width of 3 mm and the 5T has a width of 5 mm). These sensors were specially designed to be able to sense labels on thick backing, labels on clear backing, and even clear labels on clear backing. Both models provide PNP or NPN with light or dark switching, work with low, medium and high transparency materials, and have a sturdy cast aluminum housing.

V12-2

13.4 in (340 mm)

11.5 ft (2.8 m)

16.4 ft (5 m)

The V12-2 highlights include more sensor power and expanded features at unchanged prices, sensing ranges of 3.9 in (100 mm) or 11.8 in (300 mm), with adjustable sensitivity – by Teach-in, or externally via a control input for supporting automated processes. The VL12-2 photoelectric reflex switch has a range of 7.5 ft (2.3 m) (PL80A); with a polarization filter for reliable detection even when surfaces are critical, with red light to support alignment on the reflector. The VS/VE12-2 through-beam photoelectric sensor now has a range of 13.1 ft (4 m).

Expanded features include modular hardware, alternative connection technology (M12 device plug or connection cable), a choice of interface high switching frequency for reliable detection, short housing lengths and M12 housing for economical, space-saving installation and cast-metal housings to withstand mechanical loads. The many customer-oriented facets, variable system parameters, powerful ranges, and last but not least their price, make this V12-2 family of photoelectric sensors of interest for a wide variety of application fields.

V18 / V180

75.5 ft (23 m)

18.4 ft (5.6 m)

15.7 in (400 mm)

The V.18 and V.180 series of cylindrical photoelectric sensors feature a small, compact design. The V.18s include a through beam, reflex and proximity version, all in impact-resistant ABS plastic housings. The V.180s have a strong, convenient threaded metal housing. The VL 18 and VL 180 reflex sensors have a visible red light with a polarization filter. Models in both series have an 18 mm threaded housing.

V18 L

15.7 in (400 mm)

114.8 ft (35 m)

196.9 ft (60 m)

The photoelectric sensor series V18 L utilizes the latest technology laser diodes, and also features Laser class 1 (IEC 60825-1), extremely long ranges, smallest visible light spots and very short response times.

The V18 L and its ranges in overview: VSE 18 L through beam photoelectric sensor has a range of 196.7 ft (60 m); VL 18 L photoelectric reflex sensor has a range of 114.8 ft (35 m) (P 250 F); VTE 18 L photoelectric proximity sensor, energetic type has a range of 15.7 in (400 mm) at 90 % remission. Additional standard features include very short response times f = 800/s (1,000/s); manual sensitivity adjustment (VSE 18 L), or Teach-in (VL 18 L and VTE 18 L).

The Teach-in provides easy handling and additional flexibility. Select from substantial excess gain for standard applications, precise switching point and small hysteresis for special tasks. High flexibility and functionality is available from a small number of variants as a result of programmable switching type L.ON or D.ON by control line. Yellow and green LED indicators provide support during installation, operation startup, alignment and maintenance.

S130

6.6 ft (2 m)

5.9 in (150 mm)

0.63 in (16 mm)

The S.130 series with separate amplifier and remote sensing heads is available in through beam, energetic proximity, fixed-focus proximity, and contrast sensor versions. The through beam and energetic proximity versions also come in a flat housing. The separate amplifier, the SI 130, allows these sensors to be so small and still provide accurate, reliable, flexible sensing. The S.130 series offers smaller placement depth, highly flexible connection cables and excel in sensing very small parts.

Family Overviews

KT2

0.51 in (13.5 mm)

The KT 2 contrast sensor has a good price versus performance ratio. The KT 2 sensor can be used in many industrial sectors in which print marks control work processes. Dependent on the gray value difference, you can select between sensors with red or green transmission light. The manual switching threshold adjustment provides smooth operation and a high degree of detection reliability. Setting and resetting from dark to light marks and back is easy and simple via the control wire.

The KT 2 contrast sensors have a compact metal housing and are an inexpensive alternative for standard detection applications.

In addition to a 5-pin M12 standard plug, the KT 2 contrast sensor can be attached using a dovetail and additional mounting holes for convenient and flexible electric and mechanical integration in many different environments.

KT3

0.5 in (12.5 mm)

SICK's KT 3 contrast sensor, a high speed, inexpensive, solid state registration control sensor. The small, compact design can be used in applications with limited space where fibers previously were the only option. Three color LEDs make it possible to achieve high contrast resolution for standard applications with a low-cost registration sensor.

The KT 3 features an integrated switching threshold adjustment if very shiny objects need to be detected. This sensor also has static two-point teach-in, which teaches on the mark and the background for increased user-friendliness. Teach-in can be done externally via wire or with the teach button on the sensor. The KT 3 has a 50 msec. response time, allowing for a 10 kHz switching frequency.

KT5/KT10

1.6 in (40 mm)

laser: 5.9 in (150 mm)

7.9 in (200 mm)

The KT 5/KT 10 contrast sensor, a high speed, solid state registration control sensor. The KT 5 provides unparalleled sensitivity, even at 10,000 operations per second. It is the first registration control sensor to eliminate the need for switching between monochromatic green and red LEDs, using an array of six yellow-green LEDs to create an intense rectangular light spot. This allows the KT 5 to provide both high sensitivity and long range sensing (up to 40 mm/1.57 in).

The KT 5/KT 10 detects registration marks on materials with matte, glossy or reflective surfaces (including foils). It operates on 10 to 30 V DC and produces both analog and digital outputs, and can be set to allow light or dark switching. Timing options include off-delay and one shot.

The KT 5/KT 10 uses a rotatable M 12 quick disconnect that allows the cable to exit from the bottom or the back with a simple twist. Movable optics let the user change the lens position by 90 degrees. The robust metal housing provides EMI and RFI immunity and is protected against high voltage corona discharge. With a NEMA 6 rated enclosure, the KT 5/KT 10 is suited for use in washdown environments.

NT

1.6 in (40 mm)

2.36 in (60 mm)

.59 in (15 mm)

NT registration control sensors use the same principle as photoelectric proximity sensors, but have the unique advantage of recognizing up to 15 shades of gray. The NT 8 can detect very slight contrasts (even yellow on white or pastel hues) and uses incandescent white light for superior performance. The NT 6 uses both green and red LEDs with many different versions including Off delays, vertical or horizontal light spots and quick disconnect wiring. The NTL 6 is the fiber optic version of the NT 6 with red and infrared LEDs. Each features a fast response time, performing up to 10,000 operations per second, and a sturdy housing for harsh environments.

CS

0.5 to 2.4 in (12.5 or 60 mm)

2.0...39.4 in (950...1000 mm)

7.9 in (200 mm)

The CS Color Sensor is a compact, self-contained RGB color recognition sensor that represents a breakthrough in mechanical design and color recognition technology. The CS uses an Active Three-Color Method and simple push button teach-in to compare color values for online color identification at up to 60 mm in proximity mode, 1000 mm in reflex mode, and at up to 1000 inspections/ second! The CS's high quality LEDs replace short-lived lamps, making it virtually maintenance-free. Also, the CS Color Sensor is suited for use in harsh industrial environments and requires no shielding from ambient light. Model CS 1 offers one programmable reference color, while CS 3 stores up to three reference colors and can be used for sorting objects according to their color. The CSL 1 is a fiber optic version which uses industry standard fibers. With its high switching frequency as well as the blanking/gating feature, the CS Color Sensor is geared for fast-moving production lines and close sensing tasks.

CSM1

0.5 in (12.5 mm)

The CSM 1 color sensor has a small housing design that is ideal for all applications in which objects are identified, sorted and inspected on the basis of their color. The sensor is extremely small, but it offers enormous advantages. The colors and tolerances to be detected are easy to teach-in. Switching frequencies of up to 1.5 kHz permit color detection at high throughput rates for use in applications such as packaging and assembly.

The CSM 1 has a three color LED transmitter light source. Red, green and blue light are emitted and reflected from the target objects. Reflectivity is evaluated by the sensor's microprocessor with regard to the spectral color distribution, saturation and brightness. The values determined for the color composition of the target object are compared with stored reference values and the permissible tolerances and then a switching output is activated if they match. The reference value and the three selectable tolerance levels are easily taught-in.

LUT1

11.8 in (300 mm)

The LUT 1 series consists of the LUT 1-4 and LUT 1-5. The LUT 1-4 features the most power for demanding applications. Its fast response time (0.1 ms) plus extremely high sensitivity ensures maximum reliability. The LUT 1-4 features a digital display and an analog output. The LUT 1-5 is somewhat smaller than the LUT 1-4 and, although it is about half as sensitive, it offers a very stable analog output suitable for use in quality control applications. Typical applications include verification of tamper-evident seals, clear label detection, invisible registration mark sensing, crayon or fluorescent mark detection, and presence sensing of adhesives, coatings, oils, fats and detergents.

LUT2

0.5 in (12.5 mm)

The LUT 2 provides help wherever conventional photoelectric sensors are limited, especially in applications with high contrast backgrounds, fluctuating background colors and where visible marks can't be applied to the target object. Instead of detecting optically visible contrasts, the sensor detects natural or added luminescent markings that are invisible to the naked eye. The LUT 2 is extremely compact and permits space-saving mounting. Thanks to its high switching frequency, the device, with a range of approx. 12.5 mm, is also suitable for high performance applications.

The LUT 2 uses a maintenance-free, long life diode as its light source. The emitted ultraviolet light, at a wavelength of 370 nm, hits a fluorescent pigment on the surface of the target that is either natural or added for identification purposes. This pigment then generates light with a long wavelength between approx. 420 nm and 750 nm in the visible range. This is detected by the reception element of the LUT 2. In the process, the electronics check whether the emitted and received light have the same modulation frequency. This ensures that false switching caused by surface reflections or ambient light can be prevented.

Family Overviews

LUT3

3.5 in
(90 mm)

The LUT 3 Luminescence Sensors combine the convenience of a semiconductor UV light source with the power of high switching frequency (1.5 kHz) and fast response time (0.3 ms) in a smaller, more compact design than ever before. The semiconductor light source means no lamps to change and minimal downtime. The LUT 3-6 and 3-8 also feature high flexibility, with many lenses available to vary the detection range, PNP and NPN output. The LUT 3-8 includes analog output, adjustable time interval, special filtering and optional fiber optics. These expanded features make them ideal for a wide range of applications.

OD25/50/100 130/250

up to 9.8 in
(250 mm)

The LED OD is a cost-effective model with a plastic housing. This model is especially suited to short distances and rough surfaces, and has a scanning range of 20-30 mm (0.8-1.2 in). The five laser OD models have a metal housing and specialize in applications requiring the highest degree of accuracy. The laser ODs have sensing ranges that cover 26 to 400 mm (1.0 to 15.7 inches) depending on the model and based on the resolution required.

The OD works on the principle of triangulation. Light is emitted from the sender, hits the object and bounces back at an angle to the Position Sensitive Device, or PSD. The PSD uses the angle of reflection and the position of the light spot to calculate the distance to the object. The OD 30 can calculate with extreme accuracy--down to 1 micron (0.00004 in), or 1/60th the diameter of a human hair.

The OD is an all-in-one device with an internal Digital Signal Processor (DSP). There are no external components to the OD, making it a space-saving solution. The housing of the OD is designed to be easily integrated into pre-existing systems. No separate controller is required.

DME

1640 ft
(500 m)

26.3 ft
(8 m)

The DME 2000 and DME 3000 offer long range, high resolution distance measuring in a self-contained, compact package. The DME series transmits a modulated Class II laser beam and uses a phase correlation principle to determine the distance to an object. The sensors function in either a proximity or reflex mode and can sense distance changes as small as 0.04 inches. These easy to program devices are ideal for positioning cranes, monitoring storage and retrieval equipment, measuring package dimensions, positioning robotic end effectors, monitoring coil wind/unwind stands, depth gauging and level detection.

DME5000

492.1 ft
(150 m)

The DME 5000 features highly dynamic and accurate measurement, multi-functional switching outputs and inputs for stand-by, preset and other system functions, a device display with all important information available at a glance, and a particularly user-friendly mounting and alignment concept. The light and compact device is available in two versions that have been specially optimized for automatic small parts storage or for pallets in high-bay warehouses. The DME 5000 is the only device of its type that is approved by CSA and UL.

The DME 5000 is suitable for approach speeds of up to 10 m/s and takes the different requirements of the two types of warehouses into account with its two range-optimized versions for 229.7 ft (70 m) and 492.1 ft (150 m). The 229.7 ft (70 m) version is characterized by highly dynamic shelf behavior: the current measurement values are provided each millisecond. A variety of improvements, including the sensor's reduced temperature drift of 0.1 mm/K, ensure an accuracy of +/- 2 mm with a reproducibility of 0.5 mm, thus achieving extremely rapid and accurate positioning of the storage and retrieval units at container spaces. The 492.1 ft (150 m). version of the DME 5000 is the right choice for high-bay warehouses with their longer vehicle paths and larger pallet spaces. It provides a measurement value every two milliseconds with an accuracy of +/- 3 mm.

WTA24

9.8 ft (3 m)

The WTA 24 uses an infrared light source and patented system of parabolic mirrors to produce highly accurate, repeatable analog readings regardless of a target's color or reflectivity. It can even detect objects with as little as 6% reflectivity (tire treads, for instance). With a 5 ms response time, it can easily be integrated into transfer and processing lines. This sensor has a 4 to 20 mA analog output. Operating from 12 to 30 V DC, the WTA 24 offers both short and long sensing distances in three different versions ranging from 250 mm (10 in) to 3 m (10 ft). The WTA 24 is a cost-effective replacement for mechanical and ultrasonic sensors with superior online monitoring and positioning performance.

DMP

6.6 ft (2 m)

The DMP Dimensional Multifunctional Position Finder is the sensor of choice for automated storage and retrieval systems. The DMP can control the drives of shelf-supplying devices for precision placement. Not only can the DMP help you place an object accurately to begin with, it has repeatability to within 0.006 in! The DMP also takes into account changes in the environment, including changing ambient conditions, uneven floors in warehouses and variations in acceleration and slowing of shelf-supplying devices. Plus, the DMP is immune to ambient light interference, even high frequency lighting.

DMH

1.7...2.4 in (42...62 mm)

SICK's DMH height profile sensor is the answer to many industry challenges. One of the most notable applications is counting shingled objects, such as newspapers, magazines and cardboard boxes, quickly and accurately. The DMH far exceeds vision systems in accuracy and reliability. Height profiles are easily taught in and easily changed. Productivity depends on getting a good count each time and reducing the need for overruns. Four other operation modes provide simple solutions for the food and packaging industries as well as many other forms of manufacturing.

ICS100/ICS110

2.8 in (70 mm)

The revolutionary ICS 100 Intelligent Camera Sensor is so easy to operate that it can be integrated quickly and easily into any application without special image processing knowledge. It will immediately improve work flow, budget and product quality at minimal expense.

The IP 64 housing and homogenous integrated illumination and lens make it easy to mount in the smallest and most hostile factory environments. A robust CMOS sensor allows inspection of very glossy objects without glaring or blooming and a lightning fast processing speed of up to 2.5 ms makes even the fastest moving applications possible.

The ICS 100 retains whatever you teach it. During the process, the sensor compares the current image with the images it has been taught. As soon as an image appears in the viewfinder, which coincides sufficiently with the taught information, the corresponding output is triggered.

The compact and practical ICS 100 is a complete system can be installed anywhere an intelligent sensor is required. A true machine vision solution, the ICS 100 is capable of pattern matching, presence monitoring, shape verification, position and dimension verification, object detection and completeness verification.

Selection Table

Proximity/Diffuse Sensors

Background Suppression

Sensor Type	Sensing Range mm	Light Source			Features			
		Red	IR	Laser	Test	Delay	Alarm	Enclosure Rating
ET 1	50		■					IP 54
MHT 1	50		■					IP 40
WT 2S	30	■						IP 67
WT 4-2	130	■						IP 67
WT 4-2 Teflon	80	■						IP 68
WT 150	100	■						IP 67
WT 9-2	250	■						IP 67
WT 9L	150			■				IP 67
WT 1000	50		■					IP 67
WT 1000	100		■					IP 67
WTB 140	500	■						IP 67
WT 160	55	■						IP 67
WTB 160T	50	■						IP 67
WTB 160T	150	■						IP 67
WT 12-2	100	■						IP 67
WT 12-2	250		■					IP 67
WT 12-2	250			■				IP 67
WT 12L-2	200			■				IP 67
WT 190	100	■						IP 67
WT 190	300	■						IP 65
WT 190T	100	■						IP 67
WT 190T	300	■						IP 67
WT 250	310	■						IP 67
WT 250	600	■						IP 67
WT 250	1100	■						IP 67
WT 14	500		■					IP 65
WTV 18-2	200		■					IP 67
WT 18-2	250	■	■					IP 67
WT 18-2	600	■						IP 67
WT 18-2	700		■					IP 67
WT 18-2	1000		■					IP 67
WT 23	1000		■					IP 67
WT 24 Exi	2000		■					IP 65
WT 24-2	1200	■			■	■	■	IP 67
WT 24-2	2500		■		■	■	■	IP 67
WT 34	1200	■			■	■	■	IP 67
WT 34	2500		■		■	■	■	IP 67
WT 260	380		■		■	■	■	IP 66
WT 260	3200		■		■	■		IP 67
WT 27-2	1000	■				■		IP 65
WT 27-2	1500		■			■		IP 67
WT 27 L-2	800	■		■				IP 67
WT 36	800		■		■	■		IP 67, IP 65
WT 45	2000		■		■	■		IP 67
VT 18--2	105		■					IP 66
DS 60	6000			■				IP 67, IP 65
DS 60	6000			■				IP 67, IP 65

Proximity/Diffuse Sensors

Background Suppression

Sensor Type	Voltage		Output					Connection Type							Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	M8	M12	Mini	Micro	Cable	Terminal	Square	
ET 1	■		■	■				■	■			■			50
MHT 1	■		■	■								■			54
WT 2S	■		■	■				■				■			66
WT 4-2	■		■	■				■				■			70
WT 4-2 Teflon	■		■	■								■			72
WT 150	■		■	■				■				■			74
WT 9-2	■		■	■				■	■			■			80
WT 9L	■		■	■				■	■						86
WT 1000	■	■	■	■			■		■		■	■			88, 222
WT 1000	■	■	■	■			■		■		■	■			90, 224
WTB 140	■		■	■				■				■			94
WT 160	■		■	■				■				■			98
WTB 160T	■		■	■				■				■			104
WTB 160T	■		■	■				■				■			106
WT 12-2	■		■						■			■			122
WT 12-2	■		■	■					■			■			124
WT 12-2	■		■	■					■			■			126
WT 12L-2	■		■	■					■			■			130
WT 190	■		■	■				■				■			132
WT 190	■		■	■				■				■			134
WTB 190T	■		■	■				■				■			136
WTB 190T	■		■	■				■				■			138
WT 250	■	■	■	■		■			■			■			144, 226
WT 250	■	■	■	■		■			■			■			146, 228
WT 250	■	■	■	■		■			■			■			148, 230
WT 14	■		■						■						150
WTV 18-2	■		■						■						154
WT 18-2	■		■	■					■			■		■	156
WT 18-2	■		■						■			■			158
WT 18-2	■		■						■			■			160
WT 18-2	■		■						■			■			162
WT 23	■		■						■						164
WT 24 Exi	■				■				■				■		168
WT 24-2	■	■	■	■		■			■	■	■		■		170, 250
WT 24-2	■	■	■	■		■			■	■	■		■		172, 248
WT 34	■	■	■	■		■			■				■		174, 254
WT 34	■	■	■	■		■			■				■		176, 252
WT 260	■	■	■	■		■			■				■	■	178, 232
WT 260T	■	■	■	■		■			■				■	■	184, 238
WT 27-2	■	■	■	■		■			■	■					186, 246
WT 27-2	■	■	■	■		■			■	■				■	188, 242
WT 27 L-2	■	■	■			■			■	■	■			■	190, 244
WT 36	■	■	■	■		■			■				■	■	194, 260
WT 45	■	■	■	■		■							■		196, 262
VT 18--2	■		■	■					■			■			202
DS 60	■		■	■					■						214
DS 60	■		■	■					■						216

Selection Table

Proximity/Diffuse Sensors

Energetic

Sensor Type	Sensing Range mm (1750 / 3500)	Light Source: Red	Light Source: IR	Light Source: Laser	Features: Test	Features: Delay	Features: Alarm	Enclosure Rating
ET 1	100		■					IP 54
MHT 1	100		■					IP 40
ST 130	60	■						IP 66
ST 130	200	■						IP 65
WT 2S	55	■						IP 67
WT 150	250	■						IP 67
WT 9-2	450	■						IP 67
WT 9-2	1500		■					IP 67
WT 1000	500		■					IP 67
WTE 140-2	900	■						IP 67
WT 160	360	■			■		■	IP 67
WTE 160T	700	■						IP 67
WTE 160T	1000		■					IP 67
WT 170	550	■						IP 65
WT 12-2	1000	■						IP 65
WT 14	1500		■					IP 67
WT 23	2000		■					IP 67
WT 260	1500	■			■			IP 67
WT 260	3200		■		■			IP 67
WT 2000	3500		■			■	■	IP 67
VT 12T-2	115		■					IP 67
VT 12T-2	210		■					IP 66
VTE 18	800		■					IP 67
VTE 18L	400		■					IP 67
VT 18-2	110		■					IP 67
VT 180	400		■					IP 65
VT 180	400		■					IP 67

Proximity/Diffuse Sensors

Energetic

Sensor Type	Voltage		Output					Connection Type						Page
	DC	AC	PNP	NPN	FET	Relay	Triac	M8	M12	Mini	Micro	Cable	Terminal	
ET 1	■		■	■				■	■			■		52
MHT 1	■		■	■								■		56
ST 130	■		■	■								■		60
ST 130	■		■	■				■				■		62
WT 2S	■		■	■				■				■		68
WT 150	■		■	■				■				■		76
WT 9-2	■		■	■				■	■			■		82
WT 9-2	■		■	■					■			■		84
WT 1000	■		■	■					■			■		92
WTE 140-2	■		■	■				■				■		96
WT 160	■		■	■				■				■		102
WTE 160T	■		■	■				■				■		110
WTE 160T	■		■	■				■				■		112
WT 170	■		■	■				■				■		116
WT 12-2	■		■	■					■			■		128
WT 14	■		■						■			■		152
WT 23	■	■	■						■			■		166, 240
WT 260	■	■	■	■					■				■	180, 234
WT 260	■	■	■	■					■				■	182, 236
WT 2000	■		■	■	■	■			■	■	■	■		192, 256
VT 12T-2	■		■	■					■			■		198
VT 12T-2	■		■						■			■		200
VTE 18	■		■	■					■			■		206
VTE 18L	■		■	■					■			■		208
VT 18-2	■					■		■			■			210
VT 180	■		■	■					■			■		212
VT 180	■		■	■					■			■		234

Selection Table

Proximity/Diffuse Sensors

Fixed Focus

Sensor Type	Sensing Range mm	250	500	Light Source: Red	IR	Laser	Features: Test	Delay	Alarm	Enclosure Rating
ST 130	30			■				■		IP 65
WT 9-2	20			■						IP 67
WTF 160T	100			■						IP 67
WT 170	100			■						IP 67
WT 12-2	90			■						IP 67
VTF 18	100				■					IP 67

Proximity/Diffuse Sensors

Divergent

Sensor Type	Sensing Range mm	250	500	Light Source: Red	IR	Laser	Features: Test	Delay	Alarm	Enclosure Rating
WT 160	105				■		■		■	IP 67

Proximity/Diffuse Sensors

Foreground Suppression

Sensor Type	Sensing Range mm	3000	6000	Light Source: Red	IR	Laser	Features: Test	Delay	Alarm	Enclosure Rating
WT 12-2	100			■						IP 67
WTV 190T	100			■						IP 67
WTV 190T	300			■						IP 67
DS 60	6000				■	■				IP 67

Proximity/Diffuse Sensors

Fixed Focus

Sensor Type	Voltage		Output					Connection Type						Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	M8	M12	Mini	Micro	Cable	Terminal	
ST 130	■		■	■								■		58
WT 9-2	■		■	■				■	■			■		78
WTF 160T	■		■	■				■				■		108
WT 170	■		■	■				■				■		114
WT 12-2	■		■	■				■				■		118
VTF 18	■		■	■					■			■		204

Proximity/Diffuse Sensors

Divergent

Sensor Type	Voltage		Output					Connection Type						Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	M8	M12	Mini	Micro	Cable	Terminal	
WT 160	■		■	■				■				■		100

Proximity/Diffuse Sensors

Foreground Suppression

Sensor Type	Voltage		Output					Connection Type						Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	M8	M12	Mini	Micro	Cable	Terminal	
WT 12-2	■		■	■					■			■		120
WTV 190T	■		■	■								■		140
WTV 190T	■		■	■								■		142
DS 60	■		■	■					■			■		218

Selection Table

Reflex/Retro-Reflective Sensors

Sensor Type	Sensing Range m (28 / 55)	Light Source: Red	IR	Laser	Features: Test	Delay	Alarm	Enclosure Rating
EL 1	4	■					■	IP 54
MHL 1	4	■					■	IP 40
WL 2S	0.8	■						IP 67
WL 150	2.4	■						IP 67
WL 4-2	2.8	■						IP 67
WL 4-2	2.8	■						IP 67
WL 9-2	0.4	■						IP 67
WL 9-2	4	■						IP 67
WL 9-2	4	■						IP 67
WL 9L	12			■				IP 67
WL 140	1.5	■						IP 67
WL 1000	4.2	■						IP 67
WL 160	2.4	■			■		■	IP 67
WL 160T	1	■						IP 67
WL 170	4	■						IP 67
WL 12-2	7	■						IP 67
WL 12-2	2	■						IP 67
WL 12L-2	18			■				IP 67
WL 250	9	■						IP 65
WL 14	5	■						IP 67
WL 18-2	7	■			■			IP 65
WL 23	9	■						IP 67, IP 65
WL 27-2	14	■			■	■		IP 67
WL 260	9.5	■			■			IP 67
WL 24-2	22	■			■	■	■	IP 67
WL 24 Exi	15	■						IP 67
WL 34	22	■			■	■	■	IP 67
WL 2000	18	■				■	■	IP 67, IP 65
WL 36	22	■			■	■	■	IP 67
WL 45	55	■			■	■	■	IP 67
VL 12-2 Non-polarized	3.5		■					IP 67
VL 18-3/4	3.7	■						IP 67
VL 18	5	■	■					IP 67
VL 180 Non-polarized	5.5		■					IP 67
VL 180	2.2	■						IP 67
VL 18 L	35	■		■				IP 67
DS 60 Non-polarized	20			■	■			IP 67

Clear Material Sensors

Sensor Type	Sensing Range mm (4000)	Light Source: Red	IR	Laser	Features: Test	Delay	Alarm	Enclosure Rating
WT 4-2	35	■					■	IP 67
WL 150	700	■						IP 67
WL 170	800	■						IP 67
WL 4G-2	1600	■						IP 67
WL 12G	2000	■						IP 67
WL 12-2	4000	■						IP 67

Reflex/Retro-Reflective Sensors

Sensor Type	Voltage		Output						Connection Type						Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	Other	M8	M12	Mini	Micro	Cable	Terminal	Square	
EL 1	■		■	■					■	■			■			270
MHL 1	■		■	■									■			274
WL 2S	■		■	■					■				■			276
WL 150	■		■	■					■				■			278
WL 4-2	■		■	■					■				■			280
WL 4-2	■		■	■					■				■			282
WL 9-2	■		■	■					■	■			■			284
WL 9-2	■		■	■					■	■			■			286
WL 9-2	■		■	■					■	■			■			288
WL 9L	■		■	■					■	■						290
WL 140	■		■	■					■				■			292
WL 1000	■	■	■	■			■			■		■	■			294, 348
WL 160	■		■	■					■				■			296
WL 160T	■		■	■					■				■			298
WL 170	■		■	■					■				■			300
WL 12-2	■		■	■						■			■			302
WL 12-2	■		■	■						■			■			304
WL 12L-2	■		■	■						■						306
WL 250	■	■	■	■		■				■			■			308, 354
WL 14	■		■	■						■			■			310
WL 18-2	■		■	■						■			■		■	312
WL 23	■	■	■	■		■				■			■			314, 350
WL 27-2	■	■	■	■				ASI		■	■		■		■	316, 352
WL 260	■	■	■	■		■				■	■		■	■	■	320, 356
WL 24-2	■	■	■	■		■				■	■			■		322, 362
WL 24 Exi	■				■					■				■		324
WL 34	■	■	■	■		■				■				■		326, 364
WL 2000	■	■	■	■		■		FET		■	■	■	■			328, 358
WL 36	■	■	■	■		■				■				■	■	330, 366
WL 45	■	■	■	■		■								■		332, 368
VL 12-2 Non-polarized	■		■							■			■			334
VL 18-3/4		■					■			■			■			336
VL 18	■		■	■												338
VL 180 Non-polarized	■		■	■						■			■			340
VL 180	■		■	■						■			■			342
VL 18 L	■		■	■						■			■			344
DS 60 Non-polarized	■		■	■						■						348

Clear Material Sensors

Sensor Type	Voltage		Output						Connection Type						Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	Other	M8	M12	Mini	Micro	Cable	Terminal	Square	
WT 4-2	■		■	■					■	■			■			374
WL 150	■		■	■					■				■			376
WL 170	■		■	■					■				■			378
WL 4G-2	■		■	■					■				■			380
WL 12G	■		■	■						■			■			382
WL 12-2	■							■		■			■			384

Selection Table

Through Beam Sensors

Sensor Type	Sensing Range m	175	350	Light Source: Red	IR	Laser	Features: Test	Delay	Alarm	Enclosure Rating
SS/SE 130	0.35			■						IP 66
SS/SE 130	2.2			■						IP 66
WS/WE 2S	1.2			■						IP 67
WS/WE 4-2 Teflon	3			■			■			IP 68
WS/WE 4-2	4			■			■			IP 67
WS/WE 150	4.4			■						IP 67
WS/WE 1000	5			■	■					IP 67
WS/WE 9-2	7			■						IP 67
WS/WE 9L	50			■		■				IP 67
WS/WE 140-2	15			■						IP 67
WS/WE 160	14				■					IP 67
WS/WE 170	8.5			■			■			IP 67
WS/WE 12-2	20			■			■			IP 67
WS/WE 12L-2	80			■		■	■			IP 67
WS/WE 250	25			■			■			IP 67
WS/WE 18-2	20			■			■			IP 67
WS/WE 260	35				■		■			IP 67
WS/WE 27-2	35			■			■			IP 67
WS/WE 24-2	60			■			■		■	IP 67
WS/WE 34	60			■			■		■	IP 67
WS/WE 2000	50				■		■	■	■	IP 67
WS/WE 36	60				■		■	■	■	IP 67, IP 65
WS/WE 45	350				■		■	■	■	IP 67
VS/VE 12-2	5				■					IP 67
VS/VE 18	20				■					IP 67
VS/VE 18	22				■					IP 67
VS/VE 18 L	60			■		■				IP 67
VS/VE 180	23				■					IP 66

Through Beam Sensors

Sensor Type	Voltage		Output						Connection Type							Page
	DC	AC	PNP	NPN	Namur	Relay	Triac	Other	M8	M12	Mini	Micro	Cable	Terminal	Square	
SS/SE 130	■		■	■									■			390
SS/SE 130	■		■	■									■			392
WS/WE 2S	■		■	■					■				■			396
WS/WE 4-2 Teflon	■		■	■									■			398
WS/WE 4-2	■		■	■					■				■			400
WS/WE 150	■		■	■					■				■			402
WS/WE 1000	■	■	■	■			■			■		■	■			404, 452
WS/WE 9-2	■		■	■					■	■			■			406
WS/WE 9L	■		■	■					■	■						408
WS/WE 140-2	■		■	■					■				■			410
WS/WE 160	■		■	■					■				■			412
WS/WE 170	■		■	■					■				■			414
WS/WE 12-2	■		■	■						■			■			416
WS/WE 12L-2	■		■	■						■			■			418
WS/WE 250	■	■	■	■		■				■			■			420, 454
WS/WE 18-2	■		■	■						■			■			422
WS/WE 260	■	■	■	■		■				■			■	■		424, 458
WS/WE 27-2	■	■	■	■		■				■	■		■		■	426, 456
WS/WE 24-2	■	■	■	■		■		ASI		■			■	■	■	428, 462
WS/WE 34	■	■	■	■		■				■			■	■		434, 464
WS/WE 2000	■	■	■	■		■				■	■		■			436, 460
WS/WE 36	■	■	■	■		■				■			■	■	■	438, 466
WS/WE 45	■	■	■	■		■								■		440, 468
VS/VE 12-2	■		■	■						■			■			442
VS/VE 18	■		■	■						■			■			444
VS/VE 18	■								■			■				470
VS/VE 18 L	■		■	■						■			■			446
VS/VE 180	■		■	■						■			■			448

Selection Table

Zero Pressure Accumulation Sensors

Sensor Type	Sensing Range m	9	Mounting	Voltage DC	Voltage AC	Integrated Sensor	Integrated Logic	Integrated Daisy Chain	Output	Logic	Page
ZLM 1	External sensor dependent		Side-Frame-Mount	■			■	■	valve	1)	478
	External sensor dependent		Side-Frame-Mount	■			■	■	valve	2)	478
WTR 1	■ 0.9		Under-the-Conveyor	■		■	■	■	valve	1)	482
	■ 0.9		Under-the-Conveyor	■		■	■	■	valve	3)	482
WTR 2-P621	■ 0.9		Under-the-Conveyor	■		■	■	■	cable	1)	484
WLR 2100-D	■■■■■■■■■	9	Over-the-Conveyor	■		■	■	■	cable	1)	486
	■■■■■■■■■	9	Over-the-Conveyor	■		■	■	■	cable	2)	486
WLR 2100-M	■■■■■■■■■	9	Over-the-Conveyor		■	■	■	■	cable	4)	488
	■■■■■■■■■	9	Over-the-Conveyor		■	■			cable	5)	488
WTR 2	■ 0.9		Under-the-Conveyor	■	■		■	■	PNP/NPN	6)	490

[1] Single Accumulation with Single and Slug Release
[2] Slug Accumulation with Slug Release
[3] Slug Accumulation with Single Release
[4] Adjustable accumulation with single or adjustable slug release
[5] Adjustable accumulation with slug or adjustable single release
[6] None. To be used as a stand alone sensor or with ZLM

Light Grid Sensors

Sensor Type	Sensing Range	Sensing Type	Resolution 6	10	20	30	50	Output PNP	NPN	RS 485	Page
WLG 12	0...1.5 m	Reflex	■					■	■		500
MLG Standard	0...8.5 m	Through beam		■	■	■	■	■	■	■	502
MLG Programmable	0...8.5 m	Through beam		■	■	■	■	■	■	■	504
MLG Multiple Scan	0.5...5 m	Through beam		■	■	■	■	■	■	■	506

Fork Sensors

Sensor Type	Sensing Range/ Fork Width	Light Source	Voltage	Output	Connection Type	Page
WF 3T/5T	3 mm/5 mm	Infrared	DC	PNP/NPN	Plug, M8 4-pin	510
WF	2...120 mm	Infrared	DC	PNP/NPN	Plug, M8 4-pin	512

Fiber Optic Sensors

Sensor Type	Light Source			Voltage		Enclosure Rating	Output	Connection Type						Page
	Red	IR	Green	DC	AC			M8	M12	Cable	Mini	Micro	Terminal	
WLL 170	■			■		IP 50	PNP/NPN	■		■				518
WLL 170 High Speed	■			■		IP 50	PNP/NPN	■		■				520
WLL 12	■	■	■	■		IP 67	PNP/NPN		■					522
WLL 160	■			■		IP 66	PNP/NPN	■		■				524
WLL 160T	■			■		IP 66	PNP/NPN	■		■				526
WLL 170 Analog	■			■		IP 50	Analog	■		■				528
WLL 170T	■			■		IP 50	PNP/NPN	■		■				530
WLL 170 Green			■	■		IP 50	PNP/NPN	■		■				532
WLL 1000	■			■		IP 67	PNP/NPN		■	■				534
WLL 1000		■		■		IP 67	PNP/NPN		■	■				536
WLL 24 Exi	■			■		IP 65	NAMUR		■				■	538
WLL 260	■			■		IP 66	PNP/NPN		■				■	540
WLL 2000	■			■		IP 67	PNP/NPN		■	■				542
VLL 18	■			■		IP 67	PNP/NPN		■	■				544
WLL 260	■			■	■	IP 66	Relay						■	548
WLL 2000	■			■	■	IP 67	Relay			■	■			550
WLL 2000	■			■	■	IP 67	FET			■	■	■		552

Contrast Sensors

Sensor Type	Sensing Distance	Switching Frequency	Light Source						Sensitivity Adj.		Housing Material		Page
			Red	Laser	IR	Green	Blue	White	Manual	Teach-in	Metal	Plastic	
ST 130	16 mm	2.5 kHz	■			■			■			■	556
WTM 160T	10 mm	2.5 kHz				■				■		■	560
KT 3	12.5 mm	10 kHz	■			■	■			■		■	562
KT 2	13.5 mm	10 kHz	■			■			■		■		564
KT 5G-2	10/20/40 mm	10 kHz				■			■		■		566
KT 5G-2 Teach	10/20 mm	10 kHz				■				■	■		568
KT 5W-2 Dyn. Teach	10/20 mm	10 kHz	■			■	■			■	■		570
KT 5G-2 Auto.	10 mm	10 kHz				■			■		■		572
KT 5W-2 Mark Teach	10 mm	10 kHz	■			■	■			■	■		574
KT 5L	150 mm	10 kHz	■	■					■		■		576
KT 10W	12.5 mm	25 kHz	■			■	■			■	■		578
NT 6	9 mm	10 kHz	■			■			■		■		580
NT 8	9 mm	10 kHz						■	■		■		582
NTL 6	15/60 mm	10 kHz	■		■	■			■		■		584
KTL 5G-2	Dependent on fiber	10 kHz				■			■		■		586
KTL 5W-2 Dyn. Teach	Dependent on fiber	10 kHz	■			■	■			■	■		588
KTL 10W	Dependent on fiber	25 kHz	■			■	■			■	■		590

Color Sensors

Sensor Type	Sensing Distance	Switching Frequency	Output	Light Source			Sensitivity Adj.		Housing Material		Page
				Red	Green	Blue	Manual	Teach-in	Metal	Plastic	
CSM 1	12.5 mm	1500 Hz	PNP/NPN	■	■	■		■		■	594
CS 1	12.5/60 mm	1000 Hz	PNP/NPN	■	■	■		■	■		596
CS 3	12.5/60 mm	300 Hz	PNP/NPN	■	■	■		■	■		598
CSL 1	Dependent on fiber	1000 Hz	PNP/NPN	■	■	■		■	■		600

Selection Table

Luminescence Sensors

Sensor Type	Sensing Distance	Switching Frequency	Output	Light Source	Sensitivity Adj.		Housing Material		Page
				UV	Manual	Teach-in	Metal	Plastic	
LUT 2	12.5 mm	500/2000 Hz	PNP/NPN	■		■		■	604
LUT 3-6	10...50 mm	1.5 kHz	PNP/NPN	■	■		■		606
LUT 3-8	10/20/50/90 mm	1.5 kHz	PNP/NPN/Analog	■	■		■		608
LUT 3-9	10/20/50/90 mm	1.5 kHz	PNP/NPN/Analog	■	■		■		610
LUT 1-5	1.5...140 mm	250 hz	PNP/NPN/Analog	■	■		■		612
LUT 1-4	5...300 mm	5 kHz	PNP/Analog	■	■		■		614

Displacement Sensors

Sensor Type	Sensing Range	Resolution	Operating Temperature	Light Source		Output			Page
				Red	Laser	PNP	NPN	Analog	
OD 25	25 ±5 mm	3 µm	14...104°F (-10...40°C)	■		■	■	■	620
OD 30	30 ±4 mm	1 µm	14...104°F (-10...40°C)		■	■	■	■	622
OD 50	50 ±10 mm	3 µm	14...104°F (-10...40°C)		■	■	■	■	624
OD 100	100 ±35 mm	15 µm	14...104°F (-10...40°C)		■	■	■	■	626
OD 130	130 ±50mm	20 µm	14...104°F (-10...40°C)		■	■	■	■	628
OD 250	250 ±150 mm	150 µm	14...104°F (-10...40°C)		■	■	■	■	630
OD CMOS	30...100 mm	2/8/8/10 µm	14...104°F (-10...40°C)		■	■	■	■	632

Ultrasonic Sensors

Sensor Type	Sensing Range	Switching Frequency	Voltage	Output			Page
				Single	Double	Analog	
							644
UM 30-1	30...250 mm	11/s	12...30 V DC	■	■	■	644
UM 30-2	60...350 mm	8/s	12...30 V DC	■	■	■	644
UM 30-3	200...1300 mm	6/s	12...30 V DC	■	■	■	644
UM 30-4	350...3400 mm	3/s	12...30 V DC	■	■	■	646
UM 30-5	800...6000 mm	2/s	12...30 V DC	■	■	■	648
UM 18	40 mm ±3 mm	Double sheet Detector	12...30 V DC				650

Distance Sensors

Sensor Type	Sensing Range	Resolution	Accuracy	Repeatability	Output	Light Source			Page
						Red	Laser	IR	
DT 2	50...300 mm	1 mm	±8%	3%	Analog			■	654
WTA 24	100...1200 mm	5 mm	5 mm	0.5 mm	PNP/Analog			■	656
DT 200	100...2000 mm	0.125 mm	5 mm	1 mm	Analog	■	■		658
DMT 5	0.5...55 m	1 mm	10 mm	7 mm	Open collector/Analog		■	■	660
DMT 10	0.5...155 m	1 mm	10 mm	7 mm	Open collector/Analog		■	■	662
DME 2000									
Proximity mode	100...2047 mm	1 mm	5 mm	1 mm	PNP/Analog/RS 232	■	■		664
Reflex mode	0.1...130 m	1 mm	+5/-20 mm	2 mm	PNP/Analog/RS 232	■	■		664
DME 3000-1	0.1...500 m	0.125/1 mm	5 mm	0.5 mm max.	PNP/NPN/RS 422/SSI/Profibus	■	■		666
DME 3000-2	100...8000 mm	0.125/1 mm	5 mm	1 mm	PNP/NPN/RS 422/SSI/Profibus	■	■		668
DME 5000	0.15...150 m	0.05 mm	2 mm	0.5 mm	PNP/NPN/RS 422/SSI	■	■		672
DME 5000 Profibus	0.15...150 m	0.05 mm	2 mm	0.5 mm	PNP/NPN/Profibus	■	■		674
DML 40	0.5...300 m	1 mm	10 mm	6 mm	Open collector/RS 232, 422/Analog		■	■	676
DML 40 Profibus	0.15...300 m	1 mm	10 mm	6 mm	Open collector/RS 232/Profibus		■	■	678

Dimensional Multi-Functional Sensors

Sensor Type	Sensing Range	Sensor Function	Light Source			Page
			Green	Red	Laser	
DMH	42...62 mm	Distance sensor		■	■	682
DMH Counter	42...62 mm/70...110 mm	Shingle counter sensor		■	■	684
DMP	200...2000 mm	Position finder sensor		■		686
DMP	200...2000 mm	Position finder sensor		■		688
ICS 100	70 mm	Intelligent camera sensor	■			690
ICS 110	70 mm	Intelligent camera sensor	■			692

Infrared Data Transmission Systems

Sensor Type	Sensing Range	Baud Rate	Operating Temperature	Output	Page
ISD 230	0.2...200 m	38.4 kBd	32...131°F (0...55°C)	RS 232/422/485/CL 20 mA/Sinec	696
ISD 260/280	0.2...180 m	0.5/1.5 M Bd	32...104°F (0...40°C)	RS 422/485/SSI/Profibus/Interbus	698
ISD 300 Profibus	0.2...200 m	1.5 M Bd	41...122°F (5...50°C)	RS 485/Profibus	700
ISD 300 Interbus RS 422	0.2...200 m	1.5 M Bd	41...122°F (5...50°C)	RS 422/Interbus	702
ISD 300 Interbus Fiber Optic	0.2...200 m	1.5 M Bd	41...122°F (5...50°C)	Interbus	704
ISD 300 DH+/RIO	0.2...200 m	1.5 M Bd	41...122°F (5...50°C)	DH+/RIO	706
ISD 300 CANopen/DeviceNet	0.2...200 m	1.5 M Bd	41...122°F (5...50°C)	CANopen/DeviceNet	708

Selection Table

Inductive Proximity Sensors

Sensor Type	Housing			Sensing Range s_n in mm		Switching Output		
	Design	Size in mm	Material	Shielded	Non-Shielded	PNP	NPN	NAMUR
IM 04 Miniature	Barrel, threaded	M4	Nickel plated, brass	0.6		■	■	
IM 05 Miniature	Barrel, threaded	M5	Nickel plated, brass	0.8		■	■	
IM 08 Standard	Barrel, threaded	M8	Nickel plated, brass	1.5	2.5	■	■	
IM 08 Short	Barrel, threaded	M8	Nickel plated, brass	1.5		■	■	
IM 08 Advanced	Barrel, threaded	M8	Nickel plated, brass	2	4	■	■	
IM 08 Advanced Short	Barrel, threaded	M8	Nickel plated, brass	2	4	■	■	
IM 08 Triple Sensing Range	Barrel, threaded	M8	Nickel plated, brass	3	6	■	■	
IM 08 NAMUR	Barrel, threaded	M8	Nickel plated, brass	1				■
IM 12 Standard	Barrel, threaded	M12	Nickel plated, brass	2	4	■	■	
IM 12 Short	Barrel, threaded	M12	Nickel plated, brass	2	4	■	■	
IM 12 2-wire	Barrel, threaded	M12	Nickel plated, brass	2	4			
IM 12 Advanced	Barrel, threaded	M12	Nickel plated, brass	4	8	■	■	
IM 12 Advanced Short	Barrel, threaded	M12	Nickel plated, brass	4	8	■	■	
IM 12 Triple Sensing Range	Barrel, threaded	M12	Nickel plated, brass	6	10	■	■	
IM 12 Harsh Environment	Barrel, threaded	M12	Nickel plated, brass	2	4	■	■	
IM 12 QuadProx	Barrel, threaded	M12	Nickel plated, brass	2	4	■	■	
IM 12 Universal	Barrel, threaded	M12	Nickel plated, brass	2	4			
IM 12 NAMUR	Barrel, threaded	M12	Nickel plated, brass	2	4			■
IM 18 Standard	Barrel, threaded	M18	Nickel plated, brass	5	8	■	■	
IM 18 Short	Barrel, threaded	M18	Nickel plated, brass	5	8	■	■	
IM 18 2-wire	Barrel, threaded	M18	Nickel plated, brass	5	8			
IM 18 Advanced	Barrel, threaded	M18	Nickel plated, brass	8	12	■	■	
IM 18 Triple Sensing Range	Barrel, threaded	M8	Nickel plated, brass	12	20	■	■	
IM 18 Harsh Environment	Barrel, threaded	M18	Nickel plated, brass	5	8	■	■	
IM 18 QuadProx	Barrel, threaded	M18	Nickel plated, brass	5	8	■	■	
IM 18 Universal	Barrel, threaded	M18	Nickel plated, brass	5	8			
IM 18 NAMUR	Barrel, threaded	M18	Nickel plated, brass	5	8			■
IM 30 Standard	Barrel, threaded	M30	Nickel plated, brass	10	15	■	■	
IM 30 Short	Barrel, threaded	M30	Nickel plated, brass	10	15	■	■	
IM 30 2-wire	Barrel, threaded	M30	Nickel plated, brass	10	15			
IM 30 Advanced	Barrel, threaded	M30	Nickel plated, brass	15	20	■	■	
IM 30 Triple Sensing Range	Barrel, threaded	M30	Nickel plated, brass	22	40	■	■	
IM 30 Universal	Barrel, threaded	M30	Nickel plated, brass	10	15			
IM 30 NAMUR	Barrel, threaded	M30	Nickel plated, brass	10	15			■
IH 03 Miniature	Barrel, smooth	3 mm	Stainless Steel	0.6		■	■	
IH 04 Miniature	Barrel, smooth	4 mm	Stainless Steel	0.8		■	■	
IH 06 Short	Barrel, smooth	6.5 mm	Stainless Steel	1.5		■	■	
IH 06 Advanced	Barrel, smooth	6.5 mm	Stainless Steel	2	4	■	■	
IH 06 Advanced Short	Barrel, smooth	6.5 mm	Stainless Steel	2	4	■	■	
IH 20 Universal	Barrel, smooth	20 mm	Plastic		10			
IH 34 Universal	Barrel, smooth	34 mm	Plastic		30			
IQ 05 Miniature	Rectangular		Brass	0.8		■	■	
IQ 08 Standard	Rectangular		Plastic	2	4	■	■	
IQ 10 Standard	Rectangular		Plastic	3	6	■	■	
IQ 12 Standard	Rectangular		Plastic	3	6	■	■	
IQ 40 Short	Rectangular		Plastic	15, 20	3	■		
IQ 40 Standard	Rectangular		Plastic	15	20	■		
IQ 40 Universal	Rectangular		Plastic	15	20			
IQ 80 Standard	Rectangular		Plastic		60	■		
IQ 80 Universal	Rectangular		Plastic		60			

Inductive Proximity Sensors

Sensor Type	Output Function			Connection Type		Electrical Configuration	Page
	NO	NC	NO/NC	NAMUR	Cable Connector	Terminals	
IM 04 Miniature		■		■		DC 3-wire	714
IM 05 Miniature		■		■	■	DC 3-Wire	716
IM 08 Standard		■		■	■	DC 3-Wire	718
IM 08 Short		■		■	■	DC 3-Wire	720
IM 08 Advanced		■		■	■	DC 3-Wire	722
IM 08 Advanced Short		■		■	■	DC 3-Wire	724
IM 08 Triple Sensing Range	■			■	■	DC 3-Wire	726
IM 08 NAMUR			■	■		DC 2-Wire	728
IM 12 Standard		■		■	■	DC 3-Wire	730
IM 12 Short	■			■	■	DC 3-Wire	732
IM 12 2-wire	■			■	■	DC 2-Wire	734
IM 12 Advanced		■		■	■	DC 3-Wire	736
IM 12 Advanced Short		■		■	■	DC 3-Wire	738
IM 12 Triple Sensing Range		■		■	■	DC 3-Wire	740
IM 12 Harsh Environment	■	■	■		■	DC 4-Wire	742
IM 12 QuadProx	■	■	■	■	■	DC 4-Wire	744
IM 12 Universal		■		■	■	AC	746
IM 12 NAMUR			■	■		DC 2-Wire	748
IM 18 Standard		■		■	■	DC 3-Wire	750
IM 18 Short	■			■	■	DC 3-Wire	752
IM 18 2-wire	■			■	■	DC 2-Wire	754
IM 18 Advanced		■		■	■	DC 3-Wire	756
IM 18 Triple Sensing Range	■			■	■	DC 3-Wire	758
IM 18 Harsh Environment	■	■	■		■	DC 4-Wire	760
IM 18 QuadProx	■	■	■	■	■	DC 4-Wire	762
IM 18 Universal		■		■	■	AC/DC	764
IM 18 NAMUR			■	■		DC 2-Wire	766
IM 30 Standard		■		■	■	DC 3-Wire	768
IM 30 Short	■			■	■	DC 3-Wire	770
IM 30 2-wire		■		■	■	DC 2-Wire	772
IM 30 Advanced		■		■	■	DC 3-Wire	774
IM 30 Triple Sensing Range	■			■	■	DC 3-Wire	776
IM 30 Universal		■		■		AC/DC	778
IM 30 NAMUR			■	■		DC 2-Wire	780
IH 03 Miniature	■			■		DC 3-Wire	782
IH 04 Miniature	■			■	■	DC 3-Wire	784
IH 06 Short	■			■	■	DC 3-Wire	786
IH 06 Advanced	■			■	■	DC 3-Wire	788
IH 06 Advanced Short		■		■	■	DC 3-Wire	790
IH 20 Universal	■			■		AC/DC	792
IH 34 Universal		■		■		AC/DC	794
IQ 05 Miniature	■	■	■	■		DC 3-Wire	796
IQ 08 Standard	■			■	■	DC 3-Wire	798
IQ 10 Standard	■			■	■	DC 3-Wire	800
IQ 12 Standard	■			■	■	DC 3-Wire	802
IQ 40 Short	■	■	■		■	DC 3-Wire	804
IQ 40 Standard	■	■	■		■	DC 3-Wire	806
IQ 40 Universal	■	■	■		■	AC/DC	808
IQ 80 Standard	■	■	■		■	DC 3-Wire	810
IQ 80 Universal	■	■	■		■	AC/DC	812

Selection Table

Capacitive Proximity Sensors

Sensor Type	Housing			Sensing Range s_n in mm		Switching Output	
	Design	Size in mm	Material	Shielded	Non-Shielded	PNP	NPN
CM 18 Capacitive	Barrel, threaded	M18	Plastic	8	12	■	■
CM 18-PTFE Capacitive	Barrel, threaded	M18	PTFE	8		■	■
CM 30 Capacitive	Barrel, threaded	M30	Plastic	16, 25	25	■	
CQ 35 Capacitive	Rectangular		Plastic		25	■	■

Magnetic Proximity Sensors

Sensor Type	Housing			Sensing Range s_n in mm		Switching Output		
	Design	Size in mm	Material	Shielded	Non-Shielded	PNP	NPN	NAMUR
MM 08 Advanced	Barrel, threaded	M8	Brass	60		■		
MM 12 Advanced	Barrel, threaded	M12	Brass	60		■		
MM 12 NAMUR	Barrel, threaded	M12	Brass	60		■		■
MM 18 Advanced	Barrel, threaded	M18	Brass	70		■		
MM 18 NAMUR	Barrel, threaded	M18	Brass	70		■		■
MQ 10 Advanced	Rectangular		Plastic	60		■	■	

Capacitive Proximity Sensors

Sensor Type	Output Function			Connection Type		Electrical Configuration	Page
	NO	NC	NO/NC	Cable	Connector	Terminals	
CM 18 Capacitive	■	■	■	■	■	IP 67	818
CM 18-PTFE Capacitive	■	■	■	■	■	IP 67	820
CM 30 Capacitive	■	■	■	■	■	IP 67	822
CQ 35 Capacitive	■	■	■	■	■	IP 67	824

Magnetic Proximity Sensors

Sensor Type	Output Function				Connection Type		Electrical Configuration	Page
	NO	NC	NO/NC	NAMUR	Cable	Connector	Terminals	
MM 08 Advanced	■				■	■	IP 67	830
MM 12 Advanced	■				■	■	IP 67	832
MM 12 NAMUR				■	■	■	IP 67	834
MM 18 Advanced	■				■	■	IP 67	836
MM 18 NAMUR				■	■	■	IP 67	838
MQ 10 Advanced	■				■	■	IP 67	840

Selection Table

Magnetic Cylinder Sensors

Sensor Type	Housing		Relative Sensitivity in mT (gauss)	Switching Output			
	Mounting	Material		PNP	NPN	Reed	NAMUR
MZ N1	C-slot cylinders	Plastic	3 (30)	■			
RZ N1 Reed	C-slot cylinders	Metal	3 (30)			■	
MZ U2 Weld Immune	Weld immune	Metal	3 (30)	■			
MZ T6	T-slot cylinders	Plastic	2.8 (28)	■			
RZ T6	T-slot cylinders	Plastic	3 (30)			■	
MZ T1	T-slot cylinders	Plastic	3 (30)	■	■		
RZ T1 Reed	T-slot cylinders	Plastic	3 (30)			■	
MZ F1	T-slot cylinders	Aluminum, plastic	3 (30)	■			
MZ Z1	Tie-rod cylinder	Aluminum, plastic	3 (30)	■	■		
MZ Z1 NAMUR	Tie-rod cylinder	Aluminum, plastic	3 (30)				■
MZ Z2	Tie-rod cylinder	Aluminum, plastic	3 (30)	■	■		
MZ P3	Integrated profile cylinder	Aluminum, plastic	3 (30)	■	■		
MZ P3 NAMUR	Integrated profile cylinder	Aluminum, plastic	3 (30)				■
MZ P4	Integrated profile cylinder	Aluminum, plastic	3 (30)	■			
MZ P4 NAMUR	Integrated profile cylinder	Aluminum, plastic	3 (30)				■
MZ R1	Round-body cylinders	Aluminum, plastic	3 (30)	■	■		
MZ R2	Round-body cylinders	Aluminum, plastic	3 (30)	■	■		
MZ R2 NAMUR	Round-body cylinders	Aluminum, plastic	3 (30)				■
MZ K1 DC	Dovetail cylinders	Aluminum, plastic	2 (20)	■	■		
MZ K3 DC	Dovetail cylinders	Aluminum, plastic	2 (20)	■			

Magnetic Cylinder Sensors

Sensor Type	Output Function				Connection Type		Electrical Configuration	Page
	NO	NC	NO/NC	NAMUR	Cable	Connector	Terminals	
MZ N1	■				■	■	IP 67	846
RZ N1 Reed	■				■	■	IP 67	848
MZ U2 Weld Immune	■				■	■	IP 67	850
MZ T6	■				■	■	IP 67	854
RZ T6	■				■	■	IP 67	856
MZ T1	■				■		IP 67	858
RZ T1 Reed	■				■		IP 67	860
MZ F1	■				■		IP 67	862
MZ Z1	■				■	■	IP 67	866
MZ Z1 NAMUR				■	■	■	IP 67	868
MZ Z2	■				■	■	IP 67	870
MZ P3	■				■	■	IP 67	874
MZ P3 NAMUR				■	■	■	IP 67	876
MZ P4	■				■	■	IP 67	878
MZ P4 NAMUR				■	■	■	IP 67	880
MZ R1	■				■	■	IP 67	884
MZ R2	■				■	■	IP 67	886
MZ R2 NAMUR				■	■		IP 67	888
MZ K1 DC	■				■	■	IP 67	892
MZ K3 DC	■				■	■	IP 67	894

Theory of Operation...Proximity/Diffuse Sensors

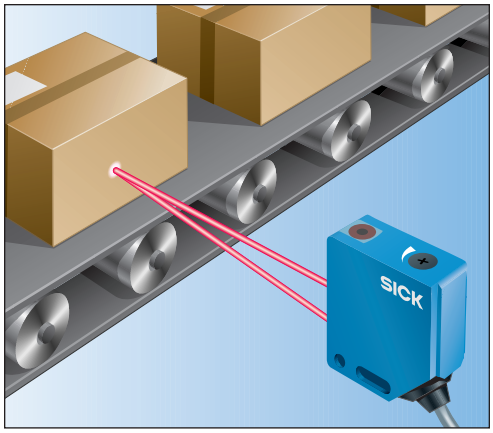


Fig. 1 Photoelectric proximity sensor application example

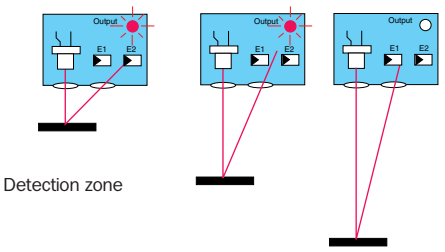


Fig. 2 Background suppression principle

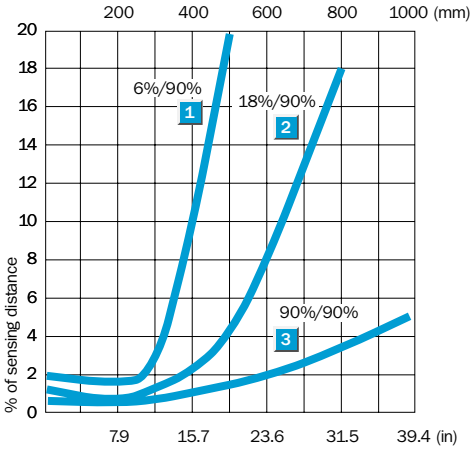


Fig. 3 Example WT 27-2 with black (6%) and gray (18%) object on white background

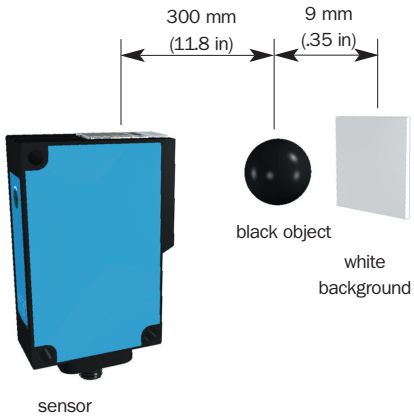


Fig. 4 At 300 mm a white background must be 9 mm behind a black object

About Photoelectric Proximity/Diffuse Sensors

Proximity sensors (designated by a "T", as in WT 2000) receive light reflected back by the target object itself (Fig. 1, 2). There are six types of proximity sensors: energetic, fixed focus, divergent, foreground suppression, background suppression and background rejection. SICK's wide range of proximity sensors are detailed in the following sections.

Background Suppression

While through beam and reflex sensors detect objects that block the light path, the various types of photoelectric proximity sensors detect objects by the light they reflect back to the sensor. Proximity sensors with SICK's patented adjustable background suppression use triangulation to limit the distance to which the sensor can "see" and keep objects in the background from interfering with the sensor.

True background suppression is accomplished by means of light triangulation (Fig. 2) in which a focal distance is defined by mechanical or electronic adjustment of the sensor. This focal distance defines a plane beyond which the sensor is not capable of detecting objects, hence the name "background suppression." Multiple receivers are used to define this plane. When a background suppression sensor is adjusted, the focal plane is moved but the sensitivity of the sensor is not changed as it is with energetic or fixed-focus proximity sensors. This has the advantage of making the background suppression sensor much less susceptible to environmental changes or dirt build-up on the optics.

All background suppression sensors have a special set of curves that show their capabilities. These curves show the background suppression as a percentage of the sensing distance for different color objects on a white (90% reflectance) background.

In the curve at left (Fig. 3), taken from the WT 27-2ABS IR/DC, the worst case is a black (6% reflectance) object on a white (90% reflectance) background. At a distance of 300 mm (11.8 in) the curve shows a background suppression of about 3%. This means that at 300 mm the white background must be at least 3% of 300 mm, or 9 mm (0.35 in), behind a black object (Fig.4).

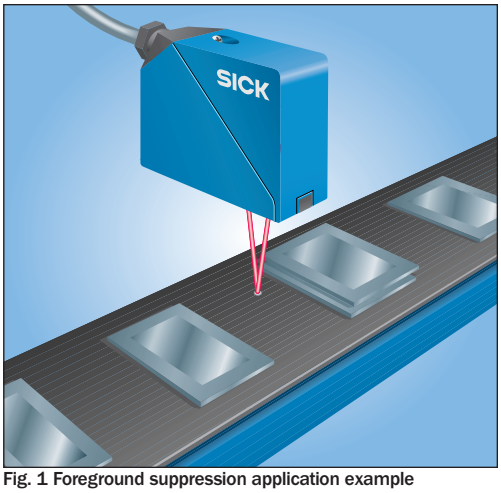


Fig. 1 Foreground suppression application example

Foreground Suppression

Photoelectric proximity sensors, even those with true background suppression, can have difficulty detecting objects with shiny or irregular surfaces. These types of objects can reflect the light emitted from the sensor in many different directions. This can cause false readings. The sensor with "foreground suppression," a SICK exclusive, solves this problem by not detecting the object directly. Instead the sensor detects the object by the lack of light being reflected by the background.

Sensors with foreground suppression also have graphed curves to detail their capabilities. In the curve shown in Fig. 3, taken from the WT 12-2, the worst case is a white (90% reflectance) object on a black (6% reflectance) background. At a distance of 50 mm (1.97 in) the curve shows a foreground suppression of about -2%. This means that at 50 mm the black background must be at least 2% of 50 mm, or 1 mm (0.039 in) behind the white object (Fig. 4).

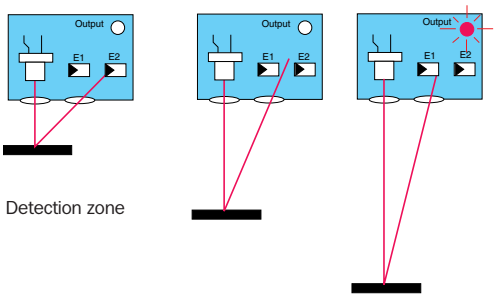


Fig. 2 Foreground suppression principle

The same multiple receiver system used in background suppression is used in foreground suppression (Fig. 1, 2). The difference is that the sensor is set so that it can "see" the background, but an object close to the sensor is not detected. The background is used as a reflector by the sensor and anything that passes between sensor and background is detected because it blocks the reflection from the background. This means that even objects, which are shiny or have irregular surfaces, can be reliably detected in cases where an actual reflector cannot be used.

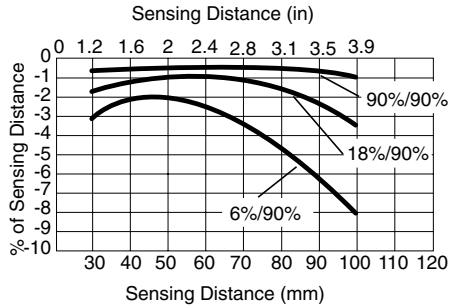


Fig. 3 Example WT 12-2 with black (6%) and white (90%) object on a black background

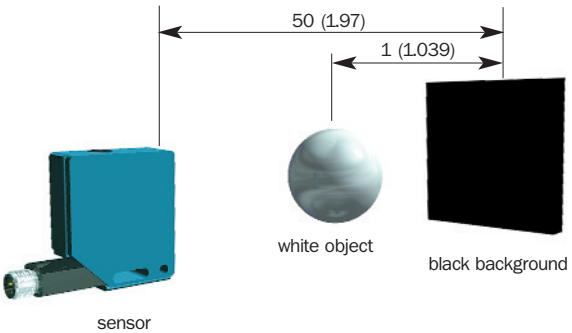


Fig. 4 At 50 mm an object must be 1 mm in front of the black background

Theory of Operation...Proximity/Diffuse Sensors

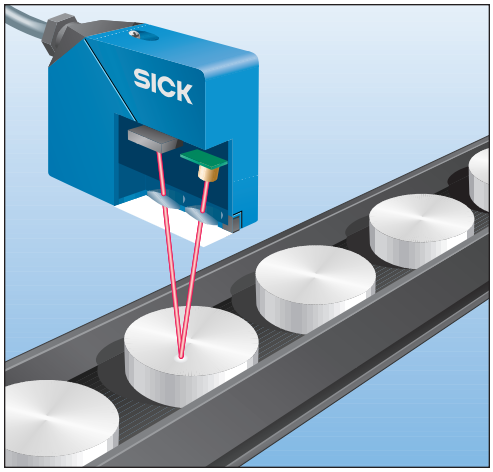


Fig. 1 Background rejection sensor application example

Background Rejection

Background rejection is an ultra-precise form of background suppression. Background rejection sensors can detect the slightest difference from the object to the background. It can be achieved either electronically or optically.

Optically, the angle between the sender and the receiver's light beam is altered while setting the sensing distance. Objects are detected at the point where the emitted beam is reflected back to the receiver element. Anything below this point is cut out as no light or not enough light, reaches the receiver element.

The electronic method uses Position Sensitive Devices (PSD). The emitted light beam is reflected by the object and hits the PSD receiver. Depending on the location of the incoming light beam, the signal is recognized as a background signal and electronically cut out.

Background rejection sensors can be prone to false readings from shiny objects in the background. Screening off or tilting the device can solve this problem however.

Divergent Proximity

Divergent proximity sensors can accurately detect small objects with minimal spacing between them. The focus of the sensor is adjusted on the surface of the object so that even small objects can be detected. Because the light spot is so small in the plane of detection, accurate recognition and higher switching frequencies are possible due to the higher resolution.

However, some problems may be encountered if vibrations and oscillations are not adequately suppressed so that the light spot remains stable with respect to the target object. The space between the sensor and the target object must also remain constant so that the plane of detection does not drift out of focus.

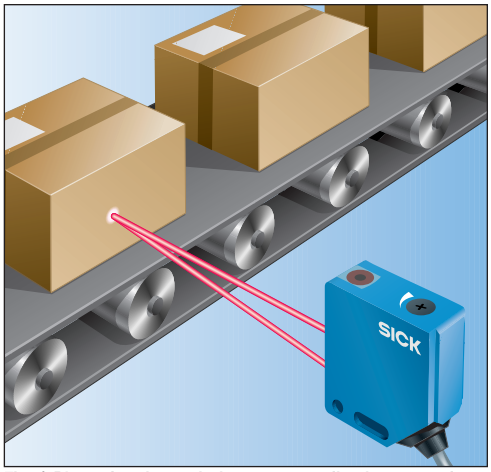


Fig. 1 Photoelectric proximity sensor application example

Fixed Focus Proximity

A fixed focus, triangulation type photoelectric device has optics set up to see at angles. The fixed focus has a type of limited background suppression. Where the angle of acceptance and the angle of divergence cross, this is the only area where detection of an object can take place.

This detection area would also be affected by the color of the object, so there may still be some difficulty with a dark object that is very close to a light-colored background.

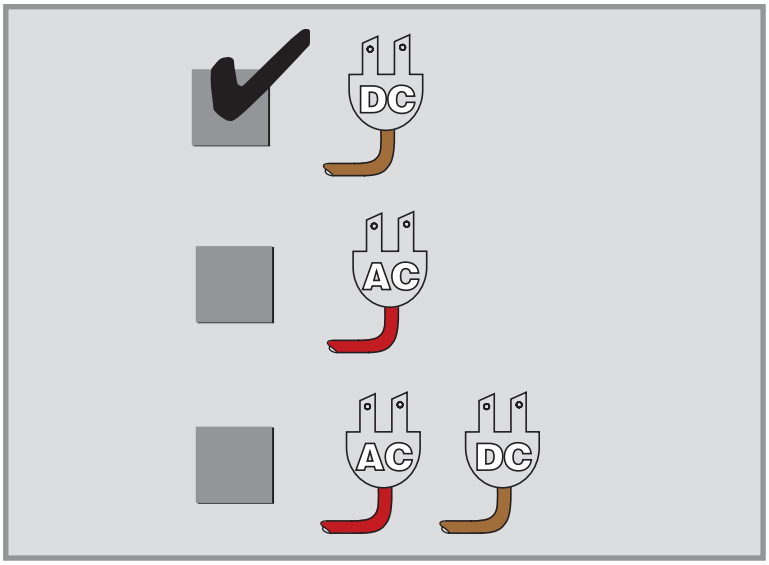
Energetic Proximity

Energetic proximity sensors send light out in an infinite focus concentrated beam. Energetic type sensors typically have a longer range and a medium sized light spot. It has to be pointed directly at the object it wants to see and that range is dependent on the color of the object being detected.

In the case where the object to be detected is close to that of some "background" object, such as a conveyor belt being detected from above, an energetic proximity sensor may have difficulty (object and background reflecting at the same or similar level). This is especially true if the object to be detected is darker than the background (background having more reflectivity than the object).

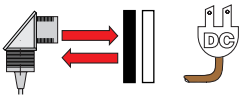
Proximity/Diffuse Sensors

Proximity/Diffuse Sensors



ET 1

Proximity/Diffuse Sensors - Background Suppression



0...2 in (0...50 mm)

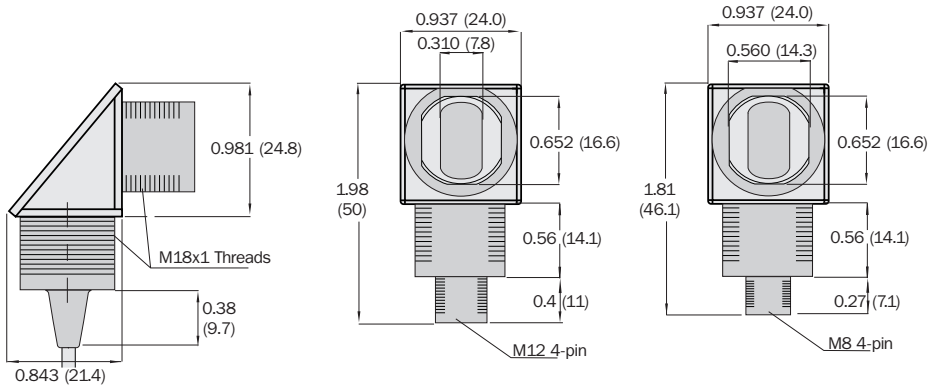
sensing range

Highlights

- ELF - Economical Little Functional
- Extremely compact to fit almost any application
- Universal mounting configuration for simple installation
- Unparalleled optical performance
- Electrical functionality previously available only in large sensors
- Available with M8 or M12 connector or pre-leaded cable

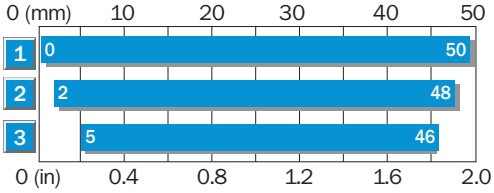
ET 1

Dimensional Drawing



dimensions in inches (mm)

Sensing Range



1	Sensing range on white, 90% reflectance
2	Sensing range on grey, 18% reflectance
3	Sensing range on black, 6% reflectance

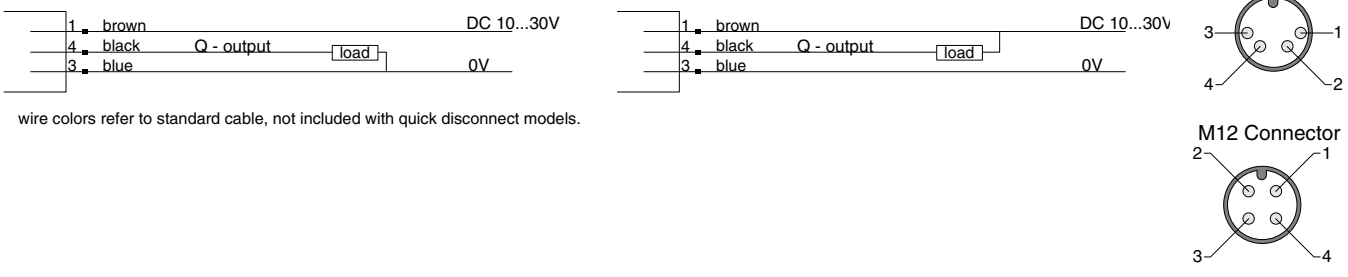
Order Information	
Type	**Part no.**
ET 1-P122	7 027 222
ET 1-N122	7 027 223
ET 1-P124	7 027 224
ET 1-N124	7 027 225
ET 1-P127	7 027 276
ET 1-N127	7 027 277

Accessories	page
Cables and connectors	908, 909
Mounting bracket 18 mm	925, 926

Technical Data	ET 1-	P122	N122	P124	N124	P127	N127
Sensing range	0...2 in (0...50 mm)	■	■	■	■	■	■
Light source [1]	LED, infrared light	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■
Ripple	< 5 V_{SS}, must be within V_S tolerances	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■
Switching outputs	PNP	■		■		■	
	NPN		■		■		■
	Light operate	■	■	■	■	■	■
	Dark operate						
Output current I_A max.	50 mA	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■
Connection types	Cable[2], 2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■				
	Plug, M12 4-pin			■	■		
	Plug, M8 4-pin					■	■
Enclosure rating	IP 54	■	■	■	■	■	■
Ambient temperature	Operation -13...122 °F (-25...50°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■
	overload and short circuit protection	■	■	■	■	■	■
Mounting hardware	Quantity 1, M18 x 1 nut which can be used	■	■	■	■	■	■
	near connector or lens						

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

ET 1

Proximity/Diffuse Sensors - Energetic

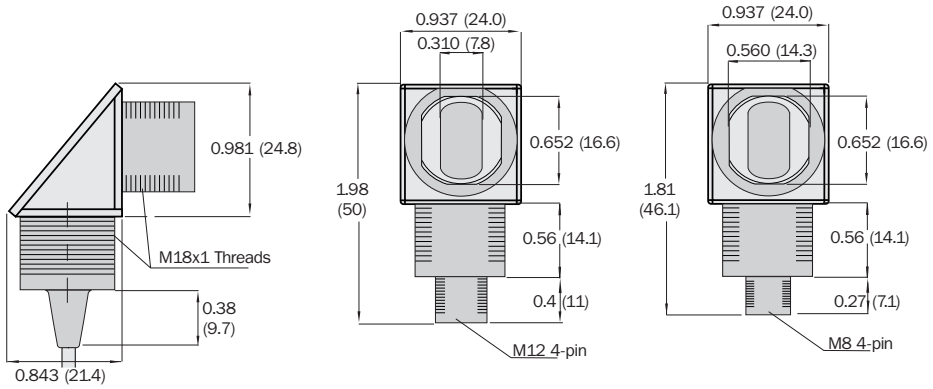
0.04...3.9 in (1...100 mm)
sensing range

Highlights

- ELF - Economical Little Functional
- Extremely compact to fit almost any application
- Universal mounting configuration for simple installation
- Unparalleled optical performance
- Electrical functionality previously available only in large sensors
- Available with M8 or M12 connector or pre-leaded cable

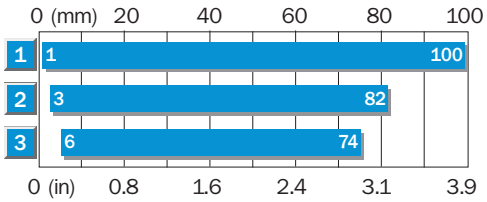
ET 1

Dimensional Drawing



dimensions in inches (mm)

Sensing Range



1	Sensing range on white, 90% reflectance
2	Sensing range on grey, 18% reflectance
3	Sensing range on black, 6% reflectance

Order Information

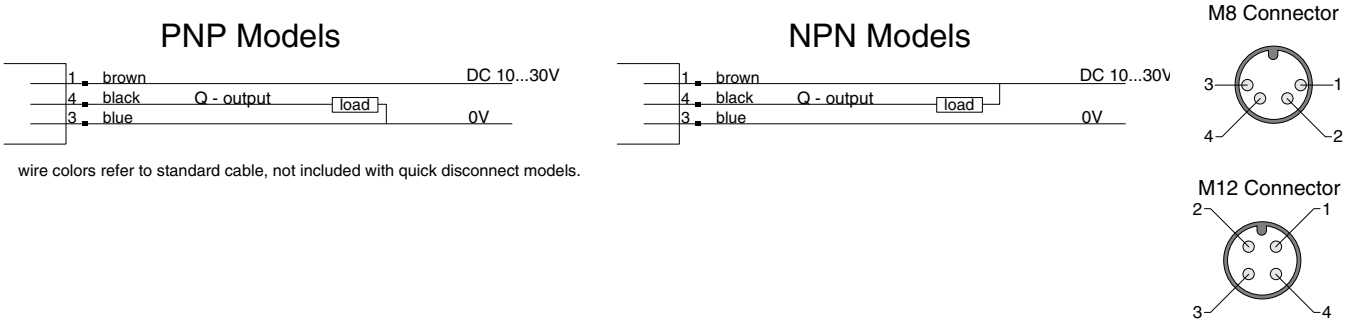
Type	Part no.
ET 1-P222	7 027 226
ET 1-N222	7 027 227
ET 1-P224	7 027 228
ET 1-N224	7 027 229
ET 1-P227	7 027 278
ET 1-N227	7 027 279

Accessories	page
Cables and connectors	908, 909
Mounting bracket 18 mm	925, 926

Technical Data	ET 1-	P222	N222	P224	N224	P227	N227
Sensing range	0.04...3.9 in (1...100 mm)	■	■	■	■	■	■
Light source [1]	LED, infrared	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■
Ripple	$< 5\ V_{SS}$, must be within V_S tolerances	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■
Switching outputs	PNP	■		■		■	
	NPN		■		■		■
	Light operate	■	■	■	■	■	■
	Dark operate						
Output current I_A max.	50 mA	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■
Connection types	Cable[2], 2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■				
	Plug, M12 4-pin			■	■		
	Plug, M8 4-pin					■	■
Enclosure rating	IP 54	■	■	■	■	■	■
Ambient temperature	Operation -13...122 °F (-25...50°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■
	overload and short circuit protection	■	■	■	■	■	■
Mounting hardware	Quantity 1, M18 x 1 nut which can be used	■	■	■	■	■	■
	near connector or lens						

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

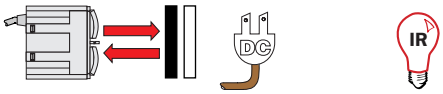
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

MHT 1 50 mm

Proximity/Diffuse Sensors - Background Suppression



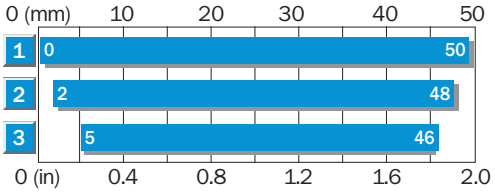
0...2.0 in (0...50 mm)
sensing range

Highlights

- Excellent price/performance ratio thanks to an optical ASIC
- Can be mounted quickly and reliably using a snap holder
- Sensors are stackable
- Mounting via dovetail
- PNP or NPN output

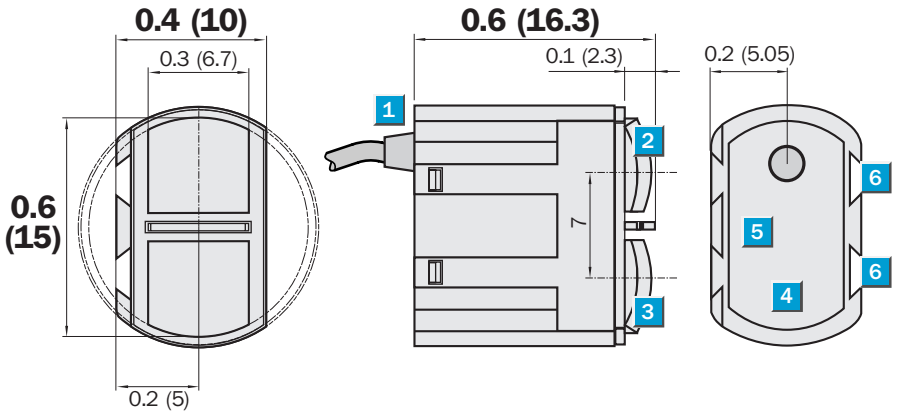
MHT 1

Sensing Range



1	Sensing range on white, 90% reflectance
2	Sensing range on grey, 18% reflectance
3	Sensing range on black, 6% reflectance

Dimensional Drawing



dimensions in inches (mm)

1	Connection cable 2 m, 3 x 0.25 mm²
2	Optical axis, sender
3	Optical axis, receiver
4	LED function indicator
5	Translucent back
6	Mounting slots

Order Information

Type	Part no.
MHT1-P122	1 016 051
MHT1-N122	1 019 707

Accessories	page
Snap holder*	932
Mini ball joint bracket	932

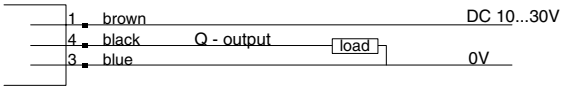
* included with delivery

Technical Data	MHT 1-	P122	N122							
Sensing range	0...2.0 in (0 ... 50 mm)	■	■							
Light source[1]	LED, infrared light	■	■							
Supply voltage V_S[2]	10 ... 30 V DC	■	■							
Ripple[3]	$< 5\ V_{SS}$ within U_V	■	■							
Current consumption[4]	< 20 mA	■	■							
Switching outputs	PNP	■								
	NPN		■							
	Light switching	■	■							
Output current I_A max.	50 mA	■	■							
Response time	< 2.5 ms	■	■							
Switching frequency[5]	200 hz	■	■							
Connection type[6]	Cable, 2 m	■	■							
Enclosure rating	IP 40	■	■							
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■							
	Storage -40...158°F (-40...70°C)	■	■							
Housing material	Glass fiber reinforced ABS	■	■							

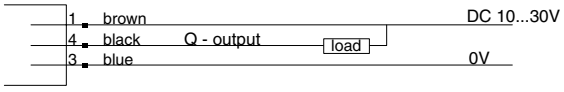
1) Average service life 100,000 h at $T_U = 25°C$
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Programmable up to 700/s on request
6) Do not bend below 0°C

Connection Diagram

PNP Models



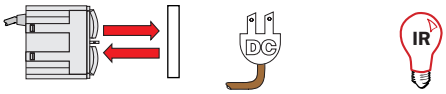
NPN Models



wire colors refer to standard cable, not included with quick disconnect models.

MHT 1 100 mm

Proximity/Diffuse Sensors - Energetic



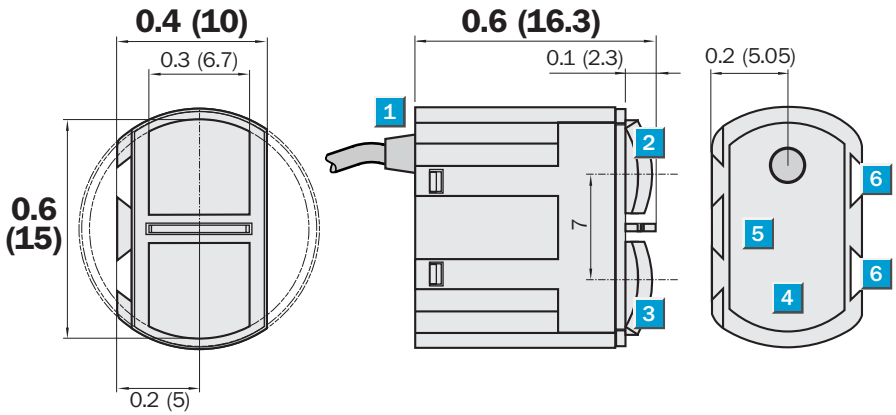
0.04...3.9 in (1...100 mm)
sensing range

Highlights

- Excellent price/performance ratio thanks to an optical ASIC
- Mounting via dovetail
- PNP or NPN output
- Stackable sensors
- Can be mounted fast and reliably using a snap holder

MHT 1

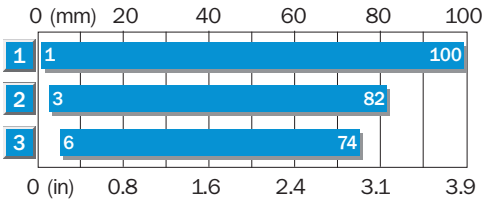
Dimensional Drawing



dimensions in inches (mm)

1 Connection cable 2 m, 3 x 0.25 mm²
2 Optical axis, sender
3 Optical axis, receiver
4 LED output indicator
5 Translucent back
6 Mounting slots

Sensing Range



1 Sensing range on white, 90% reflectance
2 Sensing range on grey, 18% reflectance
3 Sensing range on black, 6% reflectance

Order Information

Type	Part no.
MHT 1-P222	1 019 706
MHT 1-N222	1 019 708

Accessories	page
Snap holder*	932
Mini ball joint bracket	932

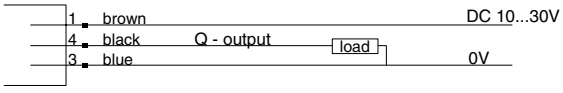
*included with delivery

Technical Data	MHT 1-	P222	N222							
Sensing range	0.04...3.9 in (1 ... 100 mm)	■	■							
Light source[1]	LED, infrared light	■	■							
Supply voltage V_S[2]	10 ... 30 V DC	■	■							
Ripple[3]	$< 5\ V_{SS}$ within U_V	■	■							
Current consumption[4]	< 20 mA	■	■							
Switching outputs	PNP	■								
	NPN		■							
	Light switching	■	■							
Output current I_A max.	50 mA	■	■							
Response time	< 2.5 ms	■	■							
Switching frequency[5]	200 Hz	■	■							
Type of connection[6]	Cable, 2 m	■	■							
Enclosure rating	Housing IP 40	■	■							
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■							
	Storage -40...158°F (-40...70°C)	■	■							
Housing material	Glass fiber reinforced ABS	■	■							

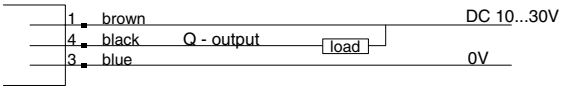
1) Average service life 100,000 h at $T_U = 25°C$
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Programmable up to 700/s on request
6) Do not bend below 0°C

Connection Diagram

PNP Models



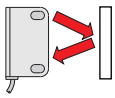
NPN Models



SICK

ST 130

Proximity/Diffuse Sensors - Fixed Focus



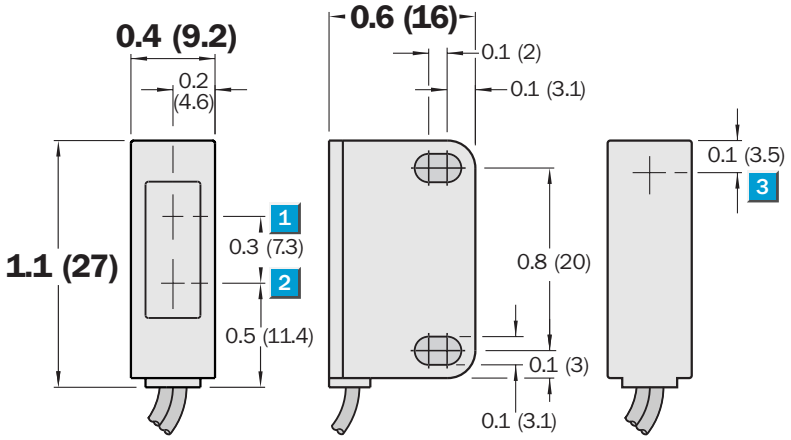

0.2...1.2 in (5...30 mm)
sensing range

Highlights

- Ultra-miniature housing
- Focused optics, small light spot
- Red light for easy alignment
- Easy mounting with included bracket

ST 130

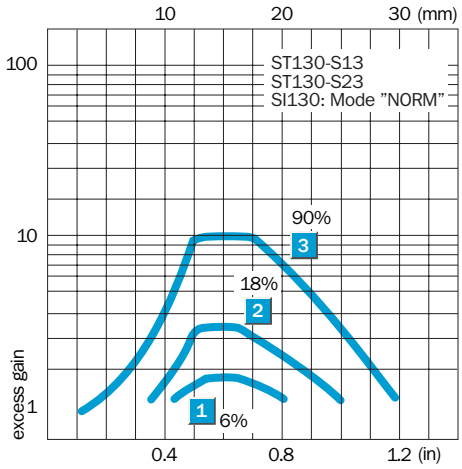
Dimensional Drawing

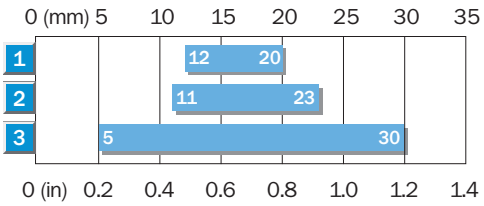


dimensions in inches (mm)

1 Center of optical axis, transmitter
2 Center of optical axis, receiver
3 LED indicator, red: light reception

Excess Gain





1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Order Information	
Type	**Part no.**
ST 130-S13	6 011 083
ST 130-S23	6 011 085

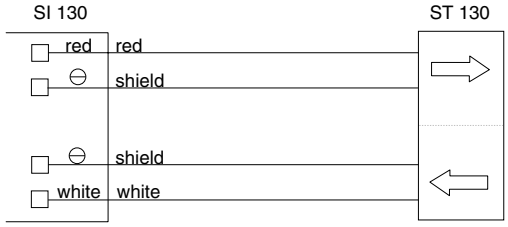
Accessories	page
SI 130	64
Mounting brackets*	918, 919

* included with delivery

Technical Data	ST 130-	S13	S23
Photoelectric proximity switches	SI 130 in "NORM" mode, see page 64	■	■
Sensing range	0.2...1.2 in (5...30 mm) (object with 90% remission)	■	■
Background suppression	From approx. 1.8 in (45 mm) (object with 90% remission)	■	■
Light source[1], light type	LED, visible red light	■	■
Light spot size	Approx. 1 x 4 mm w. focal point 16 mm	■	
	Approx. 1 x 1 mm w. focal point 16 mm		■
Angle of divergence, sender	Focused, focal point 16 mm ± 0.5 mm	■	■
Power supply and evaluation unit	ST 130 only functional in combination with separate interpreter (SI 130), see page 64	■	■
Supply voltage V_S	See SI 130, page 64		
Switching outputs	See SI 130, page 64		
Output current I_A max.	See SI 130, page 64		
Operation mode	See SI 130, page 64		
Response time[2]	See SI 130, page 64		
Max. switching frequency[3]	See SI 130, page 64		
Connection types	Cable, PVC, 2 m[4] (screened), (cannot be extended)	■	■
VDE protection class	⧫	■	■
Circuit protection[5]	A	■	■
Enclosure rating	IP 65	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■
	Storage -40...158°F (-40...70°C)	■	■
Approximate weight	0.8 oz (23 g)	■	■
Housing material	Glass fiber reinforced ABS	■	■

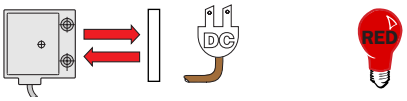
1) Average service life 100,000 h at T_A = 25°C
2) Signal transit time with resistive load
3) With light/dark ratio 1:1
4) Do not bend below 0°C
5) A = V_S connections reverse-polarity protected

Connection Diagram



ST 130

Proximity/Diffuse Sensors - Energetic



0...2.4 in (0...60 mm)

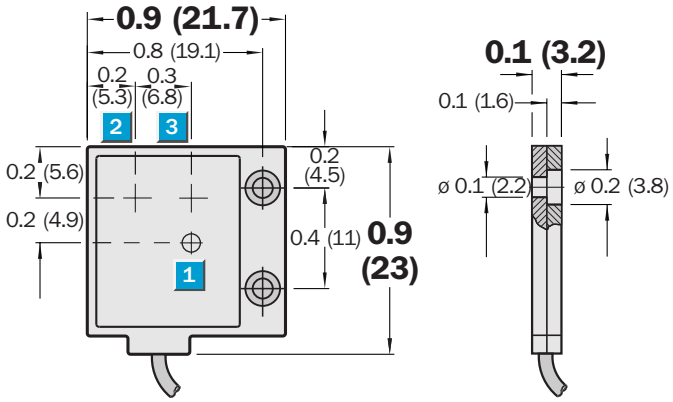
sensing range

Highlights

- Ultra-miniature housing
- Large sensing range
- Red light and LED signal for easy alignment
- Easy mounting with included bracket

ST 130

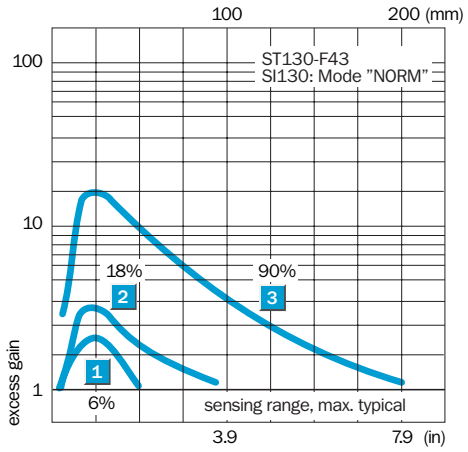
Dimensional Drawing

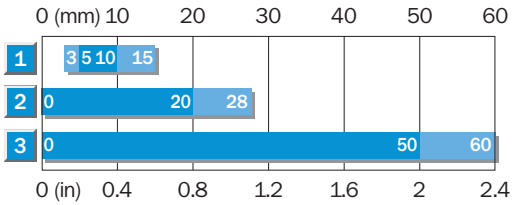


dimensions in inches (mm)

1 LED indicator, red: light reception
2 Center of optical axis, transmitter
3 Center of optical axis, receiver

Background Suppression





1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

Order Information	
Type	**Part no.**
ST 130-F 43	6 011 082

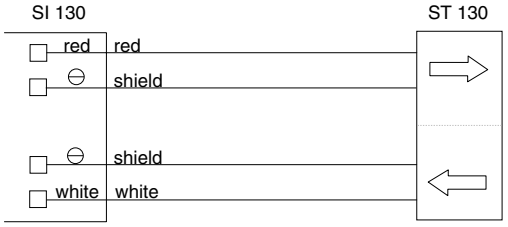
Accessories	page
SI 130	64
Mounting brackets*	918, 919

* included with delivery

Technical Data	ST 130-	F43
Sensing range, max. typical	0...2.4 in (0...60 mm)[1]	
Operating distance	0...2 in (0...50 mm)[1]	
Light source[2]**, light type**	LED, visible red light	
Light spot size	Approx. 1.4 in at 2 in (35 mm at 50 mm)	
Angle of divergence, sender	Approx. 38°	
Power supply and evaluation unit	ST 130 only functional in combination	
	with separate interpreter (SI 130),	
	see page 64	
Supply voltage V_S	See SI 130, page 64	
Switching outputs	See SI 130, page 64	
Output current I_A max.	See SI 130, page 64	
Light receiver, switching mode	See SI 130, page 64	
Response time[3]	See SI 130, page 64	
Max. switching frequency[4]	See SI 130, page 64	
Connection type	Cable, PVC, 2 m[5] (screened),	
	(cannot be extended)	
VDE protection class	⧫	
Circuit protection[6]	A	
Enclosure rating	IP 66	
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	
	Storage -40...158°F (-40...70°C)	
Approximate weight with cable 2 m	ST 130-F 43: 0.7 (20 g)	
	ST 130-F 43: 0.7 (20 g)	
Housing material	Housing: ABS/optics: PC	

1) Object with 90% remission (based on standard white to DIN 5033)
2) Average service life 100,000 h at $T_A = +25°C$
3) Signal transit time with resistive load
4) With light/dark ratio 1:1
5) Do not bend below 0°C
6) A = V_S connections reverse-polarity protected

Connection Diagram



ST 130

Proximity/Diffuse Sensors - Energetic

0...7.9 in (0...200 mm)

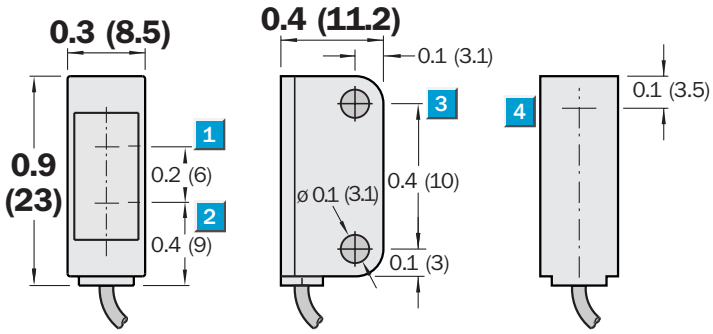
sensing range

Highlights

- Ultra-miniature housing
- Large sensing range
- Red light and LED signal for easy alignment
- Easy mounting with included bracket

ST 130

Dimensional Drawing

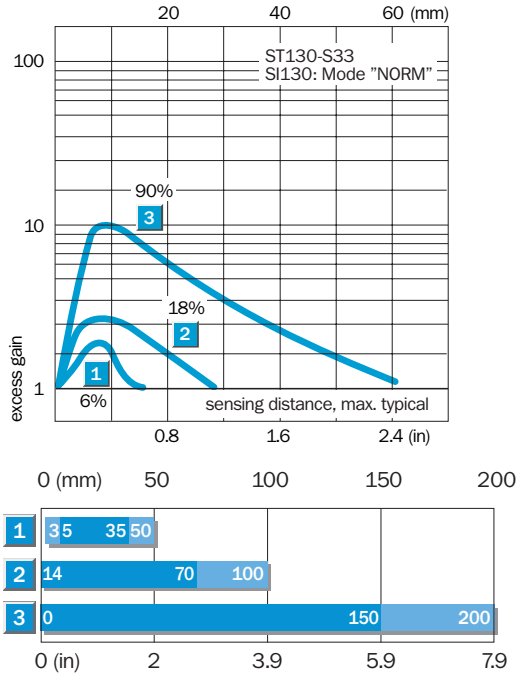


dimensions in inches (mm)

1 Center of optical axis, transmitter
2 Center of optical axis, receiver
3 Mounting hole ø 3.1 mm
4 LED indicator, red: light reception

Mounting bracket BEF-130-SP included.

Background Suppression



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Order information

Type	Part no.
ST 130-S33	6 011 081

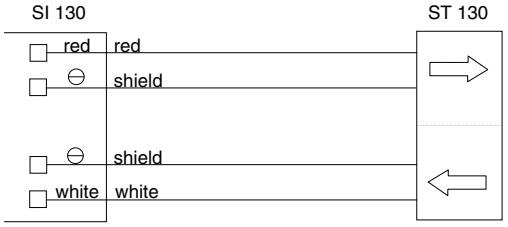
Accessories	page
SI 130	64
Mounting brackets*	918, 919

* included with delivery

Technical Data	ST 130-	S33								
Sensing range, max. typical	0...7.9 in (0...200 mm)[1]									
Operating distance	0...5.9 in (0...150 mm)[1]									
Light source[2], **light type**	LED, visible red light									
Light spot size	Approx. 0.5 x 0.5 in at 5.9 in (13 x 13 mm at 150 mm)									
Angle of divergence, sender	Approx. 5°									
Power supply and evaluation unit	ST 130 only functional in combination									
	with separate interpreter (SI 130),									
	see page 64									
Supply voltage V_S	See SI 130, page 64									
Switching outputs	See SI 130, page 64									
Output current I_A max.	See SI 130, page 64									
Light receiver, switching mode	See SI 130, page 64									
Response time[3]	See SI 130, page 64									
Max. switching frequency[4]	See SI 130, page 64									
Connection type	Cable, PVC, 2 m[5] (screened),									
	(cannot be extended)									
VDE protection class	III									
Circuit protection[6]	A									
Enclosure rating	IP 65									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight with cable 2 m	ST 130-S 33: 0.8 oz (23 g)									
Housing material	Housing: ABS/optics: PC									

1) Object with 90 % remission (based on standard white to DIN 5033)
2) Average service life 100,000 h at $T_A = +25$ °C
3) Signal transit time with resistive load
4) With light/dark ratio 1:1
5) Do not bend below 0 °C
6) A = V_S connections reverse-polarity protected

Connection Diagram



SICK

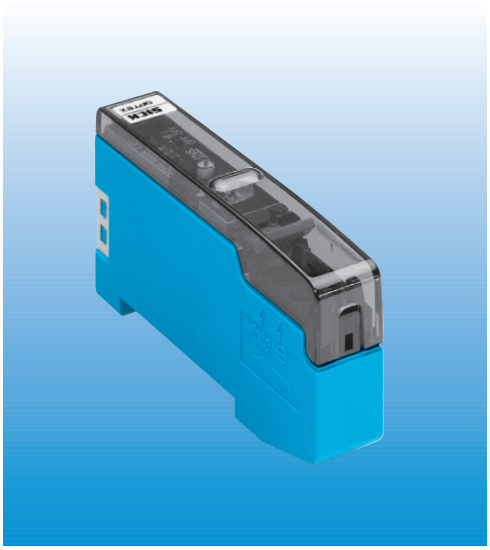
SI 130

Proximity/Diffuse Sensors

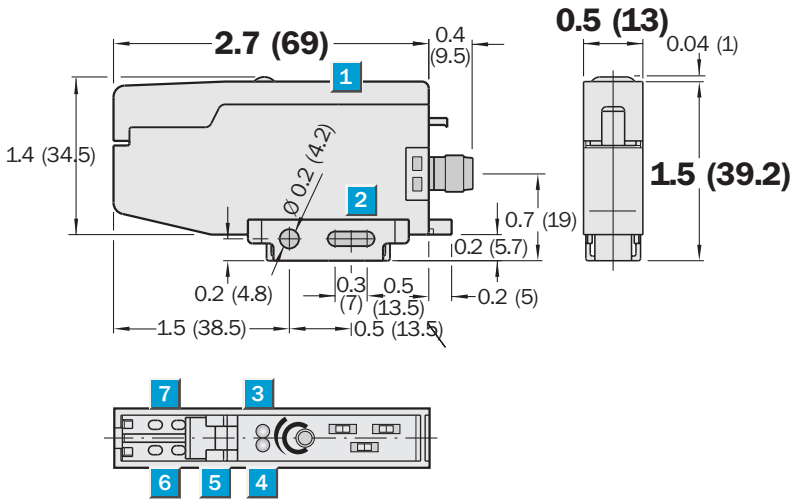
Highlights

- Basic unit for all S 130 sensors
- Simple connection of sensors
- DIN rail mounted
- Selectable off delay
- Selectable light or dark switching

SI 130

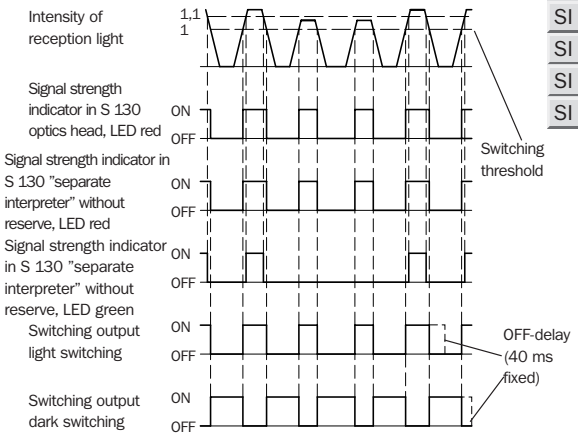


Dimensional Drawing



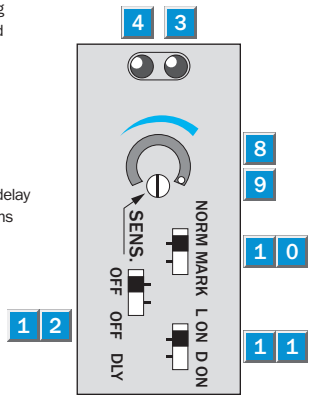
dimensions in inches (mm)

S 130 Function Diagram



Adjustments

SI 130-P12
SI 130-N12
SI 130-P40
SI 130-N40



Order information

Type	Part no.
SI 130-P12	6 011 089
SI 130-P40	6 011 090
SI 130-N12	6 011 087
SI 130-N40	6 011 088

1 Protective hood
2 BF-WLL 160 mounting bracket (included)
3 LED signal strength indicator, red (lights up when switching threshold is exceeded)
4 LED signal strength indicator, green (lights up with reception reserve > 10%)
5 For releasing/locking connection wires of S 130 photoelectric switches/photoelectric proximity switches
6 Sender terminals (red), screen (–)
7 Receiver terminals (white), screen (–)
8 Sensitivity scale (270°)
9 Sensitivity control (2 revolutions)
10 Selector switch for "NORM"/"MARK" detection (t = 0.5 ms/t ≤ 0.2 ms)
11 Selector switch for light- ("L.ON")/ dark- ("D.ON") switching
12 Selector switch for OFF-delay "OFF"/ "OFF DLY", 40 ms fixed

Accessories	page
Cable receptacles	908
Mounting brackets*	918, 919

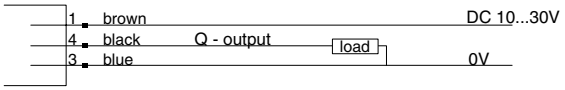
* included with delivery

Technical Data	SI 130-	P12	P40	N12	N40					
Power supply and evaluation unit	S 130 photoelectric switch series	■	■	■	■					
	in ultra-miniature housing,									
	see pages 58 to 63									
Operating mode										
"NORM" mode	All S 130 optics heads in	■	■	■	■					
	photoelectric switch mode									
"MARK" mode	Optics heads ST 130-S 13,	■	■	■	■					
	ST 130-S 19, ST 130-S 23,									
	ST 130-S 29 in									
	contrast scanner mode									
Sensitivity, adjustable	Potentiometer, 2 turns	■	■	■	■					
	with sensitivity scale 270°									
Time delay										
OFF-delay t_{OFF}	40 ms fixed, selectable via sliding switch	■	■	■	■					
Supply voltage V_S	10...30 V DC [1]	■	■	■	■					
Ripple[2]	± 10%	■	■	■	■					
Current consumption[3]	≤ 35 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Light receiver, switching mode	Light/dark switching	■	■	■	■					
	selectable via sliding switch									
Response time[4]/										
Max. switching frequency[5]										
"NORM" mode	≤ 0.5 ms/1000/s	■	■	■	■					
"MARK" mode	≤ 0.2 ms/2500/s	■	■	■	■					
Connection types	Cable, PVC, 2 m[6]	■		■						
	Plug, M 8 4-pin		■		■					
VDE protection class	⏀	■	■	■	■					
Circuit protection[7]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 50	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	2.5 oz (70 g)	■		■						
	1.1 oz (30 g)		■		■					
Housing material	ABS	■	■	■	■					

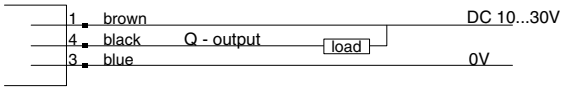
1) Limit values
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0 °C
7) A = V_S connections reverse-polarity protected
= Inputs/outputs reverse-polarity protected
C = Interference pulse suppression
B D = Outputs overcurrent and short-circuit protected

Connection Diagram

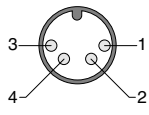
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models.

SICK

WT 2S

Proximity/Diffuse Sensors - Background Suppression

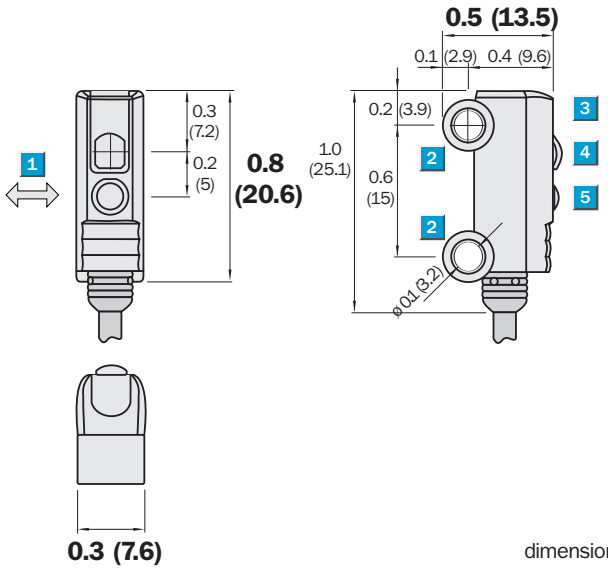
0.04...0.6 in (1...15 mm)
0.04...1.2 in (1...30 mm)
sensing range

Highlights

- Focused laser-like light spot makes the most precise detection jobs possible
- Insensitive to interference from critical backgrounds
- Sturdy housing with metal sleeves for M3 bolts

WT 2S

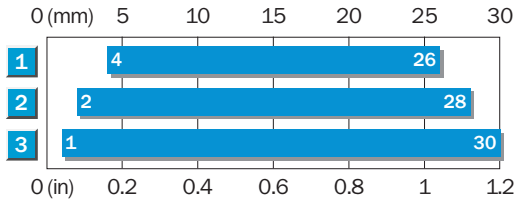
Dimensional Drawing



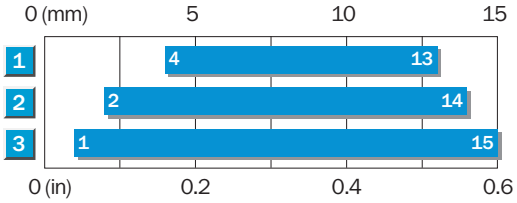
dimensions in inches (mm)

1 Standard direction of material being sensed
2 Mounting hole Ø 3.2 mm
3 LED signal strength indicator
4 Optical axis, receiver
5 Optical axis, sender

Sensing Range, 30 mm Background Suppression



Sensing Range, 15 mm Background Suppression



1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

Order Information

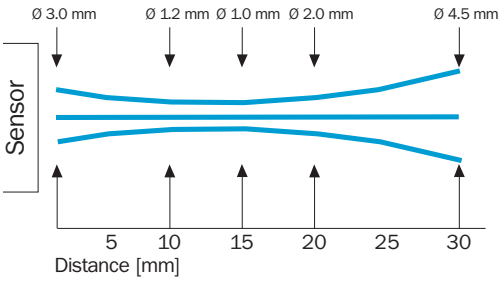
Type	Part no.
WT 2S-P111	1 022 660
WT 2S-P131	1 022 661
WT 2S-P211	1 022 658
WT 2S-P231	1 022 659
WT 2S-N111	1 022 662
WT 2S-N131	1 022 663
WT 2S-P411	1 023 631
WT 2S-P431	1 023 632
WT 2S-F211	1 024 171

Accessories	page
Cables and connectors	908
Mounting systems	932

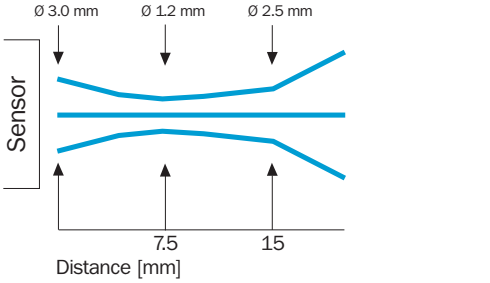
Technical Data	WT 2S-	P111	P211	N111	P131	P231	N131	P411	P431	F211
Sensing range (fix), typ.	0.04...0.6 in (1...15 mm)[1]	■	■	■				■		■
	0.04...1.2 in (...30 mm)[1]				■	■	■		■	
Background suppression from	0.7 in (18 mm)	■	■	■				■		■
	1.4 in (35 mm)				■	■	■		■	
Light source[2], light type	Pin-point LED, red light	■	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 0.04 in at 0.6 in (1.0 mm at 15 mm)				■	■	■		■	
	Approx. 0.2 in at 1.2 in (4.5 mm at 30 mm)				■	■	■		■	
	Approx. 0.05 in at 0.3 in (1.2 mm at 8 mm)	■	■	■				■		■
	Approx. 0.1 in at 0.6 in (2.5 mm at 15 mm)	■	■	■				■		■
Supply voltage V_S	10...30 V DC [3]	■	■	■	■	■	■	■	■	■
Ripple[4]	< 5 V_{PP}	■	■	■	■	■	■	■	■	■
Current consumption[5]	< 20 mA	■	■	■	■	■	■	■	■	■
Switching outputs	PNP, Q	■	■		■	■		■	■	■
	NPN, Q			■			■			
	Light switching	■	■	■	■	■	■	■	■	
	Dark switching									■
Output current I_A max.	< 50 mA	■	■	■	■	■	■	■	■	■
Response time[6]	< 0.6 ms	■	■	■	■	■	■	■	■	■
Max. switching frequency[7]	800/s	■	■	■	■	■	■	■	■	■
Connection types	Cable[8], 2 m	■		■	■		■			
	Plug, M8 3-pin, with cable[8], 200 mm		■			■				■
	Plug, M8 4-pin, with cable[8], 200 mm							■	■	
VDE protection class[9]	⧫	■	■	■	■	■	■	■	■	■
Circuit protection[10]	A, B, C	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■	■
Ambient temperature	Operation -4...122°F (-20...50°C)	■	■	■	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■	■	■	■
Approximate weight	0.6 oz (18 g)	■		■	■		■			
	0.7 oz (20 g)		■			■		■	■	■
Housing material	ABS, PMMA	■	■	■	■	■	■	■	■	■

1) Tolerance ± 13 %
2) Average service life 75,000 h at T_A = + 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) PVC, 2.4 mm Ø, do not bend below 0°C
9) Reference voltage 50 V
10) A = V_S-connections reverse-polarity protected
B = Output Q and $\bar{Q}$ reverse-polarity protected
C = Interference pulse suppression

Light Spot Diameter WT 2S 30 mm BGS

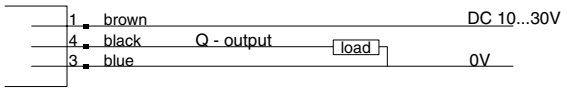


Light Spot Diameter WT 2S 15 mm BGS

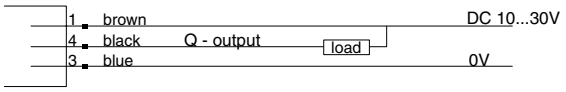


Connection Diagram

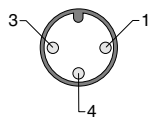
PNP Models



NPN Models

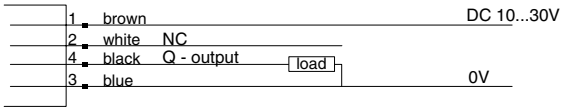


M8 Connector

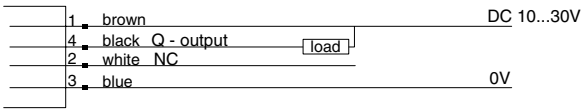


wire colors refer to standard cable, not included with quick disconnect models.

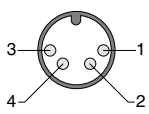
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 2S

Proximity/Diffuse Sensors - Energetic

0.08...2.2 in (2...55 mm)

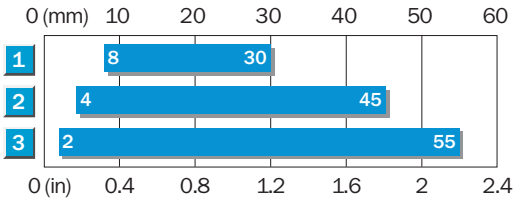
sensing range

Highlights

- Precise, small light spot
- Extremely good size to performance ratio
- Sturdy housing with metal sleeves for M3 bolts

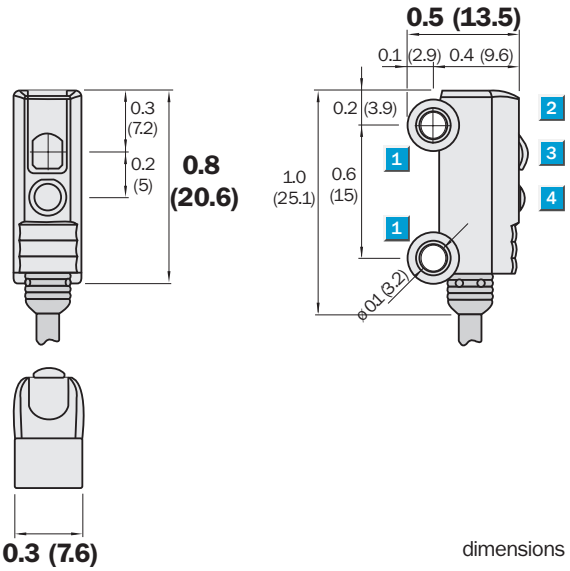
WT 2S

Sensing Range, 50 mm



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Dimensional Drawing



dimensions in inches (mm)

1	Mounting hole Ø 3.2 mm
2	LED signal strength indicator
3	Optical axis, receiver
4	Optical axis, sender

Order Information

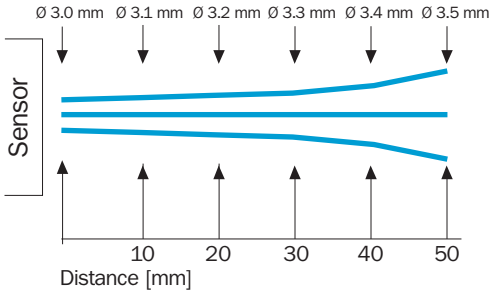
Type	Part no.
WT 2S-P161	1 022 664
WT 2S-P161	1 022 665
WT 2S-P461	1 023 641
WT 2S-P261	1 023 640

Accessories	page
Cables and connectors	908
Mounting systems	932

Technical Data	WT 2S-	P161	N161	P261	P461					
Sensing range (fix), typ.	0.08...2.2 in (2...55 mm)	■	■	■	■					
Light source[1], light type	Pin-point LED, red light	■	■	■	■					
Light spot diameter	Approx. 0.1 in at 2 in (3.5 mm at 50 mm)	■	■	■	■					
Supply voltage V_S	10...30 V DC[2]	■	■	■	■					
Ripple[3]	< 5 V_{PP}	■	■	■	■					
Current consumption[4]	< 20 mA	■	■	■	■					
Switching outputs	PNP, Q	■		■	■					
	NPN, Q		■							
	Light switching	■	■	■	■					
Output current I_A max.	< 50 mA	■	■	■	■					
Response time[5]	< 0.6 ms	■	■	■	■					
Max. switching frequency[6]	800/s	■	■	■	■					
Connection types	Cable[7], 2 m	■	■							
	Plug, M8 3-pin, with cable[8], 200 mm			■						
	Plug, M8 4-pin, with cable[8], 200 mm				■					
VDE protection class[8]	III	■	■	■	■					
Circuit protection[9]	A, B, C	■	■	■	■					
Enclosure rating	IP 67	■	■	■	■					
Ambient temperature	Operation -4...122°F (-20...50°C)	■	■	■	■					
	Storage -40...167°F (-40...75°C)	■	■	■	■					
Approximate weight	0.6 oz (18 g)	■	■							
	0.7 oz (20 g)			■	■					
Housing material	ABS, PMMA	■	■	■	■					

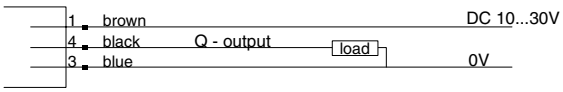
1) Tolerance ± 13 %
2) Average service life 75,000 h at T_A = + 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) PVC, 2.4 mm Ø, do not bend below 0°C
9) Reference voltage 50 V
10) A = V_S-connections reverse-polarity protected
B = Output Q and $\overline{Q}$ reverse-polarity protected
C = Interference pulse suppression

Light Spot Diameter WT 2S 50 mm, Energetic, V Optics



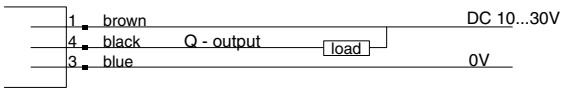
Connection Diagram

PNP Models

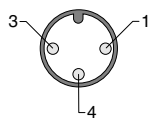


wire colors refer to standard cable, not included with quick disconnect models.

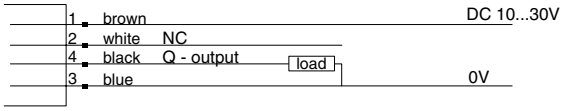
NPN Models



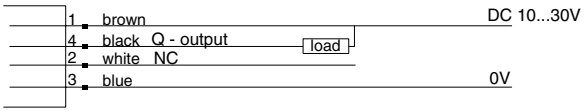
M8 Connector



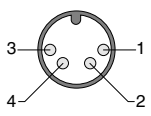
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

WT 4-2

Proximity/Diffuse Sensors - Background Suppression

0.2...5.1 in (4...130 mm)
sensing range

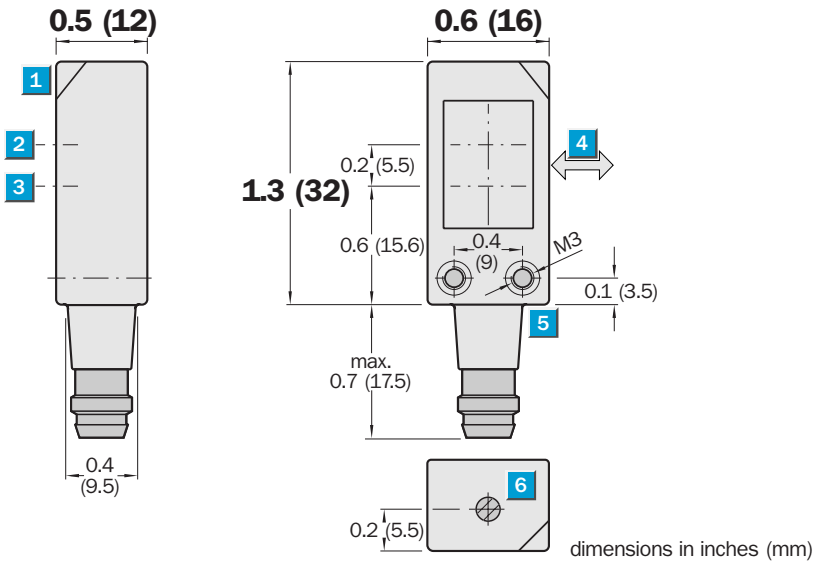
CE

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Insensitive to ambient light
- Crosstalk immunity
- Fast response time
- Red light for easy alignment
- Cable or M8 quick disconnect versions

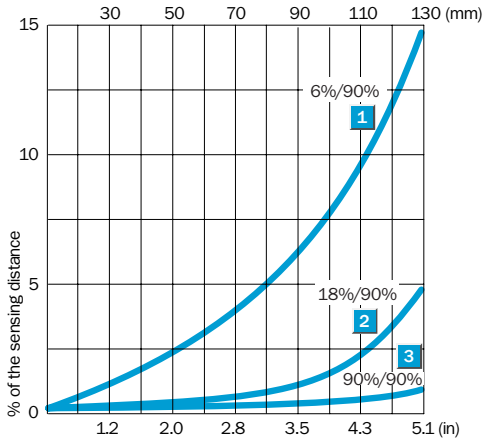
WT 4-2

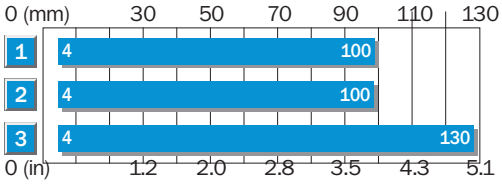
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

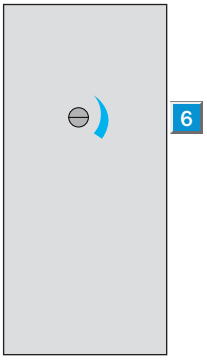




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	LED output indicator
2	Optical axis, receiver
3	Optical axis, sender
4	Standard direction of the material being sensed
5	M3 threaded mounting hole
6	Sensing range adjustment

Order Information

Type	Part no.
WT 4-2P132	1 015 150
WT 4-2P330	1 015 143
WT 4-2P331	1 015 145
WT 4-2N132	1 012 874
WT 4-2N330	1 012 920
WT 4-2N331	1 015 147
WT 4-2P430	1 015 957

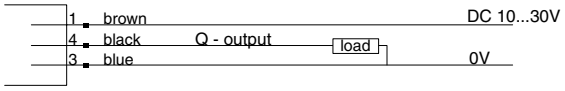
Accessories	page
Cables and connectors	908
Mounting brackets	932, 935

Technical Data	WT 4-2-	P132	P330	P331	N132	N330	N331	P430
Sensing range, adjustable	0.2...5.1 in (4…130 mm)	■	■	■	■	■	■	■
Background suppression	0.8...5.1 in (20...130 mm)	■	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■	■
Light source[1], light type	LED, red light	■	■	■	■	■	■	■
Light spot diameter	0.1 in at 2.0 in (3 mm at 50 mm)	■	■	■	■	■	■	■
Angle of divergence	Approx. 3.5°	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■
Ripple[3]	5 V_{SS}	■	■	■	■	■	■	■
Current consumption[4]	< 20 mA	■	■	■	■	■	■	■
Switching outputs	PNP, Q	■	■	■				
	NPN, Q				■	■	■	
	PNP, Q and $\overline{Q}$							■
Switching mode	Light switching	■	■	■	■	■	■	
	Dark switching							■
Output current I_A max.	100 mA	■	■	■	■	■	■	■
PNP; output voltage HIGH	V_S – (< 2.5 V)	■	■	■				■
PNP; output voltage LOW	Approx. 0 V	■	■	■				■
NPN; output voltage HIGH	Approx. V_S				■	■	■	
NPN; output voltage LOW	< 1.5 V				■	■	■	
Response time[5]	< 500 µs	■	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■	■
Connection types	Cable[7], 2 m	■			■			
	Plug, M8 3-pin		■			■		
	Plug, M8 3-pin, with cable, 100 mm			■			■	
	Plug, M8 4-pin							■
VDE protection class	⏀	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■
Enclosure rating[9]	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■	■
Approximate weight	1.4 oz (20 g)	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■

1) Average service life 100,000 h where T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
9) IP 67: with screw-in cable receptacles
IP 65: with plug-in cable receptacles

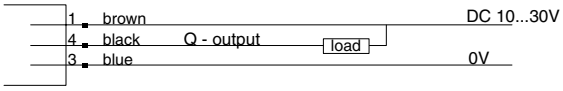
Connection Diagram

PNP Models

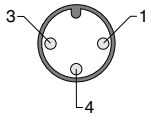


wire colors refer to standard cable, not included with quick disconnect models.

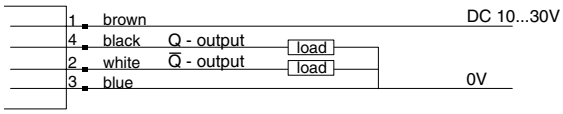
NPN Models



M8 Connector

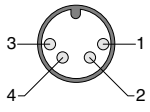


PNP Models



wire colors refer to standard cable, not included with quick disconnect models

M8 Connector



SICK

WT 4-2 Teflon

Proximity/Diffuse Sensors - Background Suppression

0.2...3.1 in (4...80 mm)

sensing range

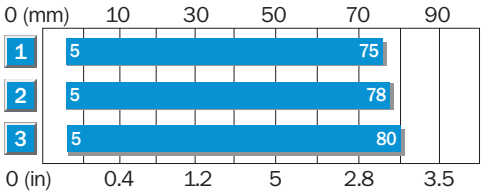
CE

Highlights

- Robust Teflon housing for use in moist and aggressive environments
- Background suppression
- Meets SEMI and FDA standards
- Crosstalk immunity
- Fast response time
- Red light for easy alignment

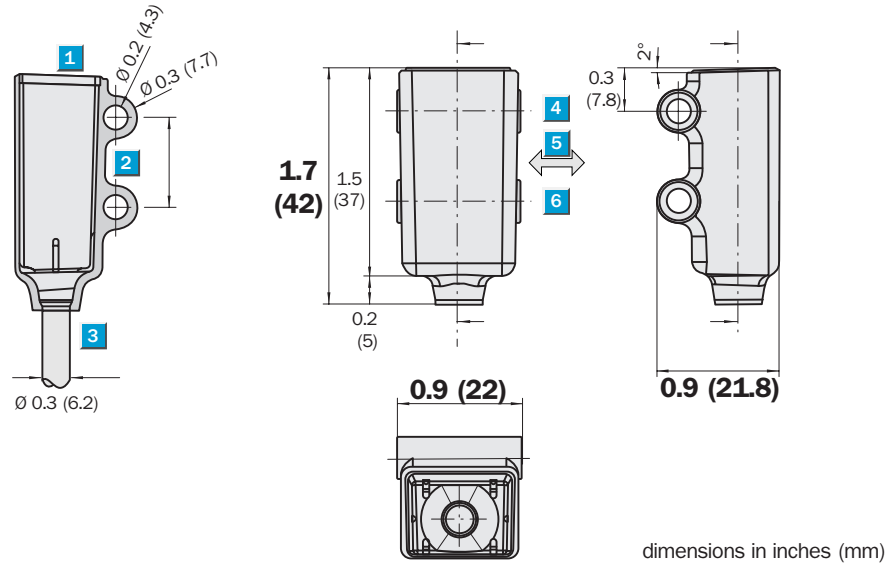
WT 4-2 Teflon

Sensing Range



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Dimensional Drawing



dimensions in inches (mm)

1	LED output indicator
2	Mounting hole Ø 4.3 mm
3	Cable 2 m, Ø 4.5 mm, 1 m Teflon coated, Ø 6.2 mm
4	Optical axis, receiver
5	Standard direction of the material being sensed
6	Optical axis, sender

Order Information

Type	Part no.
WT 4-2P 132 T01	1 022 966
WT 4-2N 132 T01	1 023 763

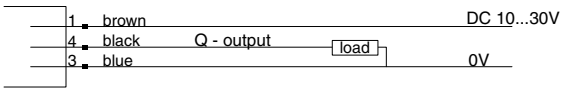
Accessories	page
Mounting brackets	932, 935

Technical Data	WT 4-2-	P132 T01	N132 T01							
Sensing range, fixed	0.2...3.1 in (5…80 mm) ±10%	■	■							
Background suppression	From 3.7 in (95 mm)	■	■							
Light source[1], **light type**	LED, red light	■	■							
Light spot diameter	0.1 in at 2.0 in (3 mm at 50 mm)	■	■							
Supply voltage V_S	10…30 V DC[2]	■	■							
Ripple[3]	5 V_{PP}	■	■							
Current consumption[4]	< 20 mA	■	■							
Switching outputs	PNP, Q	■								
	NPN, Q		■							
Switching mode	Light switching	■	■							
Output current I_A max.	< 100 mA	■	■							
PNP; output voltage HIGH	V_S – (< 2.5 V)	■								
PNP; output voltage LOW	Approx. 0 V	■								
NPN; output voltage HIGH	Approx. V_S		■							
NPN; output voltage LOW	< 1.5 V		■							
Response time[5]	< 500 µs	■	■							
Max. switching frequency[6]	1000 Hz	■	■							
Connection type	Cable[7], 2 m	■	■							
Minimum bend radius of Teflon cable	R > 1.2 in (30 mm)	■	■							
VDE protection class	⧫	■	■							
SEMI standards	SEMI E49.2-0298	■	■							
	SEMI F57-0301	■	■							
FDA regulations	21 CFR 177.1550	■	■							
	21 CFR 175.300	■	■							
	21 CFR 175.105	■	■							
	21 CFR 176.170	■	■							
	21 CFR 176.180	■	■							
Circuit protection[8]	A, B, C	■	■							
Enclosure rating	IP 68/NEMA 6	■	■							
Ambient temperature T_A	Operation -40...140°F (-40…60°C)	■	■							
	Storage -40...167°F (-40…75°C)	■	■							
Approximate weight	2.8 oz (80 g)	■	■							
Housing material										
Sensor coating	DuPont, PFA 940 HP plus	■	■							
Cable coating	DuPont, PFA 440 HP	■	■							

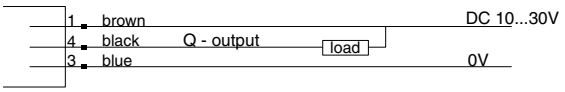
1) Average service life 100,000 h where $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

PNP Models



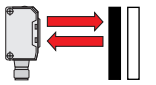
NPN Models



wire colors refer to standard cable, not included with quick disconnect models.

WT 150

Proximity/Diffuse Sensors - Background Suppression



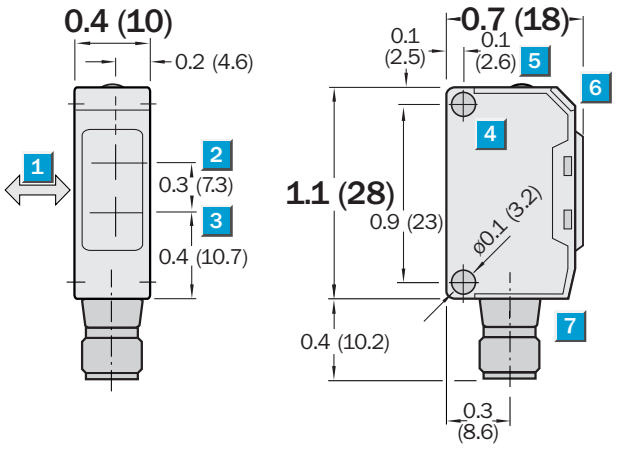

0.08...3.9 in (2...100 mm)
sensing range

Highlights

- Adjustable background suppression for reliable detection of dark objects, even in front of light backgrounds
- High switching frequency
- Signal strength indicator
- Adjustable sensing range using 5-turn adjustment screw
- Easy mounting with included bracket
- Cable or M8 quick disconnect versions

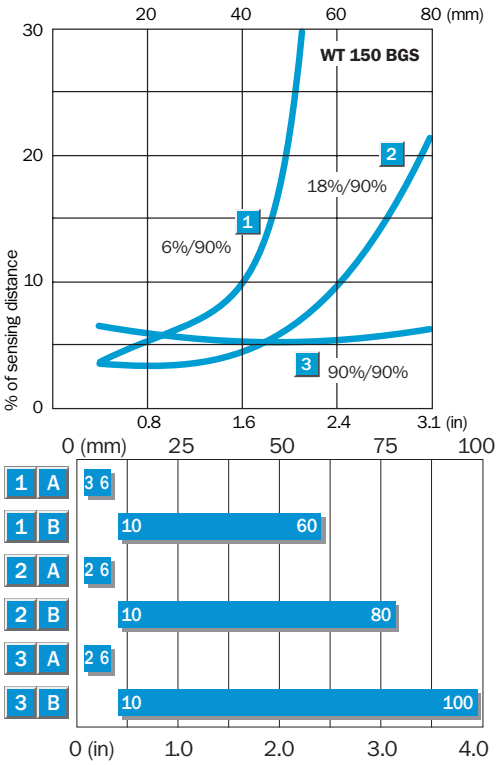
WT 150

Dimensional Drawing



dimensions in inches (mm)

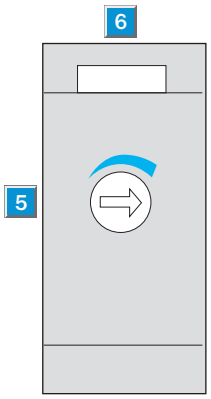
Background Suppression



1	Sensing distance on black[12]/white background
2	Sensing distance on grey[12]/white background
3	Sensing distance on white[12]/white background
A	Sensing distance control set to MIN
B	Sensing distance control set to MAX

Adjustments

All types



1	Standard direction of the material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Mounting holes Ø 3.2 mm
5	Sensing range adjustment (5 rev.)
6	LED indicator, red light received ≥ switching threshold
7	M8 4-pin plug or cable

Order Information

Type	Part no.
WT 150-P162	6 011 048
WT 150-P460	6 011 050
WT 150-N162	6 011 045
WT 150-N460	6 011 047

Accessories	page
Cables and connectors	908
Mounting brackets Type A*	919

* included with delivery

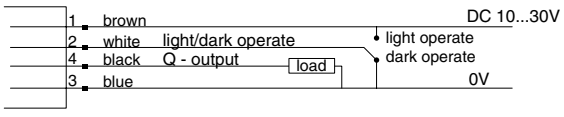
see footnote 12 on the next page

Technical Data	WT 150-	P162	P460	N162	N460
Sensing range, adjustable	0.08...3.9 in (2…100 mm)[1], adjustable	■	■	■	■
Background suppression	0.4...3.9 in (10...100 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■
	Potentiometer, 5 revolutions	■	■	■	■
Light source[2], light type	LED, visible red light	■	■	■	■
Light spot diameter	Approx. 0.2 in at 1.6 in (4 mm at 40 mm)	■	■	■	■
Angle of divergence	Approx. 5°	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Ripple[4]	± 10%	■	■	■	■
Current consumption[5]	20 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Max. output current I_A	100 mA	■	■	■	■
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[7]	0.5 ms	■	■	■	■
Max. switching frequency[8]	1000 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 4 x 0.18 mm², Ø 3.5 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[10]	⧈	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■
Approximate weight	1.6 oz (44 g)	■		■	
	0.3 oz (7 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

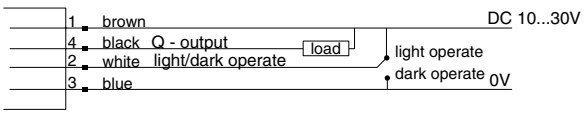
1) Object with 90% remission (based on standard white to DIN 5033)
2) Average service life 100,000 h where T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Control cable open:
NPN: light-switching
PNP: dark-switching
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected
12) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram

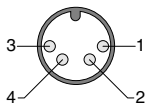
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 150

Proximity/Diffuse Sensors - Energetic

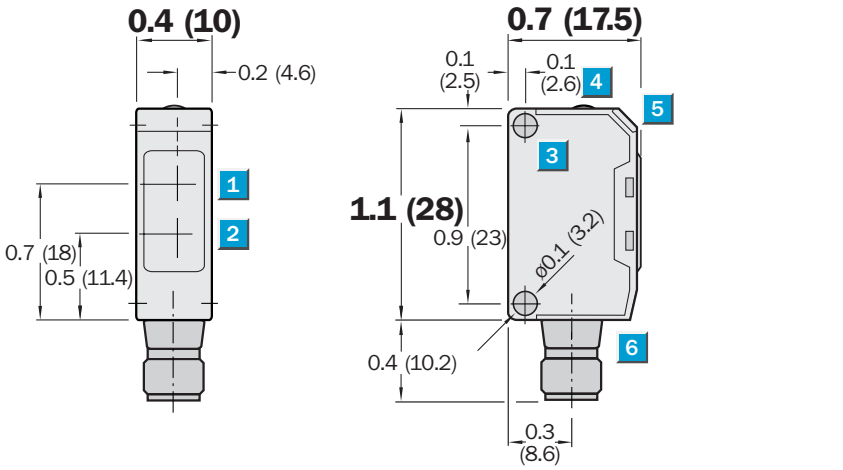
0.4...9.8 in (10...250 mm)
sensing range

Highlights

- Rugged plastic housing
- Signal strength indicator
- Switching point adjustable with sensitivity potentiometer
- Red light for easy alignment
- Easy mounting with included bracket
- Cable or M8 quick disconnect versions

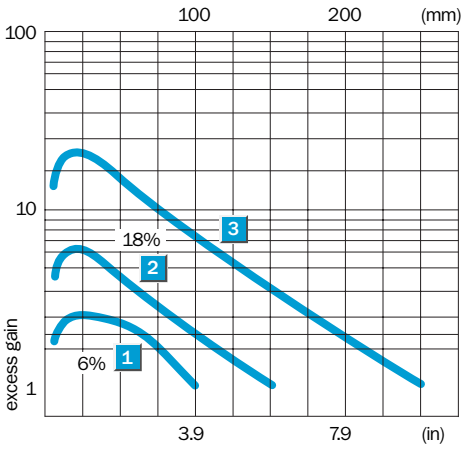
WT 150

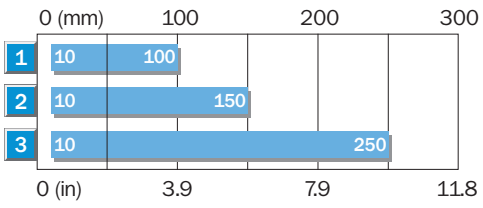
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

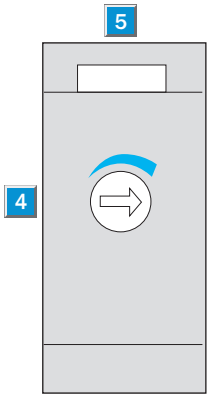




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Mounting holes Ø 3.2 mm
4	Sensitivity adjustment 270°
5	LED signal strength indicator Light received ≥ switching threshold
6	M8 plug

Order Information

Type	Part no.
WT 150-P132	6 011 042
WT 150-N132	6 011 044
WT 150-P430	6 011 039
WT 150-N430	6 011 041

Accessories	page
Cables and connectors	908
Mounting brackets*	919

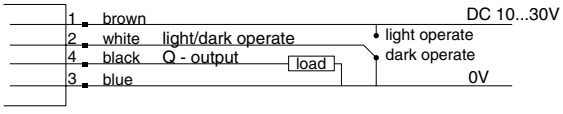
* included with delivery

Technical Data	WT 150-	P132	P430	N132	N430
Sensing range	0.4...9.8 in (10…250 mm)[1]	■	■	■	■
Sensitivity, adjustable	Potentiometer, 270°	■	■	■	■
Light source[2], light type	LED, red light	■	■	■	■
Light spot diameter	Approx. 0.8 in at 7.9 in (20 mm at 200 mm)	■	■	■	■
Angle of divergence	Approx. 6°	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Ripple[4]	± 10%	■	■	■	■
Current consumption[5]	≤ 20 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Max. output current I_A	100 mA	■	■	■	■
Operation mode[6]	Light/dark switching via control wire	■	■	■	■
	+ V_S = light switching				
	0 V = dark switching	■	■	■	■
Response time[7]	≤ 0.5 ms	■	■	■	■
Max. switching frequency[8]	1000 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 4 x 0.18 mm², Ø 3.5 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[10]	⧈	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■
Approximate weight	1.6 oz (44 g)	■		■	
	0.3 oz (7 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

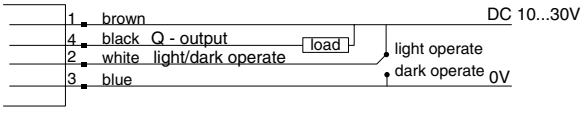
1) Object with 90% remission (based on standard white to DIN 5033)
2) Average service life 100,000 h where T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Control cable open:
NPN: light-switching
PNP: dark-switching
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

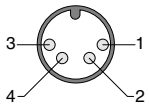
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

WT 9-2

Proximity/Diffuse Sensors - Fixed Focus

0.4...0.8 in (10...20 mm)

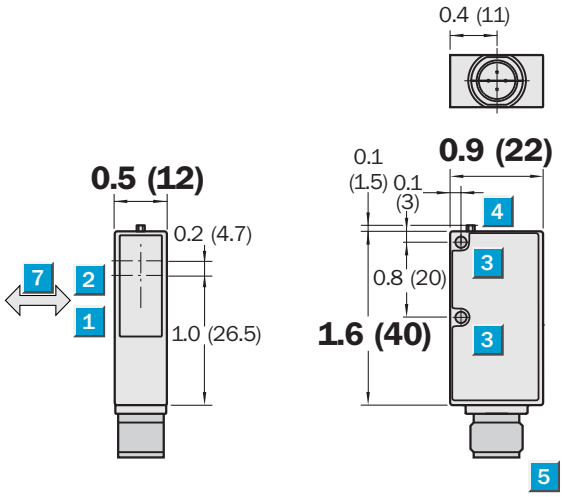
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Adjustable sensing range
- Outputs short-circuit protected
- Small, compact housing
- Sensitivity adjustment using the Teach-in procedure
- Cable, M8 or M12 quick disconnect versions

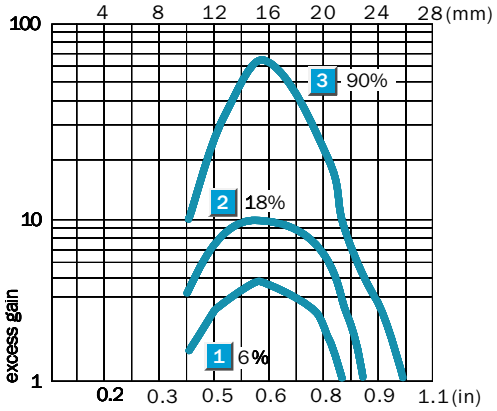
WT 9-2

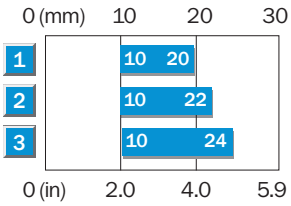
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

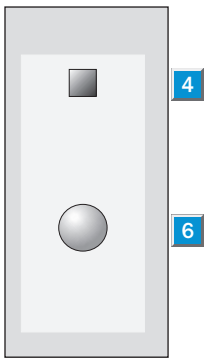




1	Sensing range on black, 6% remission
2	Sensing range on gray, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, sender
2	Center of optical axis, receiver
3	Mounting hole Ø 3.2 mm
4	LED signal strength indicator
5	Plug, M12 or M8, 4-pin, Cable, 2 m or Cable, 120 mm with plug, M12 4-pin
6	Teach-in button
7	Standard direction of material being sensed

Order Information

Type	Part no.
WT 9-2P141	1 018 301
WT 9-2P441	1 018 303
WT 9-2N141	1 018 302
WT 9-2N441	1 018 304
WT 9-2P341	1 019 274
WT 9-2P641	1 019 275

Accessories	page
Cables and connectors	908, 909
Mounting brackets	921, 933

Technical Data	WT 9-2-	P141	P441	N141	N441	P341	P641
Sensing range[1]	0.4...0.8 in (10...20 mm)	■	■	■	■	■	■
Supply voltage V_S[2]	10...30 V DC	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■
Light source	LED, visible red light[5]	■	■	■	■	■	■
Light spot size	0.1 in at 19.7 in (3 mm at 20 mm)	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■			■	■
	NPN			■	■		
Signal voltage HIGH	V_S – 2.9 V	■	■			■	■
	V_S			■	■		
Signal voltage LOW[6]	Approx. 0 V	■	■			■	■
	≤ 2.9 V			■	■		
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[7]	≤ 625 µs	■	■	■	■	■	■
Switching frequency max.[8]	800 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■		■			
	Plug, M12 4-pin, with cable, 120 mm						■
	Plug, M12 4-pin		■		■		
	Plug, M8 4-pin					■	
VDE protection class[9]	⧈	■	■	■	■		■
	⧫					■	
Enclosure rating	IP 67	■	■	■	■	■	■
Circuit protection[10]	A, B, C	■	■	■	■	■	■
Ambient temperature T_A[11]	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■			■
	0.7 oz (20 g)		■		■	■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

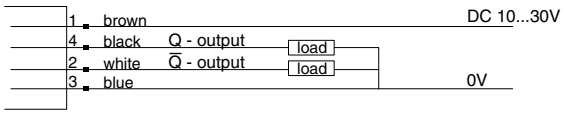
1) Object with 90% remission (referred to standard white DIN 5033)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Average service life at room temperature 50,000 h at T_A = 25°C
6) At T_A = 25°C and 100 mA output current
7) With resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = supply connections reverse-polarity protected
B = outputs short-circuit protected
C = interference suppression
11) Do not bend below 0°C

Teach-in Function

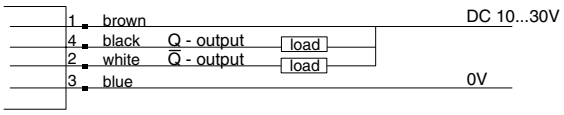
- **Programming via Teach-in button.**
- **Simple programming:**
  Position object in the beam and push the button:
  finished;
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram

PNP Models

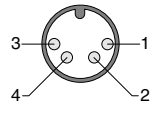


NPN Models

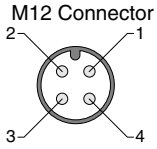


wire colors refer to standard cable, not included with quick disconnect models

M8 Connector



M12 Connector



WT 9-2

Proximity/Diffuse Sensors - Background Suppression

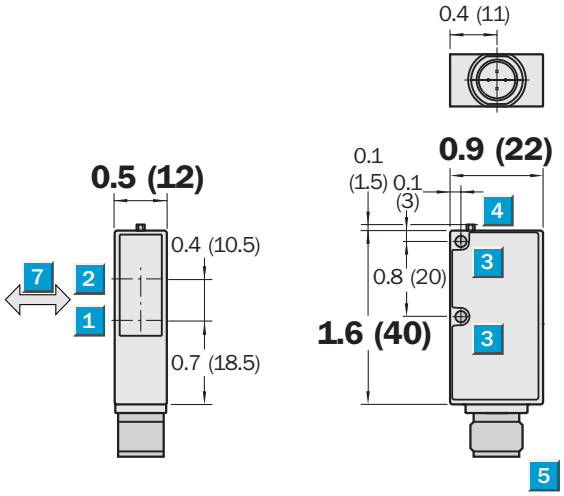
0.2...9.8 in (5...250 mm)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Adjustable background suppression
- Adjustable sensing range
- Small, compact housing
- Cable, M8 or M12 quick disconnect versions
- Outputs short-circuit protected

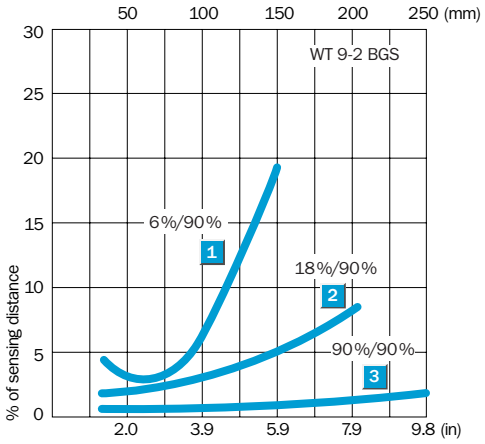
WT 9-2

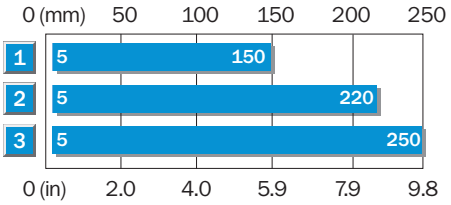
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

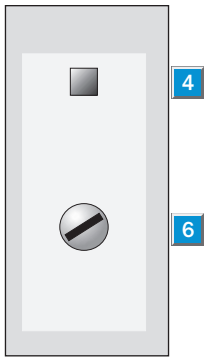




1	Sensing range on black, 6% remission
2	Sensing range on gray, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, sender
2	Center of optical axis, receiver
3	Mounting hole Ø 3.2 mm
4	LED signal strength indicator
5	Plug, M12 or M8 4-pin, Cable, 2 m or Plug, M12, 4-pin with cable, 120 mm
6	Sensing range adjustment
7	Standard direction of the material to be sensed

Order Information

Type	Part no.
WT 9-2P130	1 018 293
WT 9-2P330	1 019 026
WT 9-2P430	1 018 295
WT 9-2P630	1 019 272
WT 9-2N130	1 018 294
WT 9-2N430	1 018 296

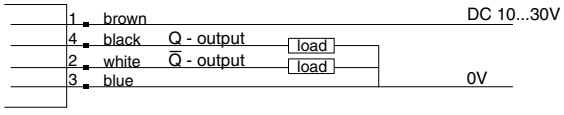
Accessories	page
Cables and connectors	908, 909
Mounting brackets	921, 933

Technical Data	WT 9-2-	P130	P330	P430	P630	N130	N430
Sensing range, adjustable[1]	0.2...9.8 in (5...250 mm)	■	■	■	■	■	■
Background suppression	1.2...9.8 in (30...250 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■
Supply voltage V_S[2]	10...30 V DC	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■
Current consumption[4]	≤ 40 mA	■	■	■	■	■	■
Light source	LED, visible red light[5]	■	■	■	■	■	■
Light spot size	0.6 x 0.6 in at 7.9 in (15 x 15 mm at 200 mm)	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■	■	■		
	NPN					■	■
Signal voltage HIGH	V_S – 2.9 V	■	■	■	■		
	V_S					■	■
Signal voltage LOW[6]	Approx. 0 V	■	■	■	■		
	≤ 1.5 V					■	■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[7]	≤ 333 µs	■	■	■	■	■	■
Switching frequency max.[8]	1.5 kHz	■	■	■	■	■	■
Connection types	Cable, 2 m	■				■	
	Plug, M12 4-pin with cable, 120 mm				■		
	Plug, M12 4-pin			■			■
	Plug, M8 4-pin		■				
VDE protection class[9]	⧈	■		■	■	■	■
	⧋		■				
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Circuit protection[10]	A, B, C	■	■	■	■	■	■
Ambient temperature T_A[11]	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■	■	■	■	■	■
	1.4 oz (20 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

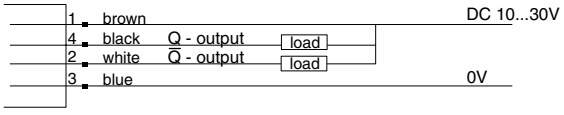
1) Object with 90% remission (referred to standard white DIN 5033)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Average service life at room temperature 100,000 h at T_A = 25°C
6) At T_A = 25°C and 100 mA output current
7) With resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = supply connections reverse polarity protected
B = outputs short-circuit protected
C = interference suppression
11) Do not bend below 0°C

Connection Diagram

PNP Models

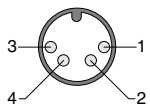


NPN Models

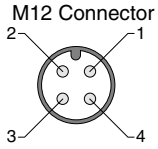


wire colors refer to standard cable, not included with quick disconnect models

M8 Connector



M12 Connector



SICK

WT 9-2

Proximity/Diffuse Sensors - Energetic

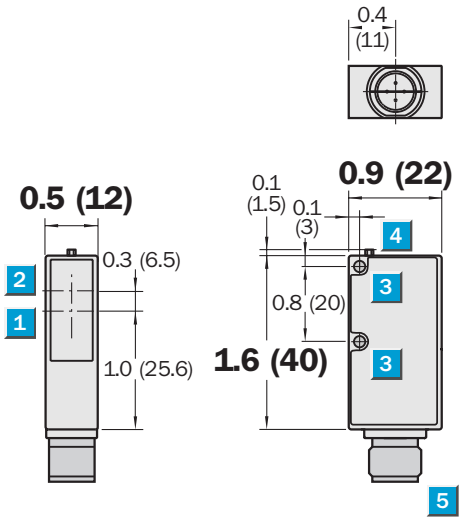
0.4...17.7 in (10...450 mm)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Outputs short circuit and over current protected
- Energetic proximity sensor with Teach-in feature
- Two Teach-in modes for easy detection of any target
- Cable or quick disconnect versions available

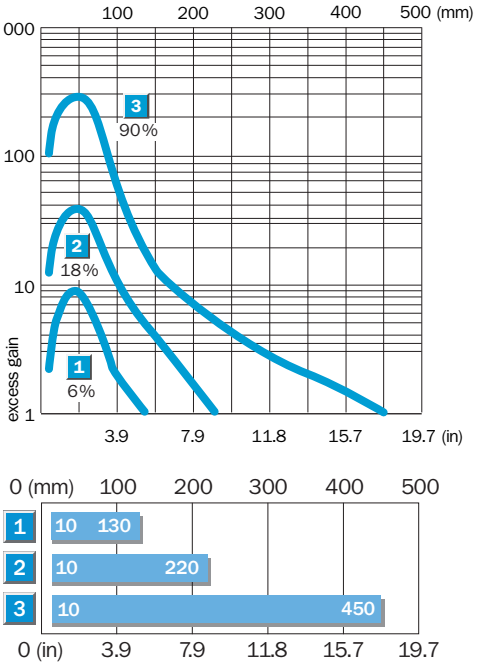
WT 9-2

Dimensional Drawing



dimensions in inches (mm)

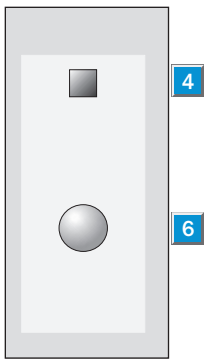
Excess Gain



1	Sensing range on black, 6% remission
2	Sensing range on gray, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Mounting hole Ø 3.2 mm
4	LED signal strength indicator
5	Plug, M12 or M 8, 4-pin, 2 m connection cable or 120 mm cable with plug, M12, 4-pin
6	Sensing range adjustment with Teach-in

Order Information

Type	Part no.
WT 9-2-P151	1 018 297
WT 9-2-P351	1 019 027
WT 9-2-P451	1 018 299
WT 9-2-P651	1 019 273
WT 9-2-N151	1 018 298
WT 9-2-N451	1 018 300

Accessories	page
Cables and connectors	908, 909
Mounting brackets	921, 933

Technical Data	WT 9-2-	P151	P351	P451	P651	N151	N451
Sensing range, adjustable[1]	0.4...17.7 in (10...450 mm)	■	■	■	■	■	■
Supply voltage V_S[2]	10...30 V DC	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■
Light source	LED, visible red light[5]	■	■	■	■	■	■
Light spot size	3.1 x 3.1 in at 19.7 in (80 x 80 mm at 500 mm)	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■	■	■		
	NPN					■	■
Signal voltage HIGH	V_S – 2.9 V	■	■	■	■		
	V_S					■	■
Signal voltage LOW[6]	Approx. 0 V	■	■	■	■		
	≤ 2.9 V					■	■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[7]	≤ 625 µs	■	■	■	■	■	■
Switching frequency max.[8]	800 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■				■	
	Plug, M12 4-pin, with cable, 120 mm				■		
	Plug, M12 4-pin			■			■
	Plug, M8 4-pin		■				
VDE protection class[9]	□	■		■	■	■	■
	⏚		■				
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Circuit protection[10]	A, B, C	■	■	■	■	■	■
Ambient temperature T_A[11]	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■			■	■	
	0.7 oz (20 g)		■	■			■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

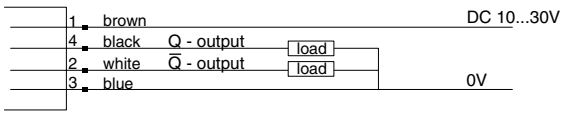
1) Object with 90% remission (referred to standard white DIN 5033)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Average service life at room temperature 50,000 h at T_A = 25°C
6) At T_A = 25°C and 100 mA output current
7) With resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = supply connections reverse-polarity protected
B = outputs short-circuit protected
C = interference suppression
11) Do not bend below 0°C

Teach-in Function

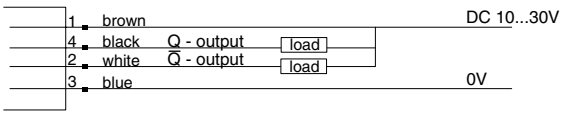
- **Programming via Teach-in button.**
- **Simple programming:**
  Position object in the beam and push the button:
  finished;
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram

PNP Models

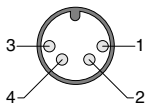


NPN Models

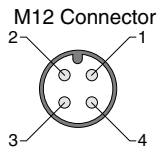


wire colors refer to standard cable, not included with quick disconnect models

M8 Connector



M12 Connector



SICK

WT 9-2

Proximity/Diffuse Sensors - Energetic

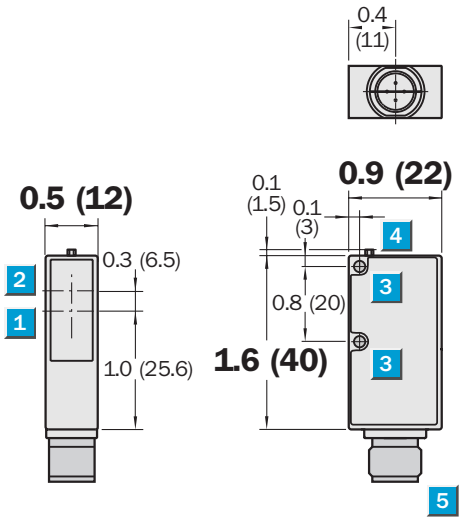
2.0...59.0 in (50...1500 mm)
sensing range

Highlights

- Rugged plastic housing
- Infrared light source with LED
- Outputs short circuit and over current protected
- Energetic proximity sensor
- Switching frequency of 500/s
- Cable or quick disconnect versions available

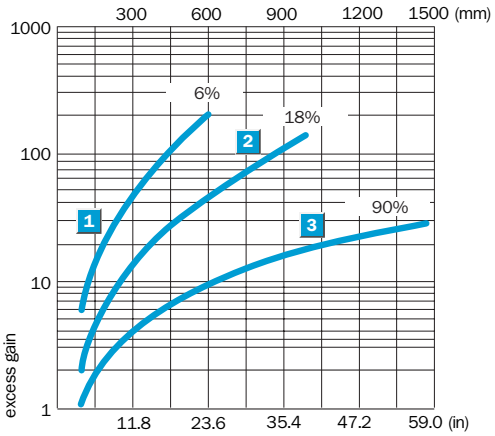
WT 9-2

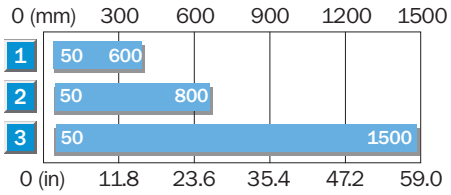
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

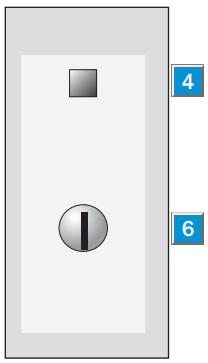




1	Sensing range on black, 6% remission
2	Sensing range on gray, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Mounting hole Ø 3.2 mm
4	LED signal strength indicator
5	Plug, M12 or M 8, 4-pin, 2 m connection cable or 120 mm cable with plug, M12, 4-pin
6	Sensing range adjustment

Order Information

Type	Part no.
WT 9-2-P160	1 019 097
WT 9-2-P460	1 019 098
WT 9-2-N160	1 019 342

Accessories	page
Cables and connectors	909
Mounting brackets	921, 933

Technical Data	WT 9-2-	P160	P460	N160
Sensing range, adjustable[1]	2.0...59.0 in (50...1500 mm)	■	■	■
Supply voltage V_S[2]	10...30 V DC	■	■	■
Ripple[3]	≤ 5 V_{PP}	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■
Light source	LED, infrared light[5]	■	■	■
Light spot size	23.6 in at 59.0 in (600 mm at 1500 mm)	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■	
	NPN			■
Signal voltage HIGH	V_S – 2.9 V	■	■	
	V_S			■
Signal voltage LOW[6]	Approx. 0 V	■	■	
	≤ 2.9 V			■
Output current I_A max.	≤ 100 mA	■	■	■
Response time[7]	≤ 1000 µs	■	■	■
Switching frequency max.[8]	500 Hz	■	■	■
Connection types	Cable, 2 m	■		■
	Plug, M12 4-pin		■	
VDE protection class[9]	□	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■
Circuit protection[10]	A, B, C	■	■	■
Ambient temperature T_A[11]	Operation -40...140°F (-40...60°C)	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■
Approximate weight	2.8 oz (80 g)	■		■
	0.7 oz (20 g)		■	
Housing material	Glass fiber reinforced ABS	■	■	■

1) Object with 90% remission (referred to standard white DIN 5033)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Average service life at room temperature 100,000 h at T_U = 25°C
6) At T_U = 25°C and 100 mA output current
7) With resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = supply connections reverse-polarity protected
B = outputs short-circuit protected
C = interference suppression
11) Do not bend below 0°C

Connection Diagram

wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 9L

Proximity/Diffuse Sensors - Background Suppression

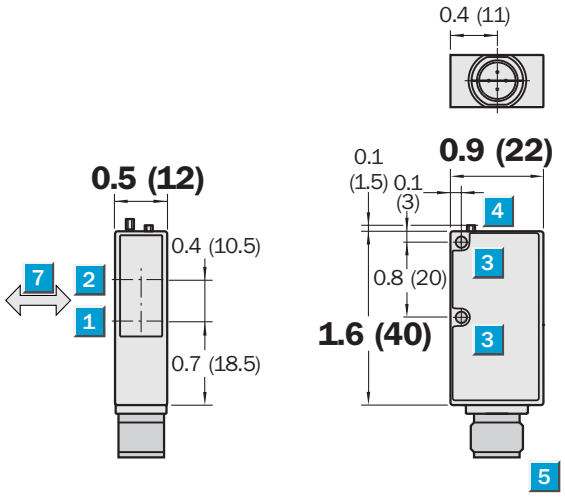
1.2...5.9 in (30...150 mm)
sensing range

Highlights

- Class II laser, red light
- Adjustable background suppression
- 1000 hz switching frequency
- Compact ABS plastic housing

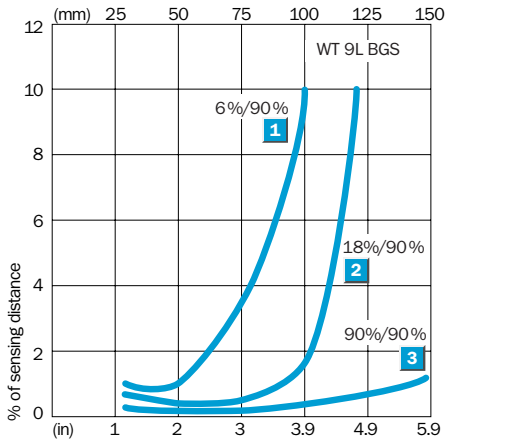
WT 9L

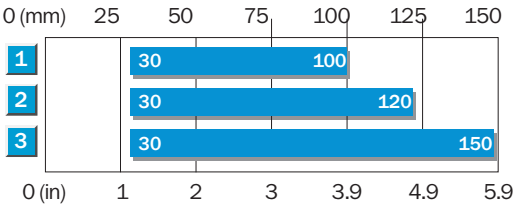
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

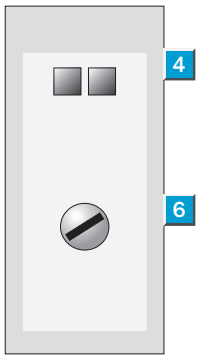




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, sender
2	Center of optical axis, receiver
3	Mounting hole Ø 3.2 mm
4	Power indicator green; LED signal strength indicator yellow
5	Plug, M12 or M8 4-pin,
6	Sensing range adjustment
7	Standard direction of the material to be sensed

Order Information

Type	Part no.
WT 9L-P330	1 023 977
WT 9L-P430	1 023 959
WT 9L-N330	1 023 991
WT 9L-N430	1 023 990

Accessories

	page
Cables and connectors	908, 909
Mounting brackets	921, 933

Technical Data	WT 9L-	P330	P430	N330	N430
Sensing range, adjustable[1]	1.2...5.9 in (30...150 mm)	■	■	■	■
Supply voltage V_S	10...30 V DC [2]	■	■	■	■
Ripple[3]	< 5 V_{PP}	■	■	■	■
Current consumption[4]	< 35 mA	■	■	■	■
Light source[5], **light type**	Laser, red light; Class II	■	■	■	■
Light spot size	< 0.019 in at 2.4 in (< 0.5 mm at 60 mm)	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■		
	NPN			■	■
PNP; signal voltage HIGH	V_S – 2 V	■	■		
PNP; signal voltage LOW	Approx. 0 V	■	■		
NPN; signal voltage HIGH	V_S			■	■
NPN; signal voltage LOW[6]	V_S < 2 V			■	■
Output current I_A max.	< 100 mA	■	■	■	■
Response time[7]	< 0.6 ms	■	■	■	■
Max. switching frequency[8]	1000/s	■	■	■	■
Connection types	Plug, M12 4-pin		■		■
	Plug, M8 4-pin	■		■	
VDE protection class[9]	⧈ (plug M12)		■		■
	III (plug M8)	■		■	
Enclosure rating	IP 67	■	■	■	■
Circuit protection[10]	A, B, C	■	■	■	■
Ambient temperature T_A[11]	Operation 14...122°F (-10...50°C)	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■
Approximate weight	0.7 oz (20 g)	■	■	■	■
Housing material	ABS plastic	■	■	■	■

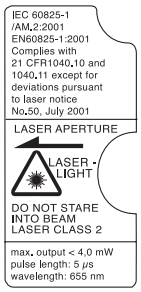
1) Object with 90 % remission (based on standard white DIN 5033)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Average service life 50,000 h at T_A = 25°C
6) At T_A = 25°C and 100 mA output current
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = V_S connections reverse-polarity protected
B = Outputs reverse-polarity protected
C = Interference pulse suppression
11) Do not stack devices

Laser Protection

EN 60825-1, Class II
Conforms to 21 CFR 1040

Beam Attenuator

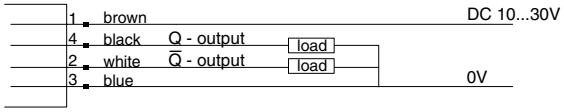
The WT 9L is equipped with an M8 or M12 style quick disconnect. This cable can be quickly and easily be removed in the event that personnel require access to the area where the sensor is mounted.



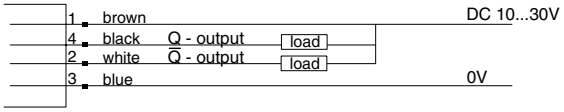
SICK AG
D-79183 Waldkirch
Sebastian - Kneipp - Str. 1
April 2003 / 7279

Connection Diagram

PNP Models

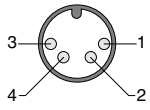


NPN Models

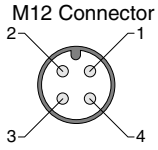


wire colors refer to standard cable, not included with quick disconnect models

M8 Connector

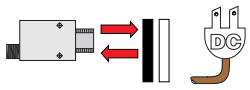


M12 Connector



WT 1000 50 mm

Proximity/Diffuse Sensors - Background Suppression



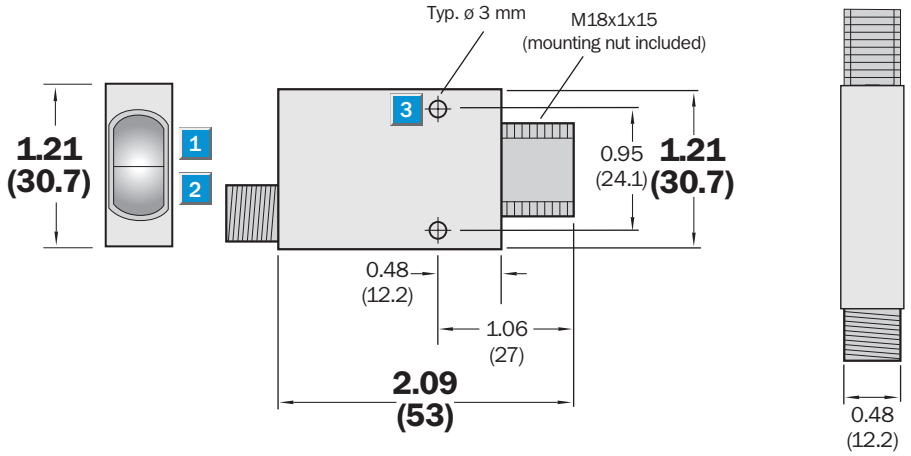
2.0 ±0.39 in (50 ±10 mm)
sensing range

Highlights

- Fixed background suppression provides superior performance to focused sensors
- Excels at sensing dark objects on light colored backgrounds
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

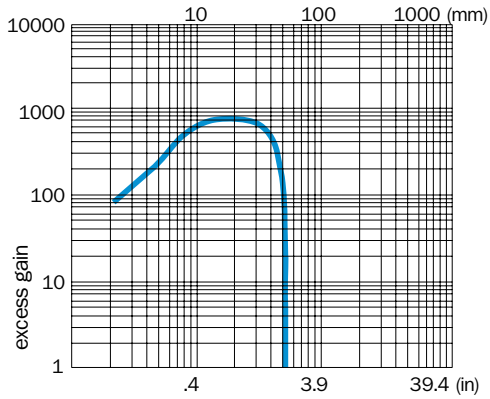
WT 1000 50

Dimensional Drawing



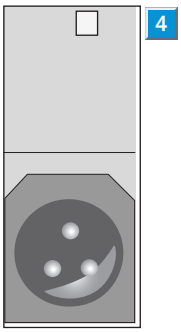
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Order Information

Type	Part no.
WT 1000-P152	7 023 817
WT 1000-P450	7 023 818
WT 1000-P451	7 024 615
WT 1000-N152	7 023 819
WT 1000-N450	7 023 820
WT 1000-N451	7 024 616

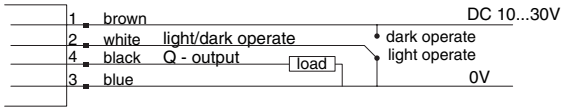
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data	WT 1000-	P152	P450	P451	N152	N450	N451
Sensing range, fixed	2.0 ±0.39 in (50 ±10 mm)	■	■	■	■	■	■
Background suppression	6%/90%: ≤5% 0.09 in at 2 in (2.5 mm at 50 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■
Light source[1], light type	LED, infrared (880 nm)	■	■	■	■	■	■
Light spot diameter	Approx. 0.36 in at 2 in (9.2 mm at 50 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 3.5°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V peak to peak	■	■	■	■	■	■
Current consumption[3]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Max. output current I_A	100 mA	■	■	■	■	■	■
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■
Response time[4]	600 µs	■	■	■	■	■	■
Max. switching frequency[5]	840 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, M12 4-pin		■			■	
	Plug, M12 4-pin, with cable, 150 m			■			■
VDE protection class[6]	□	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

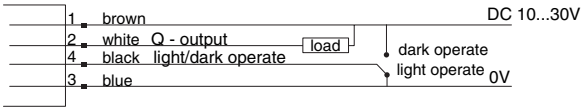
1) Average service life 100,000 h where $T_A = 25°C$
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

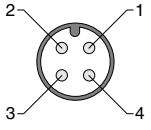
PNP Models



NPN Models



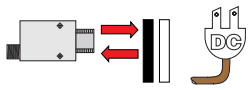
M12 Connector



SICK

WT 1000 100 mm

Proximity/Diffuse Sensors - Background Suppression



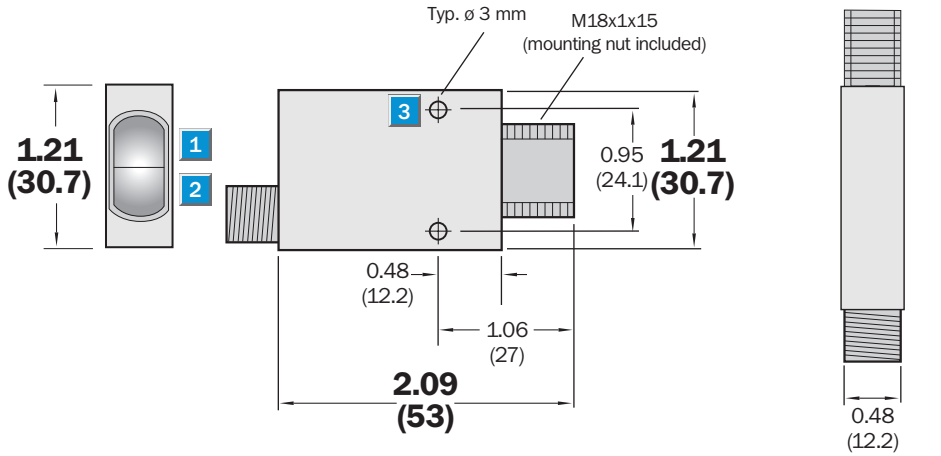
4 in ±0.9 in (100 ±22 mm)
sensing range

Highlights

- Fixed background suppression provides superior performance to focused sensors
- Excels at sensing dark objects on light colored backgrounds
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

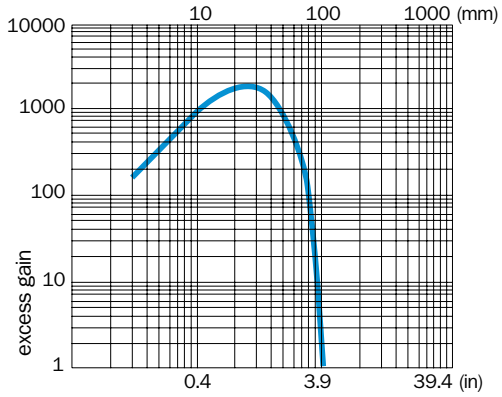
WT 1000

Dimensional Drawing



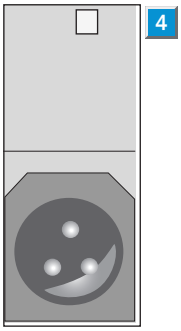
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Order Information

Type	Part no.
WT 1000-P162	7 023 823
WT 1000-P460	7 023 824
WT 1000-P461	7 024 619
WT 1000-N162	7 023 825
WT 1000-N460	7 023 826
WT 1000-N461	7 024 618

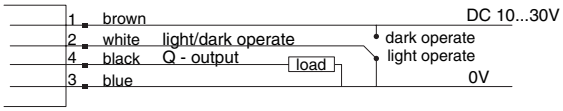
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data	WT 1000-	P162	P460	P461	N162	N460	N461
Sensing range, fixed	4.0 ±0.9 in (100 ±22 mm)	■	■	■	■	■	■
Background suppression	6%/90%: ≤5% 0.4 in at 4 in (10 mm at 100 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■
Light source[1], light type	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 0.47 in at 3.9 in (12 mm at 100 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 3.5°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V peak to peak	■	■	■	■	■	■
Current consumption[3]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Max. output current I_A	100 mA	■	■	■	■	■	■
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■
Response time[4]	600 µs	■	■	■	■	■	■
Max. switching frequency[5]	840 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, M12 4-pin		■			■	
	Plug, M12 4-pin, with cable, 150 m			■			■
VDE protection class[6]	□	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

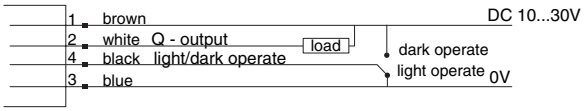
1) Average service life 100,000 h where $T_A = 25°C$
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

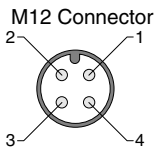
Connection Diagram

PNP Models



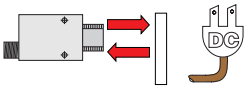
NPN Models





WT 1000

Proximity/Diffuse Sensors - Energetic



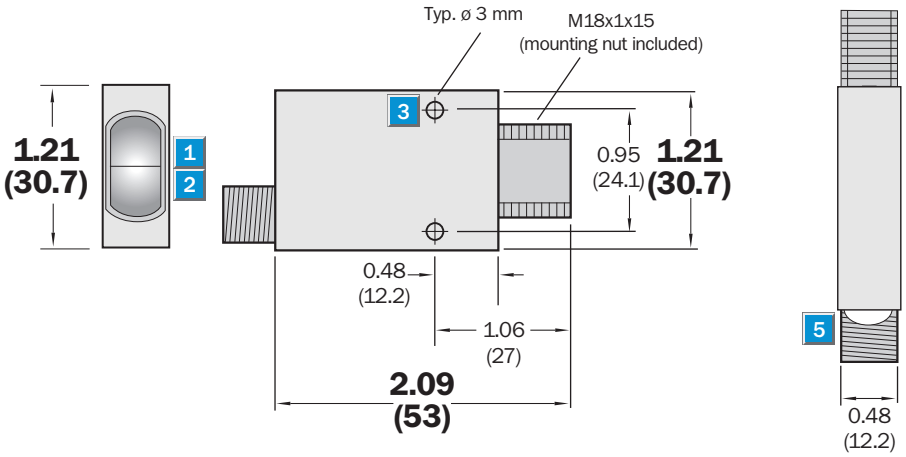
0.4...19.7 in (10...500 mm)
sensing range

Highlights

- Energetic proximity sensor with OneTouch Teach-in feature
- Two Teach-in modes for easy detection of any object
- Superior sensing range of 500 mm
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

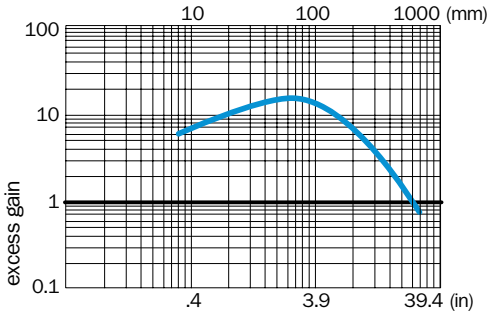
WT 1000

Dimensional Drawing



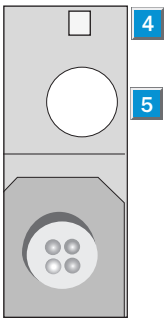
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow
5 Teach-in button

Order Information

Type	Part no.
WT 1000-P112	7 023 811
WT 1000-P410	7 023 812
WT 1000-P411	7 024 613
WT 1000-N112	7 023 813
WT 1000-N410	7 023 814
WT 1000-N411	7 024 614

Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

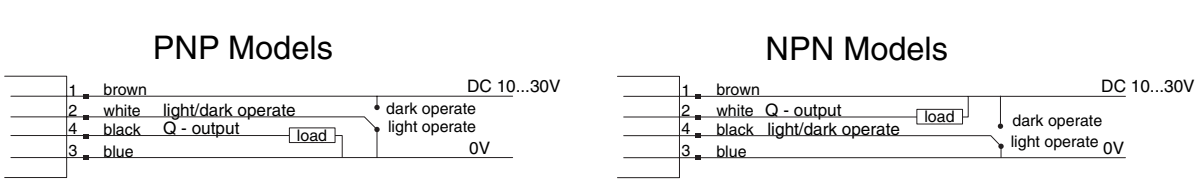
Technical Data	WT 1000-	P112	P410	P411	N112	N410	N411
Sensing range, adjustable	0.4...19.7 in (10...500 mm)	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 2.8 in at 15 in (70 mm at 380 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 10.5°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V peak to peak	■	■	■	■	■	■
Current consumption[3]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Max. output current I_A	100 mA	■	■	■	■	■	■
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■
Response time[4]	600 µs	■	■	■	■	■	■
Max. switching frequency[5]	840 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, M12 4-pin		■			■	
	Plug, M12 4-pin, with cable, 150 m			■			■
VDE protection class[6]	□	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Average service life 50,000 h where $T_A = 25°C$
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

Teach-in Function

- **Programming via Teach-in button.**
- **Simple programming:**
  Position object in the beam and push the button:
  finished;
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram



WTB 140

Proximity/Diffuse Sensors - Background Suppression

0.08...19.7 in (2...500 mm)

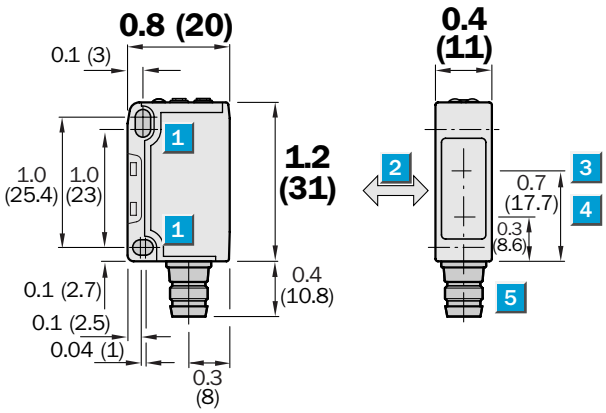
sensing range

Highlights

- Small, compact housing
- Adjustable background suppression
- Optional OFF delay
- Switching point independent of object color or surface
- Cable or quick disconnect versions available

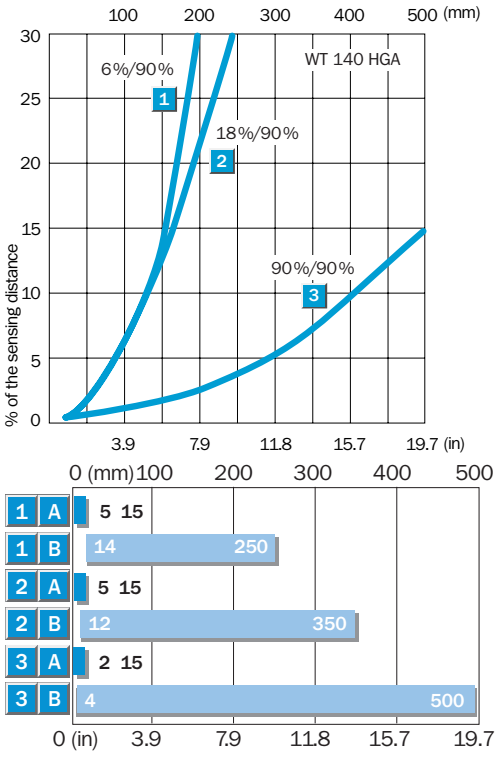
WTB 140

Dimensional Drawing



dimensions in inches (mm)

Background Suppression

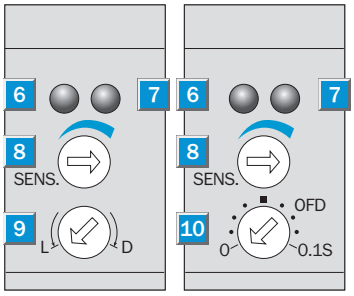


1	Sensing range on black[15], white background
2	Sensing range on gray[15], white background
3	Sensing range on white[15], white background
A	Sensing range control set to MIN
B	Sensing range control set to MAX

(see footnotes on next page)

Adjustments

WTB 140-P132	WTB 140-P122
WTB 140-N132	WTB 140-N122
WTB 140-P330	WTB 140-P420
WTB 140-N330	WTB 140-N420
WTB 140-P430	
WTB 140-N430	



1	Mounting hole Ø 3.2 mm for M3
2	Standard direction of the material to be sensed
3	Center of optical axis, receiver
4	Center of optical axis, sender
5	Plug, M8 3-/4-pin or connection cable
6	Signal strength indicator, green
7	Output indicator, orange
8	Sensing range control (5 turns)
9	Light/dark rotary switch: L = light switching, D = dark switching
10	OFF delay selector switch (switch-off delay) t_{OFF}; t = 0 s (OFF) ... 0.1 s

Order Information

Type	Order no.
WTB 140-P132	6 012 640
WTB 140-P330	6 012 642
WTB 140-P430	6 012 643
WTB 140-N132	6 012 636
WTB 140-N330	6 012 638
WTB 140-N430	6 012 639
WTB 140-P122	6 012 632
WTB 140-P420	6 012 635
WTB 140-N122	6 012 628
WTB 140-N420	6 012 631

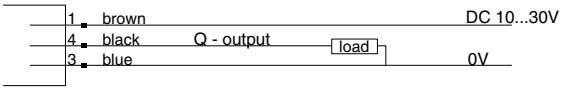
Accessories	page
Cables and connectors	908, 909
Mounting brackets	920

Technical Data	WTB 140-	P132	P330	P430	N132	N330	N430	P122	P420	N122	N420
Sensing range[1], adjustable	0.08...19.7 in (2...500 mm)	■	■	■	■	■	■	■	■	■	■
Background suppression	0.6...19.7 in (15...500 mm)	■	■	■	■	■	■	■	■	■	■
Background suppression capability	% of set sensing distance[2]	■	■	■	■	■	■	■	■	■	■
Light source[3]	LED, visible red light	■	■	■	■	■	■	■	■	■	■
Light spot diameter	0.6 in at 7.9 in (15 mm at 200 mm)	■	■	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 4.3°	■	■	■	■	■	■	■	■	■	■
Supply voltage V_S[4]	10...30 V DC	■	■	■	■	■	■	■	■	■	■
Ripple[5]	± 10%	■	■	■	■	■	■	■	■	■	■
Current consumption[6]	≤ 30 mA	■	■	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■				■	■		
	NPN, open collector: Q				■	■	■			■	■
Switching mode[7]	Light/dark switching via switch[8]	■	■	■	■	■	■				
	per control wire L/D[9]							■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■	■	■
Response time[10]	≤ 0.5 ms	■	■	■	■	■	■	■	■	■	■
Max. switching frequency[11]	1000 Hz	■	■	■	■	■	■	■	■	■	■
Timing options	Adjust 0 ... 100 ms; (OFF delay)							■	■	■	■
	270° Potentiometer							■	■	■	■
Connection types	Cable, PVC, 2 m[12]; 3 x 0.18 mm², Ø 4.0 mm	■			■						
	Cable, PVC, 2 m[12]; 4 x 0.18 mm², Ø 4.0 mm							■		■	
	Plug, M8 3-pin		■			■					
	Plug, M8 4-pin			■			■		■		■
VDE protection class[13]	⧈	■	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■	■	■
Circuit protection[14]	A, B, C, D	■	■	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■	■	■
Approximate weight	1.9 oz (53 g)	■			■			■		■	
	0.3 oz (9 g)		■	■		■	■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■	■	■

1) Object with 90% reflectance (with reference to standard white according to DIN 5033)
2) See characteristic curve
3) Average service life 100,000 h at T_U = 25°C
4) Limit values
5) Must be within V_S tolerances
6) Without load
7) Adjustable
8) L = light switching, D = dark switching
9) + V_S = light switching
0 V = dark switching
10) With resistive load
11) With light/dark ratio 1 : 1
12) Do not bend cable below 0°C
13) Rated voltage 50 V DC
14) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
15) Black = 6% reflectance
Gray = 18% reflectance
White = 90% reflectance

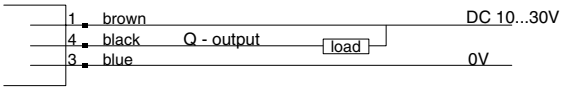
Connection Diagram

PNP Models

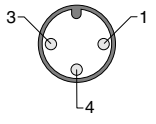


wire colors refer to standard cable, not included with quick disconnect models.

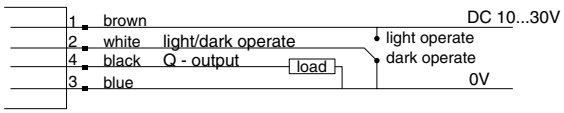
NPN Models



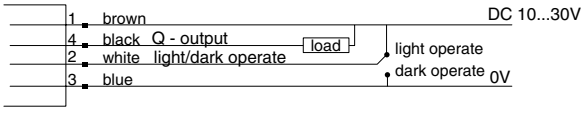
M8 Connector



PNP Models

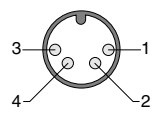


NPN Models



wire colors refer to standard cable, not included with quick disconnect models

M8 Connector



SICK

WTE 140-2

Proximity/Diffuse Sensors - Energetic

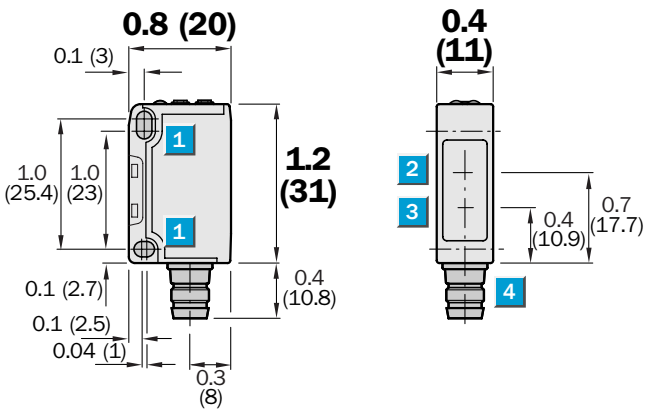
0...35.4 in (0...900 mm)
sensing range

Highlights

- Signal strength indicator
- Cable or quick disconnect versions available
- Small, compact housing
- Adjustable sensing range

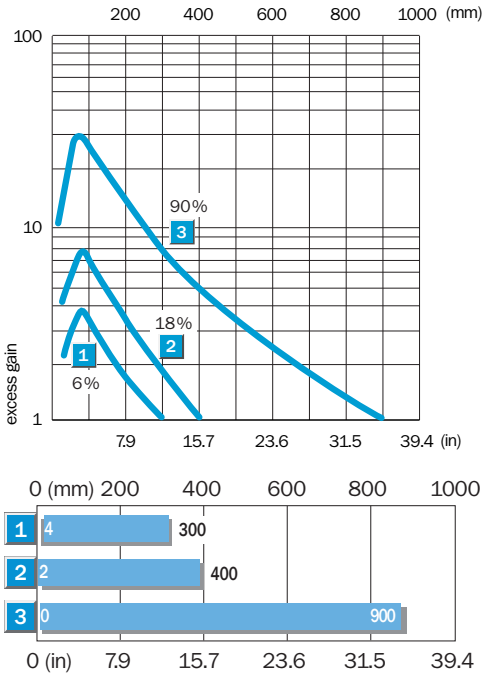
WTE 140

Dimensional Drawing



dimensions in inches (mm)

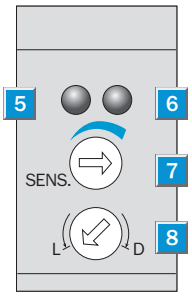
Excess Gain



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Mounting hole Ø 3.2 mm for M3
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Plug, M8 3-/4-pin or connection cable
5	Signal strength indicator, green
6	Output indicator, orange
7	Sensitivity setting (270°)
8	Light/dark rotary switch: L = light switching, D = dark switching

Order Information

Type	Part no.
WTE 140-2P132	6 024 804
WTE 140-2P330	6 024 806
WTE 140-2P430	6 024 807
WTE 140-2N132	6 024 800
WTE 140-2N330	6 024 802
WTE 140-2N430	6 024 803

Accessories

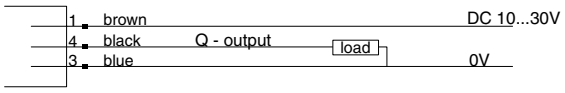
	page
Cables and connectors	908, 909
Mounting brackets	920

Technical Data	WTE 140-2-	P132	P330	P430	N132	N330	N430
Sensing range, adjustable	0...35.4 in (0...900 mm)[1]	■	■	■	■	■	■
Sensitivity, adjustable	Potentiometer, 270°	■	■	■	■	■	■
Light source[2]	LED, visible red light	■	■	■	■	■	■
Light spot diameter	2 in at 11.8 in (50 mm at 300 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 4.8°	■	■	■	■	■	■
Supply voltage V_S[3]	10...30 V DC	■	■	■	■	■	■
Ripple[4]	± 10%	■	■	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Switching type, adjustable	Light/dark switching via switch[6]	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Response time[7]	≤ 0.5 ms	■	■	■	■	■	■
Max. switching frequency[8]	1000 Hz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 3 x 0.18 mm², Ø 4.0 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class[10]	□	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25 ... 55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40 ... 70°C)	■	■	■	■	■	■
Approximate weight	1.9 oz (53 g)	■			■		
	0.3 oz (9 g)		■	■		■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

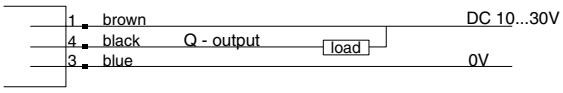
1) Object with 90% reflectance (with reference to standard white according to DIN 5033)
2) Average service life 100,000 h at T_U = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) L = light switching, D = dark switching
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend cable below 0°C
10) Rated voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

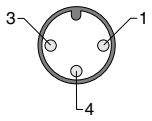


NPN Models

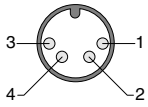


wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



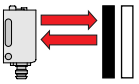
M8 Connector



SICK

WT 160

Proximity/Diffuse Sensors-Background Suppression



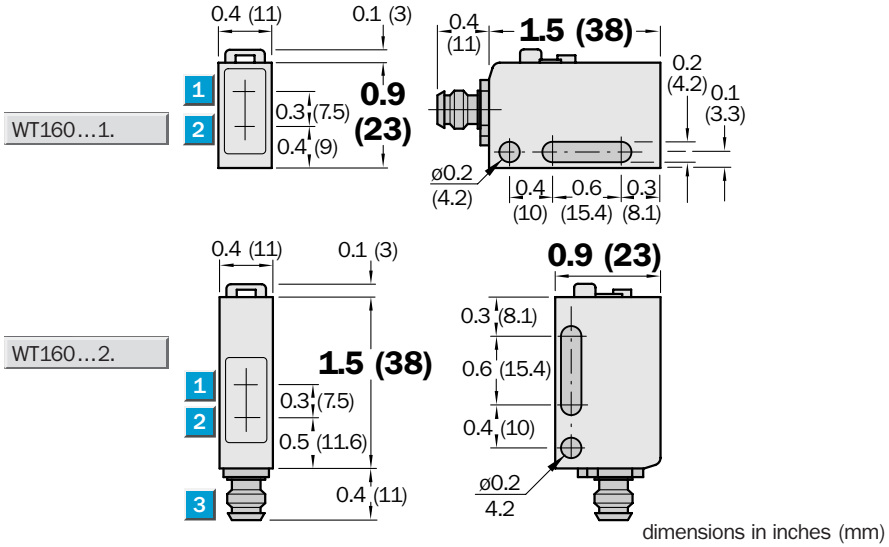

0.2...2.2 in (4...55 mm)
sensing range

Highlights

- Horizontal or vertical housing
- Rugged plastic housing
- Focused optics provide adjustable background suppression
- Red light for easy alignment
- Signal strength indicator
- Easy mounting with included bracket
- Cable or M8 quick disconnect versions

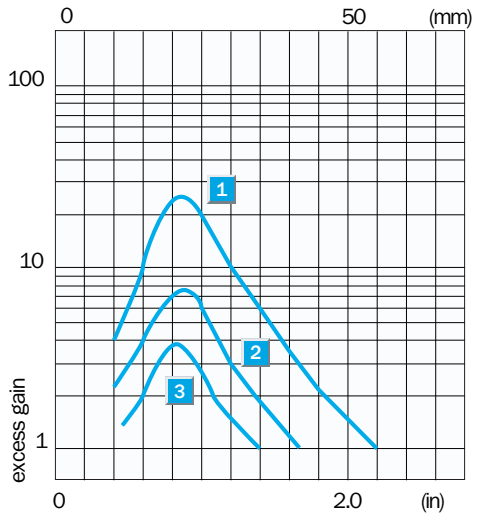
WT 160

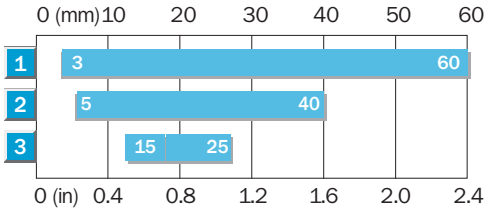
Dimensional Drawing



dimensions in inches (mm)

Excess Gain





1	Sensing range on white, 90% remission
2	Sensing range on gray, 18% remission
3	Sensing range on black, 6% remission

Adjustments

All types

1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 4-pin or connection cable
4	Sensitivity adjustment
5	Light/dark rotary switch:
	L = light switching
	D = dark switching
6	Orange LED indicator (Status output)
7	Green LED signal strength indicator

Order Information

Type	Part no.
WT 160-F112	6 022 783
WT 160-F410	6 022 788
WT 160-E112	6 022 775
WT 160-E410	6 022 780
WT 160-F122	6 022 785
WT 160-F420	6 022 790
WT 160-E122	6 022 777
WT 160-E420	6 022 782

Accessories	page
Cables and connectors	908
Mounting brackets*	919

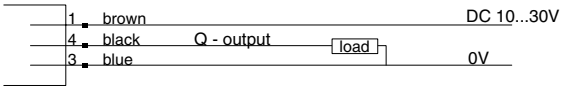
* included with delivery

Technical Data	WT 160-	F112	F410	E112	E410	F122	F420	E122	E420
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Sensing range, adjustable	0.2...2.2 in (4...55 mm)[1]	■	■	■	■	■	■	■	■
Background suppression	From approx. 3.9 in (100 mm)	■	■	■	■	■	■	■	■
	(background 90% remission)[2]								
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[2], light type	LED, red light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 0.1 in at 1 in (3 mm at 25 mm)	■	■	■	■	■	■	■	■
Angle of divergence, sender	Focused, focus 1 in (25 mm)	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[4]	■	■	■	■	■	■	■	■
Ripple[5]	± 10%	■	■	■	■	■	■	■	■
Current consumption[6]	≤ 25 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■	■
Response time[7]/max. switching freq.[8]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■	■	■
Alarm output (VMA)	100 mA, static	■	■	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10]; 5 x 0.2 mm², Ø 4.2 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Available in Plug, M8 3-pin upon request								
VDE protection class[11]	⧈	■	■	■	■	■	■	■	■
Circuit protection[12]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■		■		■		■	
	0.7 oz (20 g)		■		■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

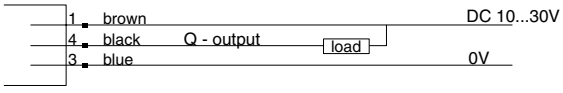
1) Sensed material with 90% remission (based on standard white according to DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Background 90% remission
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) TE not with plug model
10) Do not bend below 0°C
11) Reference voltage 50 V DC
12) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram

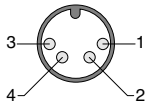
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models.

SICK

WT 160

Proximity/Diffuse Sensors-Divergent

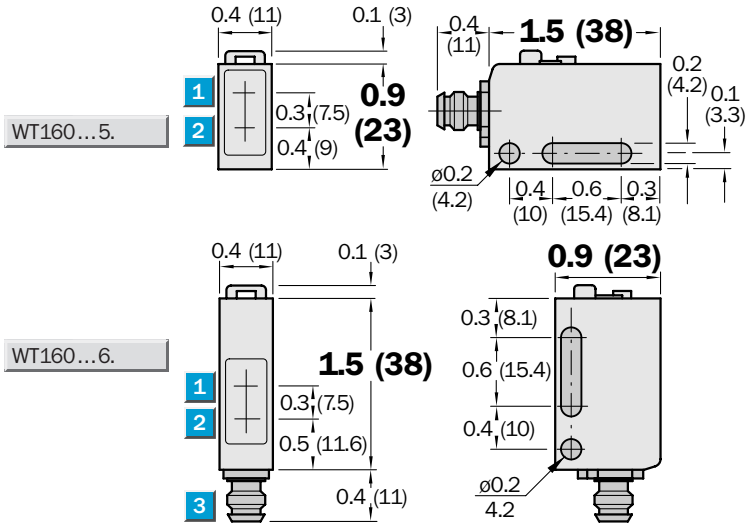
0...4.1 in (0...105 mm)
sensing range

Highlights

- Horizontal or vertical housing
- Rugged plastic housing
- Divergent beam sensor
- Adjustable sensing range
- Signal strength indicator
- Cable or M8 quick disconnect versions
- Easy mounting with included bracket

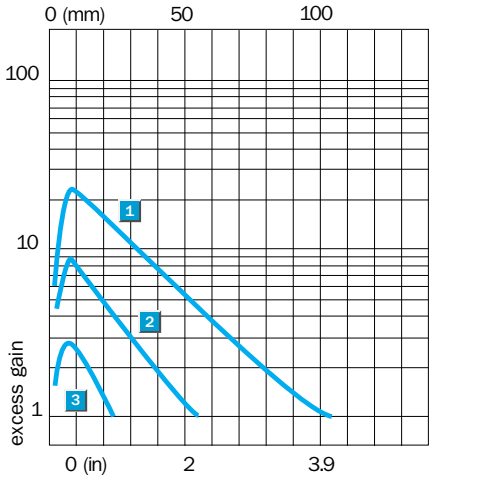
WT 160

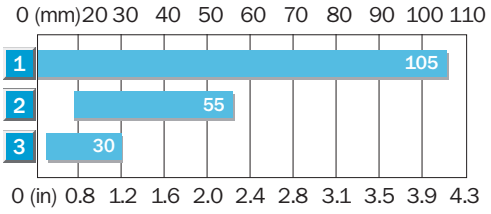
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

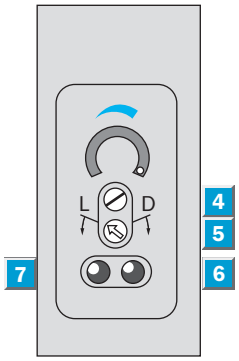




1	Sensing range on white, 90% remission
2	Sensing range on gray, 18% remission
3	Sensing range on black, 6% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 4-pin or connection cable
4	Sensitivity adjustment
5	Light/dark rotary switch: L = light switching D = dark switching
6	Orange LED indicator (Status output)
7	Green LED signal strength indicator

Order Information

Type	Part no.
WT 160-F152	6 022 799
WT 160-F450	6 022 804
WT 160-E152	6 022 791
WT 160-E450	6 022 796
WT 160-F162	6 022 801
WT 160-F460	6 022 806
WT 160-E162	6 022 793
WT 160-E460	6 022 798

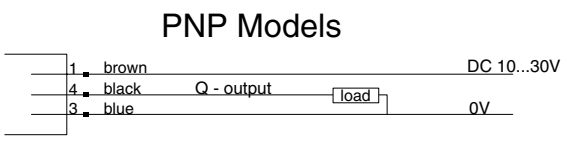
Accessories	page
Cables and connectors	908
Mounting brackets*	919

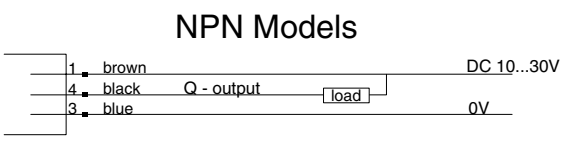
* included with delivery

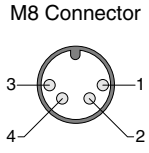
Technical Data	WT 160-	F152	F450	E152	E450	F162	F460	E162	E460
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Sensing range, adjustable	0...4.1 in (0...105 mm)[1)2)]	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[3)], light type	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 3.9 in at 3.9 in (100 mm at 100 mm)	■	■	■	■	■	■	■	■
Angle of divergence, sender	Approx. 40°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[4)]	■	■	■	■	■	■	■	■
Ripple[5)]	± 10%	■	■	■	■	■	■	■	■
Current consumption[6)]	≤ 25 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via rotary switch	■	■	■	■	■	■	■	■
Response time[7)]/max. switching freq.[8)]	≤ 0.5 ms/1000 Hz	■	■	■	■	■	■	■	■
		■	■	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10)]; 5 x 0.2 mm², Ø 4.2 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Available in Plug, M8 3-pin upon request								
VDE protection class[11)]	□	■	■	■	■	■	■	■	■
Circuit protection[12)]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■		■		■		■	
	0.7 oz (20 g)		■		■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

1) Sensed material with 90% remission (based on standard white according to DIN 5033)
2) Object size 30 x 30 mm
3) Average service life 100,000 h at T_A = 25°C
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) TE not with plug model
10) Do not bend below 0°C
11) Reference voltage 50 V DC
12) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







wire colors refer to standard cable, not included with quick disconnect models.

WT 160

Proximity/Diffuse Sensors-Energetic

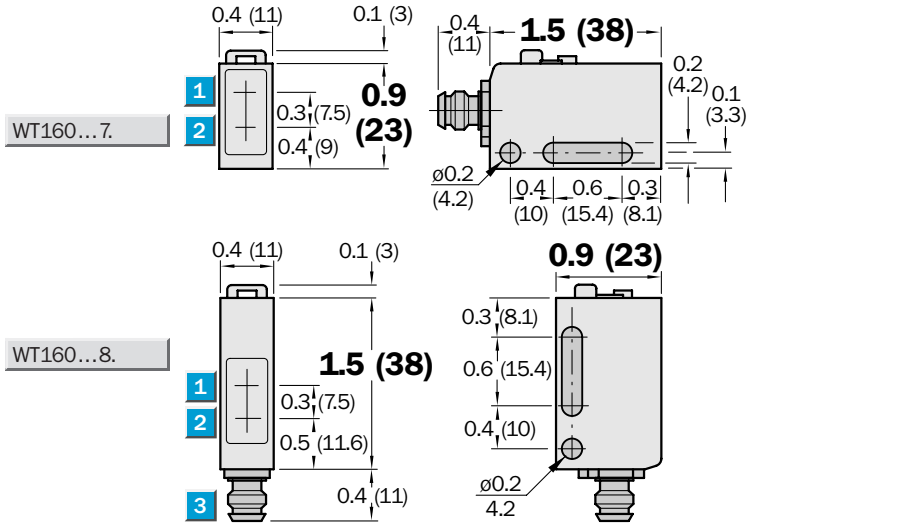

0...35.4 in (0...900 mm)
sensing range

Highlights

- Horizontal or vertical housing
- Rugged plastic housing
- Alarm output and test input
- Adjustable sensing range
- Flashing LED signal strength indicator
- Cable or M8 quick disconnect versions
- Easy mounting with included bracket

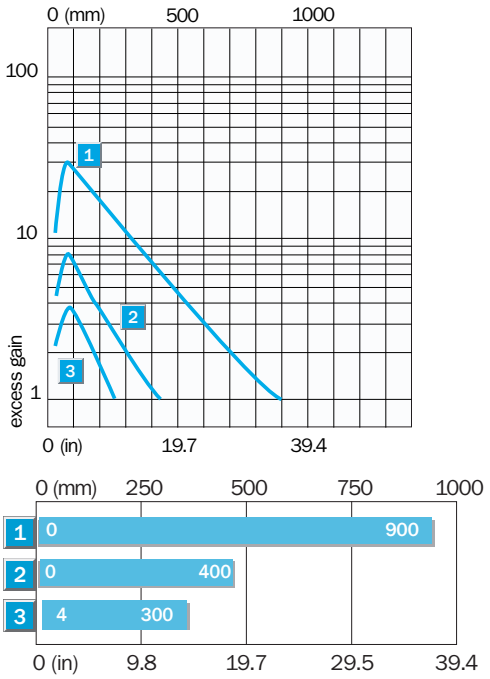
WT 160

Dimensional Drawing



dimensions in inches (mm)

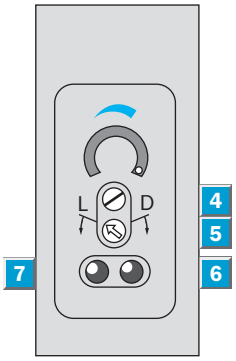
Excess Gain



1	Sensing range on white, 90% remission
2	Sensing range on gray, 18% remission
3	Sensing range on black, 6% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 4-pin or connection cable
4	Sensitivity adjustment
5	Light/dark rotary switch: L = light switching D = dark switching
6	Orange LED indicator (Status output)
7	Green LED signal strength indicator

Order Information

Type	Part no.
WT 160-F172	6 022 815
WT 160-F470	6 022 820
WT 160-E172	6 022 807
WT 160-E470	6 022 812
WT 160-F182	6 022 817
WT 160-F480	6 022 822
WT 160-E182	6 022 809
WT 160-E480	6 022 814

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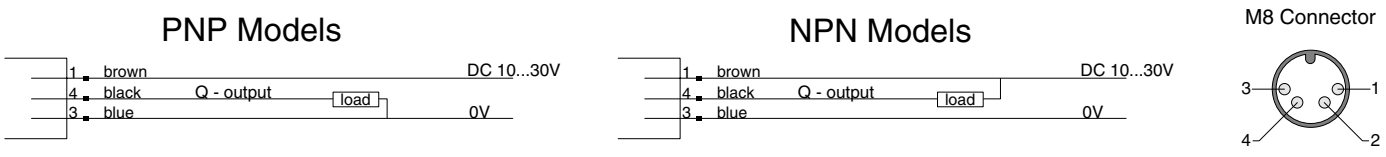
Mounting brackets*	919

* included with delivery

Technical Data	WT 160-	F172	F470	E172	E470	F182	F480	E182	E480
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Sensing range	0...35.4 in (0...900 mm)[1]	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[2], light type	LED, red light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 3.5 in at 19.7 in (90 mm at 500 mm)	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 4.8°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■	■	■	■	■
Ripple[4]	± 10%	■	■	■	■	■	■	■	■
Current consumption[5]	≤ 25 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via wire	■	■	■	■	■	■	■	■
Response time[6] / Max. switching freq.[7]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 5 x 0.2 mm², Ø 4.2 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Available in Plug, M8 3-pin upon request	■	■	■	■	■	■	■	■
VDE protection class[10]	⧈	■	■	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6								
		■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■		■		■		■	
Approximate weight	2.1 oz (60 g)		■		■		■		■
	0.7 oz (20 g)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS								

1) Sensed material with 90% remission (based on standard white according to DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) TE not with plug model
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

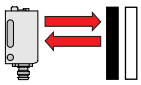
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

WTB 160T 50 mm

Proximity/Diffuse Sensors-Background Suppression



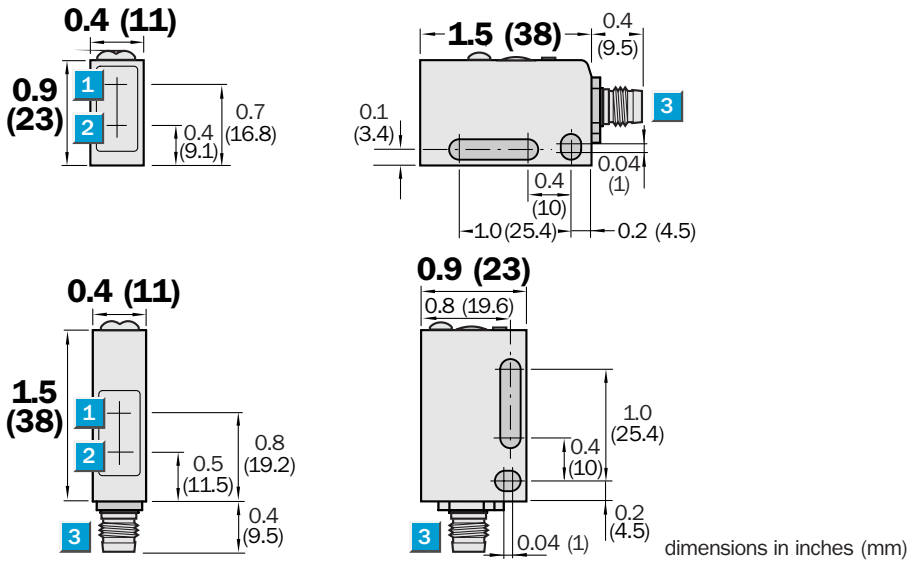

0.6...2.0 in (15...50 mm)
sensing range

Highlights

- Additional Teach-in mode for shiny and structured surfaces
- Small, compact housing
- Signal strength indicator
- Easy mounting with included bracket
- Cable or quick disconnect versions available

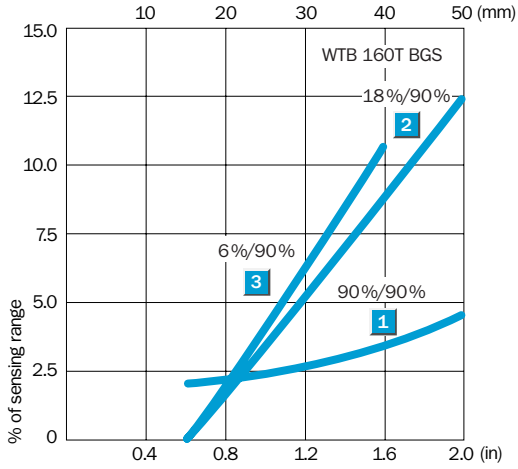
WTB 160T

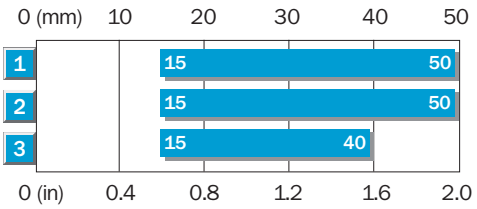
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

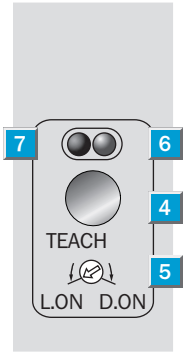




1	Sensing range on white, 90% reflectance
2	Sensing range on gray, 18% reflectance
3	Sensing range on black, 6% reflectance

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 3-pin/4-pin or connection cable
4	Teach-in button
5	Light/dark rotary switch: L = light switching, D = dark switching
6	Output indicator, orange
7	Signal strength indicator, green

Order Information

Type	Order no.
WTB 160T-P212	6 020 895
WTB 160T-P311	6 021 318
WTB 160T-P412	6 020 991
WTB 160T-N212	6 020 894
WTB 160T-N311	6 021 319
WTB 160T-N412	6 020 947
WTB 160T-F212	6 020 952
WTB 160T-F311	6 021 316
WTB 160T-F412	6 021 158
WTB 160T-E212	6 020 951
WTB 160T-E311	6 021 317
WTB 160T-E412	6 021 157

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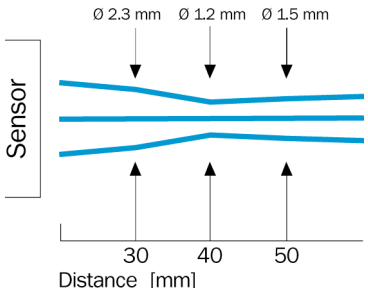
Technical Data	WTB 160T-	P[1]/F[2] 212	P[1]/F[2] 311	P[1]/F[2] 412	N[1]/E[2] 212	N[1]/E[2] 311	N[1]/E[2] 412
Sensing range	0.6...2.0 in (15...50 mm)[3]	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[4]	LED, red light	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[5]	■	■	■	■	■	■
Ripple[6]	± 10 %	■	■	■	■	■	■
Current consumption[7]	≤ 40 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[8]/switching freq. max.[9]	≤ 0.7 ms / 550 Hz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10]; 4 x 0.2 mm², Ø 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class	⧫	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

1) Housing form: horizontal
2) Housing form: vertical
3) Object with 90% reflectance (with reference to standard white according to DIN 5033)
4) Average service life 100,000 h at $T_U = 25°C$
5) Limit values
6) Must be within V_S tolerances
7) Without load
8) With resistive load
9) With light/dark ratio 1:1
10) 5 m are available on request, do not bend cable below 0°C
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Light Spot Diameter WTB 160T



Teach-in

A) 1-Point Teach-in: This method allows the target to activate the sensor from the minimum sensing range to the the background, but excludes the background. Activate teach-in via the teach-in button or the control wire (ET) until the yellow and green LEDs light once. Teach-in without background: sensor has maximum sensitivity.

B) 2-Point Teach-in: This method allows an object to activate the sensor within a targeted sensing location. Position the object. Activate teach-in via the Teach-in button or the control wire (ET) until the yellow and green LEDs light twice and immediately release. Move the object toward the background. Activate Teach-in via the Teach-in button or control wire (ET) by depressing and releasing until the yellow and green LEDs light twice. The sensitivity is aligned in the center of the two Teach-in points.

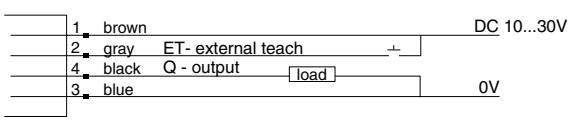
C) 3-Point Teach-in: (Position Teach-in) This method allows the object to activate the sensor from the minimum sensing range to the background and allows visual monitoring of the product via the green LED on the sensor. Position the object. Activate Teach-in via the Teach-in button or the control wire (ET) until the yellow and green LEDs light three times.

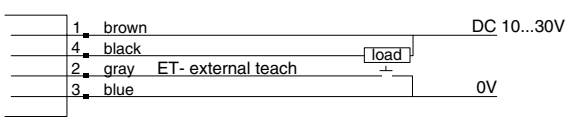
WTB 160T-xxx3x models only:

D) 4-point Teach-In: (FGS teach-in) This method allows the object to activate the sensor from the minimum sensing range to a close proximity of the background, based on the product sensitivity (see sensing distance curves) and allows visual monitoring of the product via the green LED on the sensor. Activate Teach-in via the teach-in button or control wire (ET) until the yellow and green LEDs light four times.

Ref. 3 & 4 point Teach-in: Monitoring object detection: place object in the light beam; the signal strength indicator (green LED) must light. If it does not light, readjust and/or clean the sensor and repeat the teach-in procedure. It must switch off again after the object has been removed. If this does not occur, repeat the teach-in procedure until the switching threshold is set correctly.

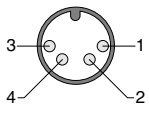
Connection Diagram



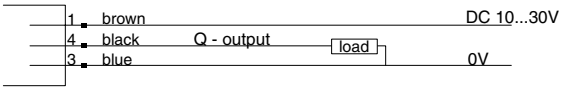


wire colors refer to standard cable, not included with quick disconnect models

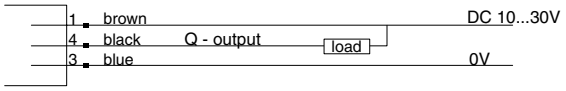
M8 Connector



PNP Models

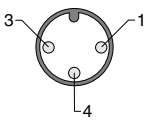


NPN Models



wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



SICK

WTB 160T 150 mm

Proximity/Diffuse Sensors-Background Suppression

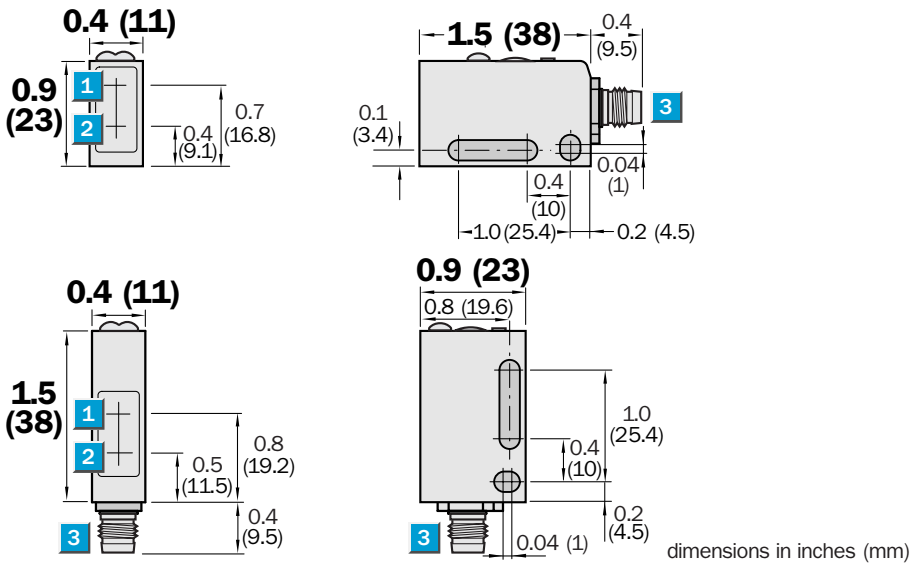
2.0...5.9 in (50...150 mm)
sensing range

Highlights

- Large sensing range (150 mm)
- Additional Teach-in mode for shiny and structured surfaces
- LED indicator: function reserve
- Small compact housing
- Signal strength indicator
- Cable or quick disconnect versions available
- Easy mounting with included bracket

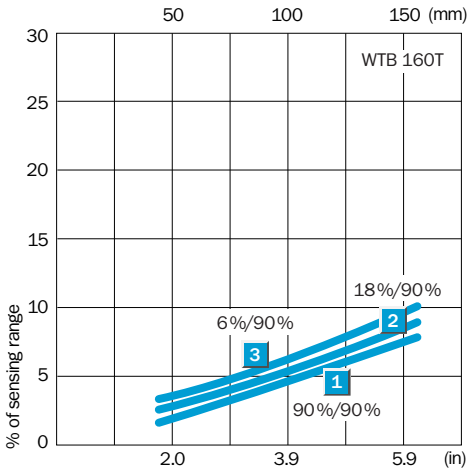
WTB 160T

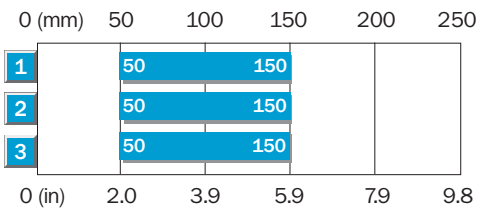
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

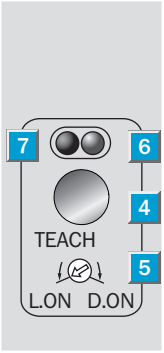




1	Sensing range on white, 6% reflectance
2	Sensing range on gray, 18% reflectance
3	Sensing range on black, 90% reflectance

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 3-pin/4-pin or cable
4	Teach-in button
5	Light/dark rotary switch: L = light switching, D = dark switching
6	Output indicator, orange
7	Signal strength indicator, green

Order Information

Type	Part no.
WTB 160T-P232	6 021 868
WTB 160T-P331	6 021 867
WTB 160T-P432	6 021 870
WTB 160T-N232	6 021 872
WTB 160T-N331	6 021 871
WTB 160T-N432	6 021 874
WTB 160T-F232	6 021 860
WTB 160T-F331	6 021 859
WTB 160T-F432	6 021 862
WTB 160T-E232	6 021 864
WTB 160T-E331	6 021 863
WTB 160T-E432	6 021 866

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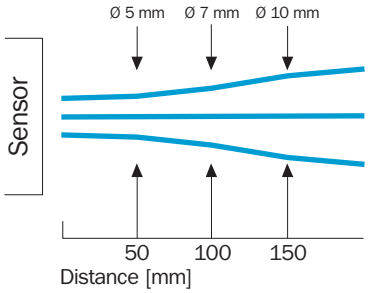
Technical Data	WTB 160T-	P[1]/F[2] 232	P[1]/F[2] 331	P[1]/F[2] 432	N[1]/E[2] 232	N[1]/E[2] 331	N[1]/E[2] 432
Sensing range	2.0...5.9 in (50 ... 150 mm)[3]	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[4]	LED, red light	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[5]	■	■	■	■	■	■
Ripple[6]	± 10 %	■	■	■	■	■	■
Current consumption[7]	≤ 45 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[8]/switching freq. max.[9]	≤ 2.5 ms / 200 Hz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10]; 4 x 0.2 mm², Ø 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class	⧫	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13 ...131°F (-25...55°C)	■	■	■	■	■	■
	Storage -40 ...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	21 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

1) Housing form: horizontal
2) Housing form: vertical
3) Object with 90% reflectance (with reference to standard white according to DIN 5033)
4) Average service life 100,000 h at T_U = +25 °C
5) Limit values
6) Must be within V_S tolerances
7) Without load
8) With resistive load
9) With light/dark ratio 1:1
10) 5 m are available on request, do not bend cable below 0 °C
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Light Spot Diameter WTB 160T



Teach-in

A) 1-Point Teach-in: This method allows the target to activate the sensor from the minimum sensing range to the the background, but excludes the background. Activate teach-in via the teach-in button or the control wire (ET) until the yellow and green LEDs light once. Teach-in without background: sensor has maximum sensitivity.

B) 2-Point Teach-in: This method allows an object to activate the sensor within a targeted sensing location. Position the object. Activate teach-in via the Teach-in button or the control wire (ET) until the yellow and green LEDs light twice and immediately release. Move the object toward the background. Activate Teach-in via the Teach-in button or control wire (ET) by depressing and releasing until the yellow and green LEDs light twice. The sensitivity is aligned in the center of the two Teach-in points.

C) 3-Point Teach-in: (Position Teach-in) This method allows the object to activate the sensor from the minimum sensing range to the background and allows visual monitoring of the product via the green LED on the sensor. Position the object. Activate Teach-in via the Teach-in button or the control wire (ET) until the yellow and green LEDs light three times.

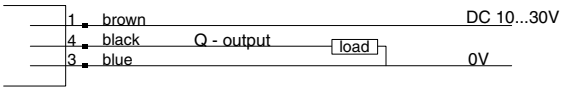
WTB 160T-xxx3x models only:

D) 4-point Teach-In: (FGS teach-in) This method allows the object to activate the sensor from the minimum sensing range to a close proximity of the background, based on the product sensitivity (see sensing distance curves) and allows visual monitoring of the product via the green LED on the sensor. Activate Teach-in via the teach-in button or control wire (ET) until the yellow and green LEDs light four times.

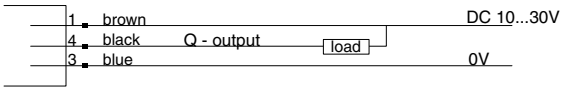
Ref. 3 & 4 point Teach-in: Monitoring object detection: place object in the light beam; the signal strength indicator (green LED) must light. If it does not light, readjust and/or clean the sensor and repeat the teach-in procedure. It must switch off again after the object has been removed. If this does not occur, repeat the teach-in procedure until the switching threshold is set correctly.

Connection Diagram

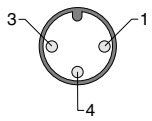
PNP Models



NPN Models

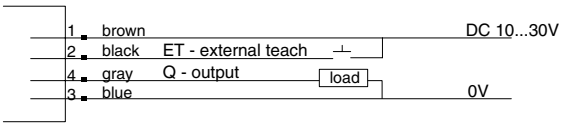


M8 Connector

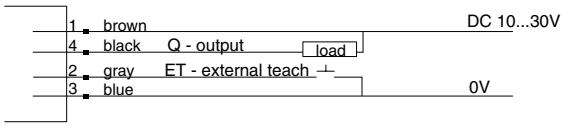


wire colors refer to standard cable, not included with quick disconnect models.

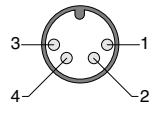
PNP Models



NPN Models



M8 Connector

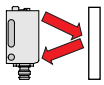


wire colors refer to standard cable, not included

SICK

WTF 160T

Proximity/Diffuse Sensors-Fixed Focus



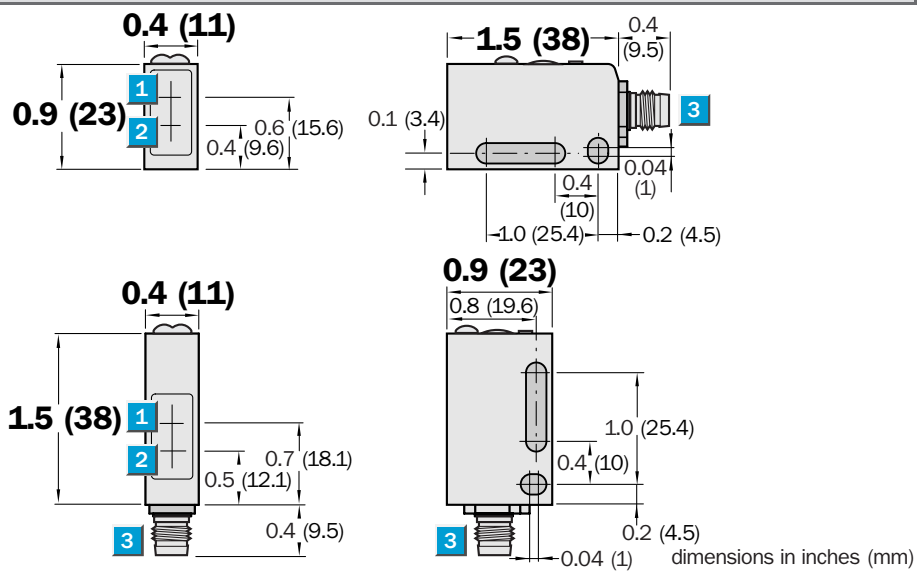

0.2...3.9 in (5...100 mm)
sensing range

Highlights

- Detects small objects and contrast differences at a long range (100 mm)
- Signal strength indicator
- Small, compact housing
- Easy mounting with included brackets

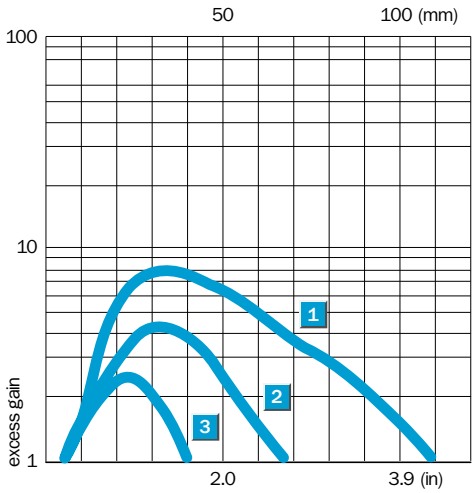
WTF 160T

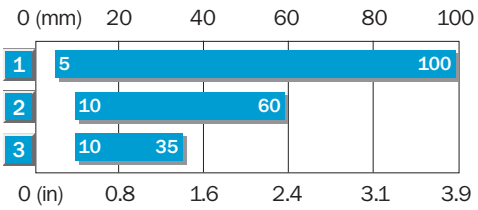
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

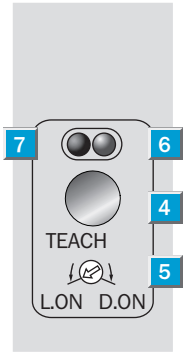




1	Sensing range on white, 90% reflectance
2	Sensing range on gray, 18% reflectance
3	Sensing range on black, 6% reflectance

Adjustments

All types



1	Center optical axis, receiver
2	Center optical axis, sender
3	Plug, M8 3-pin/4-pin or cable
4	Teach-in button
5	Light/dark rotary switch: L = light switching, D = dark switching
6	Output indicator, orange
7	Signal strength indicator, green

Order Information

Type	Order no.
WTF 160T-P212	6 021 135
WTF 160T-P311	6 020 942
WTF 160T-P412	6 021 237
WTF 160T-N212	6 021 286
WTF 160T-N311	6 021 272
WTF 160T-N412	6 021 290
WTF 160T-F212	6 021 708
WTF 160T-F311	6 021 700
WTF 160T-F412	6 021 722
WTF 160T-E212	6 020 411
WTF 160T-E311	6 020 391
WTF 160T-E412	6 020 934

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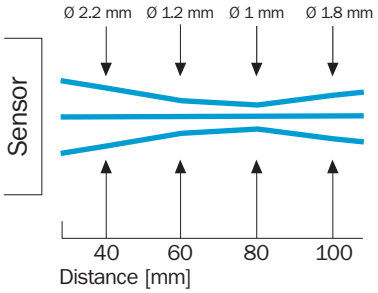
Cables and connectors	908
Mounting brackets	919

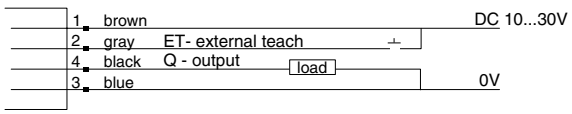
Technical Data	WTF 160T-	P[1]/F[2] 212	P[1]/F[2] 311	P[1]/F[2] 412	N[1]/E[2] 212	N[1]/E[2] 311	N[1]/E[2] 412
Sensing range	0.2...3.9 in (5...100 mm)[3]	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[4]	LED, red light	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[5]	■	■	■	■	■	■
Ripple[6]	± 10%	■	■	■	■	■	■
Current consumption[7]	≤ 40 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[8]/switching freq. max.[9]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10]; 4 x 0.2 mm², Ø 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class	⧫	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

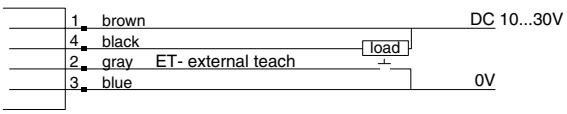
1) Housing form: horizontal
2) Housing form: vertical
3) Object with 90% reflectance (with reference to standard white according to DIN 5033)
4) Average service life 100,000 h at $T_U = 25°C$
5) Limit values
6) Must be within V_S tolerances
7) Without load
8) With resistive load
9) With light/dark ratio 1:1
10) 5 m are available on request, do not bend cable below 0°C
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Light Spot Diameter WTF 160T

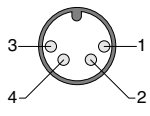


Connection Diagram



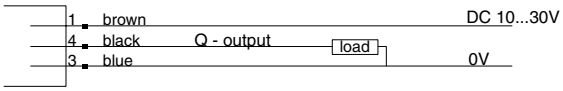


M8 Connector

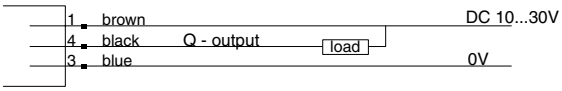


wire colors refer to standard cable, not included with quick disconnect models

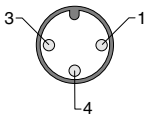
PNP Models



NPN Models



M8 Connector

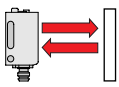


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WTE 160T Red

Proximity/Diffuse Sensors-Energetic



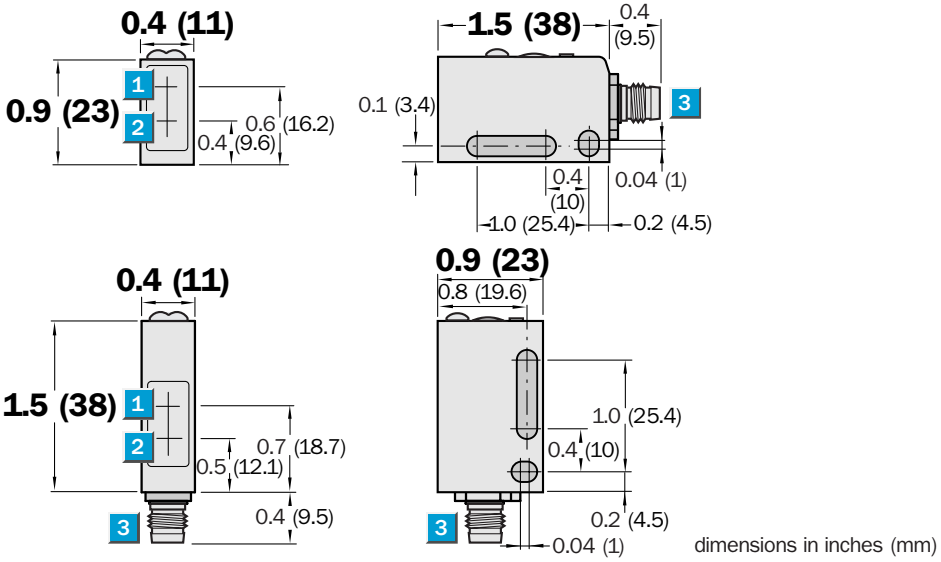

0...27.6 in (0...700 mm)
sensing range

Highlights

- Small, compact housing
- Signal strength indicator
- Cable or quick disconnect versions available
- Easy mounting with included bracket

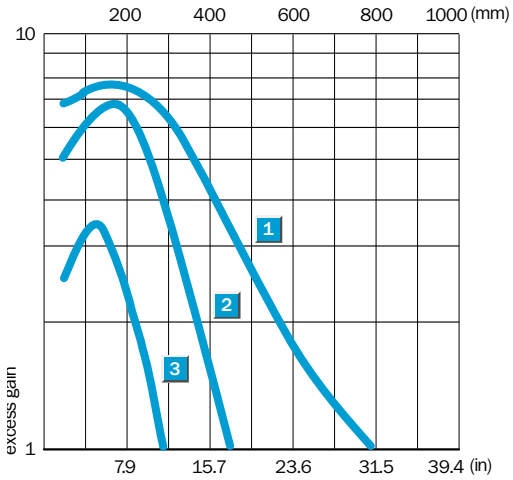
WTE 160T

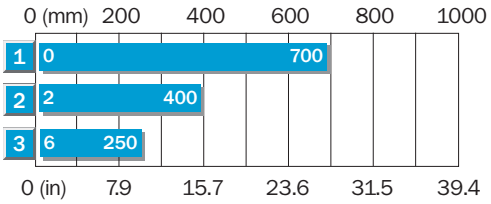
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

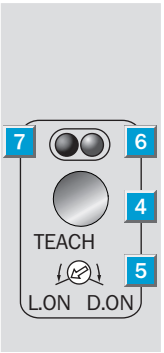




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 3-pin/4-pin or cable
4	Teach-in button
5	Light/dark rotary switch: L = light switching, D = dark switching
6	Output indicator, orange
7	Signal strength indicator, green

Order Information

Type	Part no.
WTE 160T-P232	6 021 884
WTE 160T-P331	6 021 883
WTE 160T-P432	6 021 886
WTE 160T-N232	6 021 888
WTE 160T-N331	6 021 887
WTE 160T-N432	6 021 890
WTE 160T-F232	6 021 876
WTE 160T-F331	6 021 875
WTE 160T-F432	6 021 878
WTE 160T-E232	6 021 880
WTE 160T-E331	6 021 879
WTE 160T-E432	6 021 882

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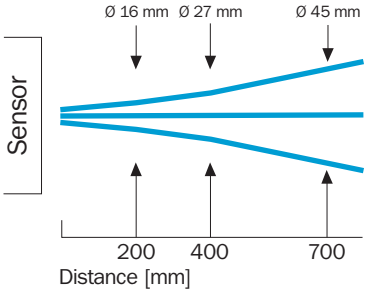
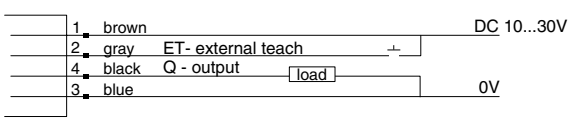
Technical Data	WTE 160T-	P[1]/F[2] 232	P[1]/F[2] 331	P[1]/F[2] 432	N[1]/E[2] 232	N[1]/E[2] 331	N[1]/E[2] 432
Sensing range	0...27.6 in (0...700 mm)[3]	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[4]	LED, red light	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[5]	■	■	■	■	■	■
Ripple[6]	± 10%	■	■	■	■	■	■
Current consumption[7]	≤ 40 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[8]/switching freq. max.[9]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10]; 4 x 0.2 mm², Ø 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class	⧫	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

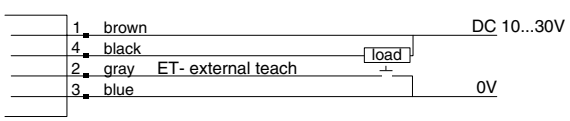
1) Housing form: horizontal
2) Housing form: vertical
3) Object with 90% reflectance (with reference to standard white according to DIN 5033)
4) Average service life 100,000 h at T_U = 25°C
5) Limit values
6) Must be within V_S tolerances
7) Without load
8) With resistive load
9) With light/dark ratio 1:1
10) 5 m are available on request, do not bend cable below 0°C
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Light Spot Diameter WTE 160T R

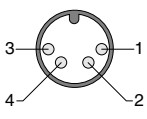


Connection Diagram



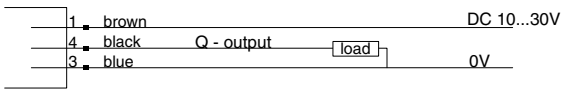


M8 Connector

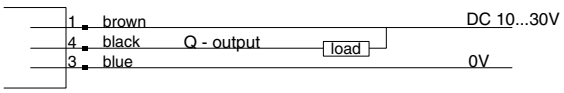


wire colors refer to standard cable, not included with quick disconnect models

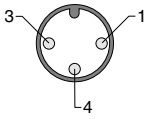
PNP Models



NPN Models



M8 Connector

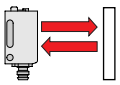


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WTE 160T IR

Proximity/Diffuse Sensors-Energetic



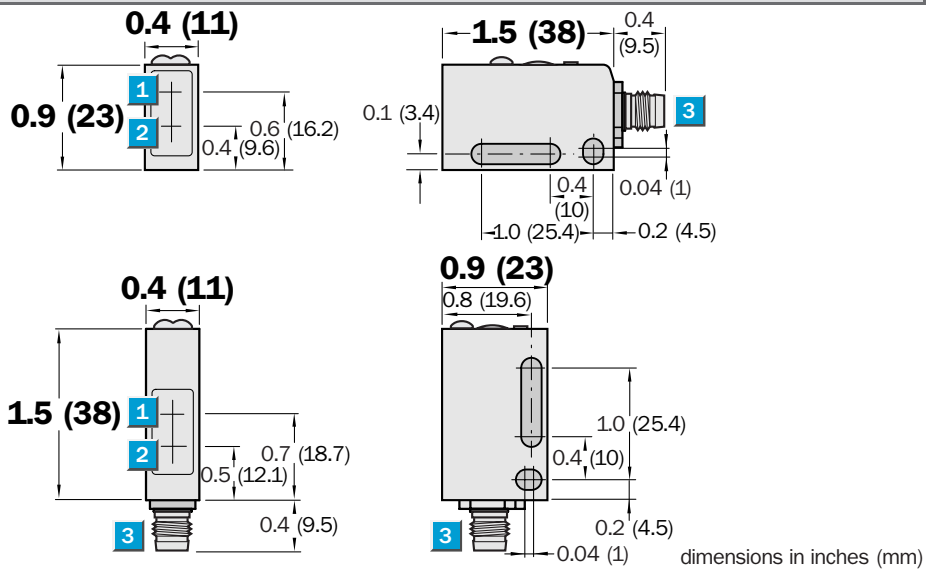

0...3.3 ft (0...1 m)
sensing range

Highlights

- Small, compact housing
- Signal strength indicator
- Cable or quick disconnect versions available
- Easy mounting with included brackets

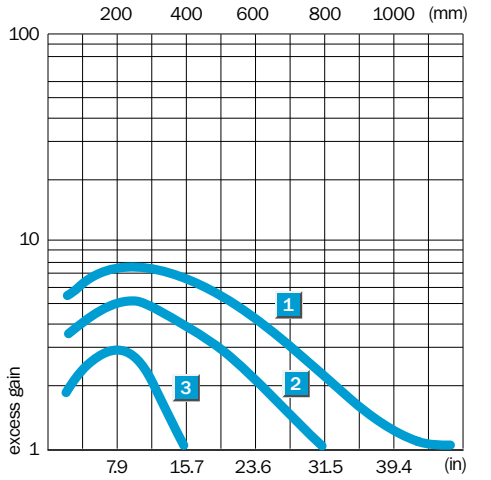
WTE 160T

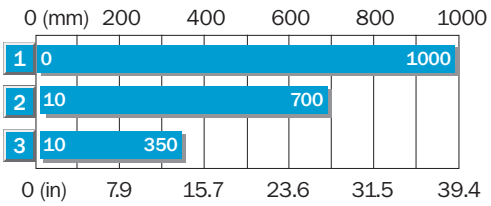
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

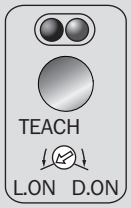




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, M8 3-pin/4-pin or cable
4	Teach-in button
5	Light/dark rotary switch: L = light switching, D = dark switching
6	Output indicator, orange
7	Signal strength indicator, green

Order Information

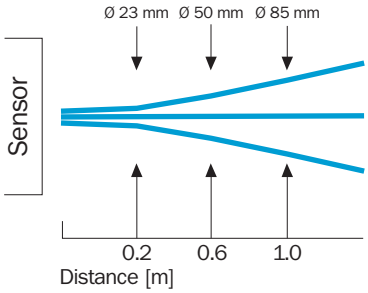
Type	Part no.
WTE 160T-P262	6 021 900
WTE 160T-P361	6 021 899
WTE 160T-P462	6 021 902
WTE 160T-N262	6 021 904
WTE 160T-N361	6 021 903
WTE 160T-N462	6 021 906
WTE 160T-F262	6 021 892
WTE 160T-F361	6 021 891
WTE 160T-F462	6 021 894
WTE 160T-E262	6 021 896
WTE 160T-E361	6 021 895
WTE 160T-E462	6 021 898

Accessories	page
Cables and connectors	908
Mounting brackets	919

Technical Data	WTE 160T-	P[1]/F[2] 262	P[1]/F[2] 361	P[1]/F[2] 462	N[1]/E[2] 262	N[1]/E[2] 361	N[1]/E[2] 462
Sensing range	0...3.3 ft (0...1 m)[3]	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[4], light type	LED, infrared light	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[5]	■	■	■	■	■	■
Ripple[6]	± 10%	■	■	■	■	■	■
Current consumption[7]	≤ 40 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[8]/switching freq. max.[9]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[10]; 4 x 0.2 mm², Ø 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class	⧫	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

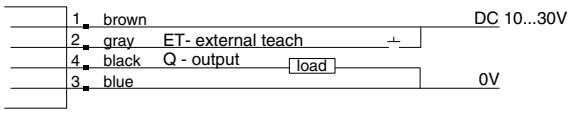
1) Housing form: horizontal
2) Housing form: vertical
3) Object with 90% reflectance (with reference to standard white according to DIN 5033)
4) Average service life 100,000 h at T_U = 25°C
5) Limit values
6) Must be within V_S tolerances
7) Without load
8) With resistive load
9) With light/dark ratio 1:1
10) 5 m are available on request, do not bend cable below 0°C
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Light Spot Diameter WTE 160T IR

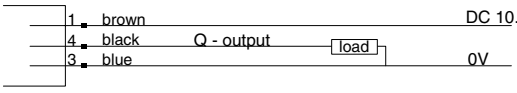


Connection Diagram

PNP Models

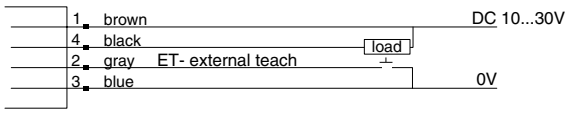


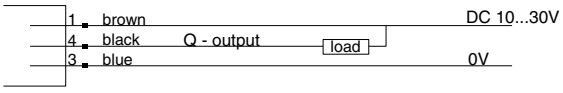
wire colors refer to standard cable, not included with quick disconnect models



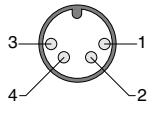
wire colors refer to standard cable, not included with quick disconnect models.

NPN Models

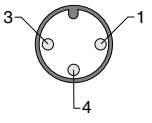




M8 Connector



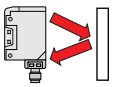
M8 Connector



SICK

WT 170

Proximity/Diffuse Sensors-Fixed Focus

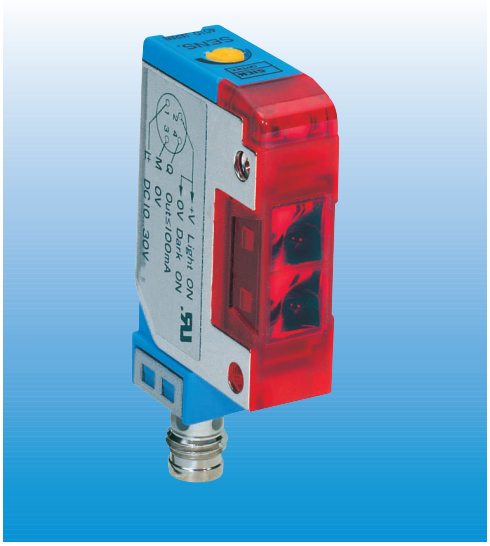



0.4...3.9 in (10...100 mm)
sensing range

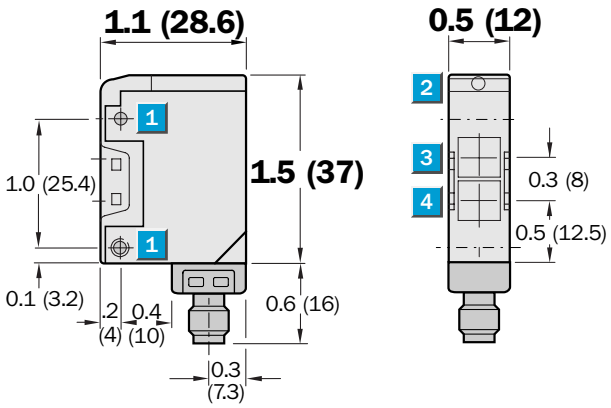
Highlights

- Rugged stainless steel and plastic housing
- Signal strength indicator
- Visible red light for easy alignment
- Adjustable sensing range
- Crosstalk immunity
- Easy mounting with included bracket
- Cable or M8 quick disconnect versions

WT 170

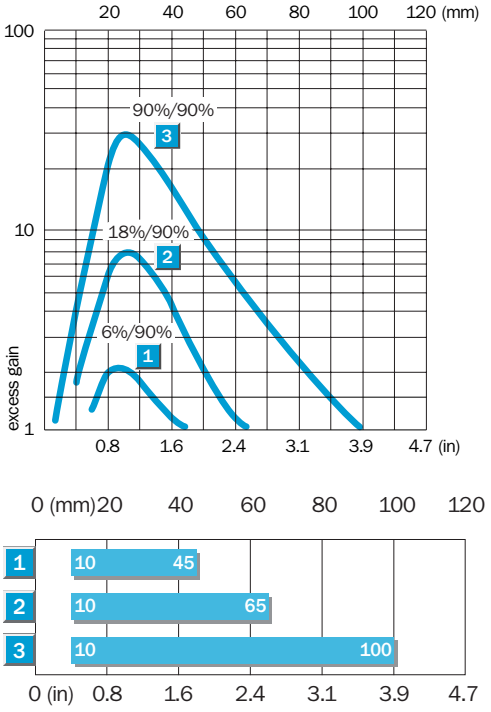


Dimensional Drawing



dimensions in inches (mm)

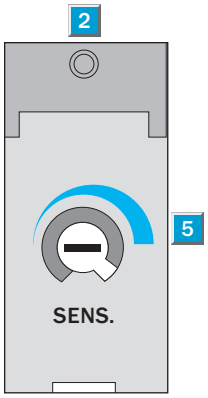
Excess Gain



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Mounting holes Ø 3 mm M3 thread
2	LED signal strength indicator, red: light received ≥ switching threshold
3	Center of optical axis, receiver
4	Center of optical axis, sender
5	Sensitivity control (potentiometer, 270°)

Order Information

Type	Part no.
WT 170-P112	6 010 193
WT 170-P410	6 010 194
WT 170-N112	6 010 195
WT 170-N410	6 010 196

Accessories	page
Cables and connectors	908
Mounting brackets*	919

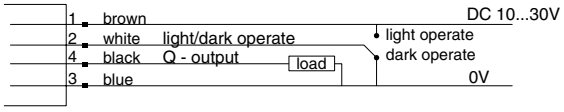
* included with delivery

Technical Data	WT 170-	P112	P410	N112	N410
Sensing range, adjustable	0.4...3.9 in (10...100 mm)[1]	■	■	■	■
Background suppression	From approx. 4.7 in (120 mm),	■	■	■	■
	Background, 90% remission				
Sensitivity	Potentiometer, 270° (adjustable)	■	■	■	■
Light source[2], light type	LED, visible red light	■	■	■	■
Light spot size	Approx. 0.1 in at 1.6 in (3.5 mm at 40 mm)	■	■	■	■
Angle of divergence, sender	Focused, focal point 1.6 in (40 mm)	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■
Ripple[4]	± 10%	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switch. via L/D control cable	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 0.7 ms	■	■	■	■
Max. switching frequency[7]	700 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8]; 4 x 0.18 mm², Ø 3.8 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[9]	⧈	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	0.9 oz (25 g)	■		■	
	2.3 oz (66 g)		■		■
Housing material	Stainless steel/glass fiber reinforced ABS	■	■	■	■

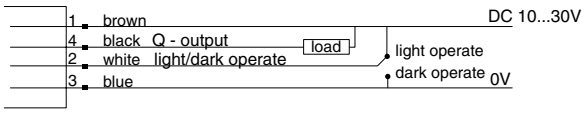
1) Object with 90% remission (based on standard white to DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

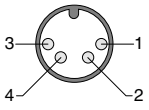
PNP Models



NPN Models



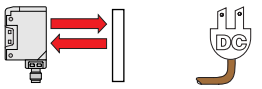
M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

WT 170

Proximity/Diffuse Sensors-Energetic

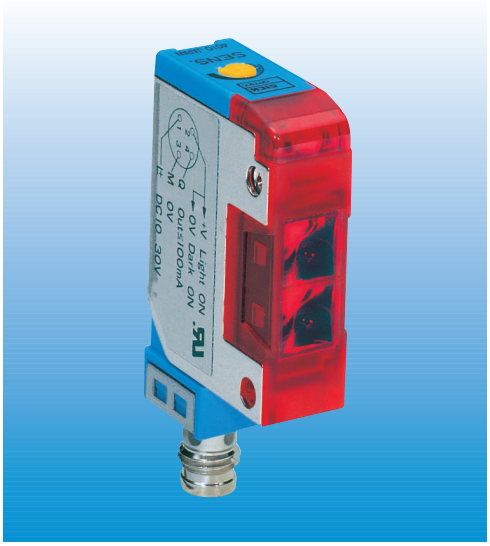


0.4...21.7 in (10...550 mm)
sensing range

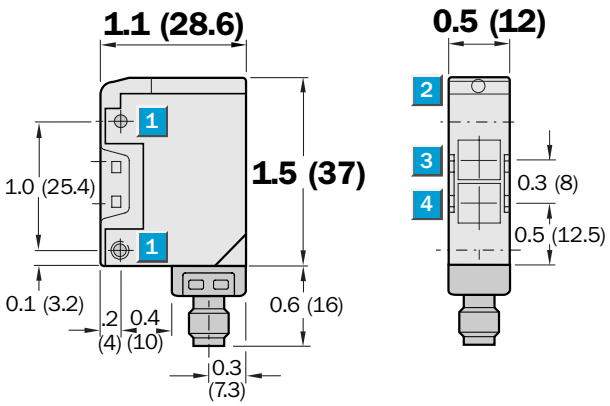
Highlights

- Rugged stainless steel/plastic housing
- Adjustable sensitivity
- Red light for easy alignment
- Cable or M8 quick disconnect versions
- Easy mounting with included bracket

WT 170

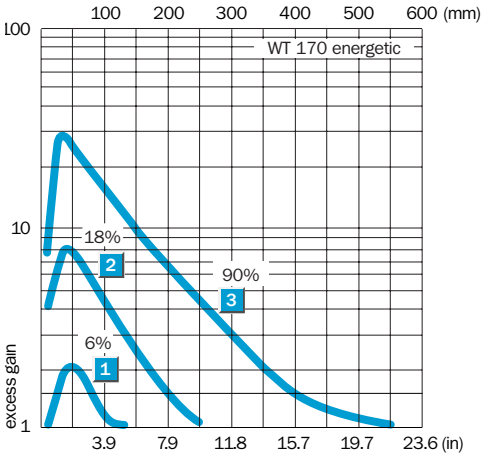


Dimensional Drawing



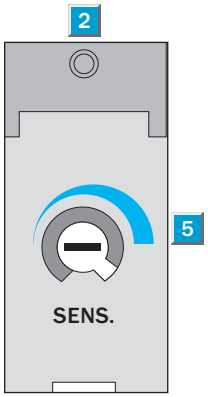
dimensions in inches (mm)

Excess Gain

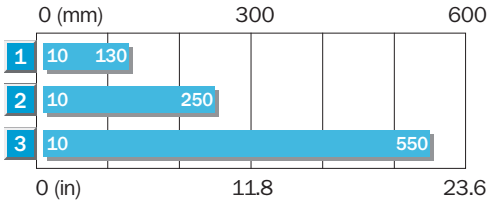


Adjustments

All types



1 Mounting holes Ø 3 mm with integrated M3 thread
2 LED signal strength indicator:
light received ≥ switching threshold
3 Center of optical axis, receiver
4 Center of optical axis, sender
5 Sensitivity control (potentiometer, 270°)



1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

Order Information

Type	Part no.
WT 170-P132	6 010 197
WT 170-P430	6 010 198
WT 170-N132	6 010 199
WT 170-N430	6 010 200

Accessories	page
Cables and connectors	908
Mounting brackets*	919

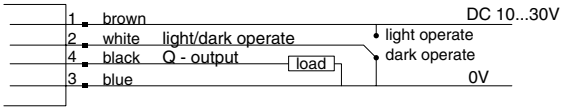
* included with delivery

Technical Data	WT 170-	P132	P430	N132	N430
Sensing range	0.4...21.7 in (10...550 mm)[1]	■	■	■	■
Sensitivity	Adjustable, 2 turns with scaling 270°	■	■	■	■
Light source[2], light type	LED, visible red light	■	■	■	■
Light spot size	Approx. 1.6 in at 15.7 in (40 mm at 400 mm)	■	■	■	■
Angle of divergence	Approx. 5°	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■
Ripple[4]	± 10%	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via wire	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 0.7 ms	■	■	■	■
Max. switching frequency[7]	700 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8]; 4 x 0.18 mm², Ø 3.8 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[9]	⧈	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67 /NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	0.7 oz (25 g)	■		■	
	2.3 oz (66 g)		■		■
Housing material	Stainless steel/glass fiber reinforced ABS;	■	■	■	■

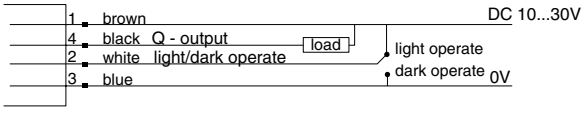
1) Object with 90% remission (based on standard white to DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

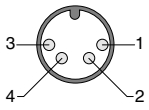
PNP Models



NPN Models



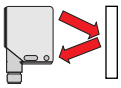
M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

WT 12-2

Proximity/Diffuse Sensors-Fixed Focus



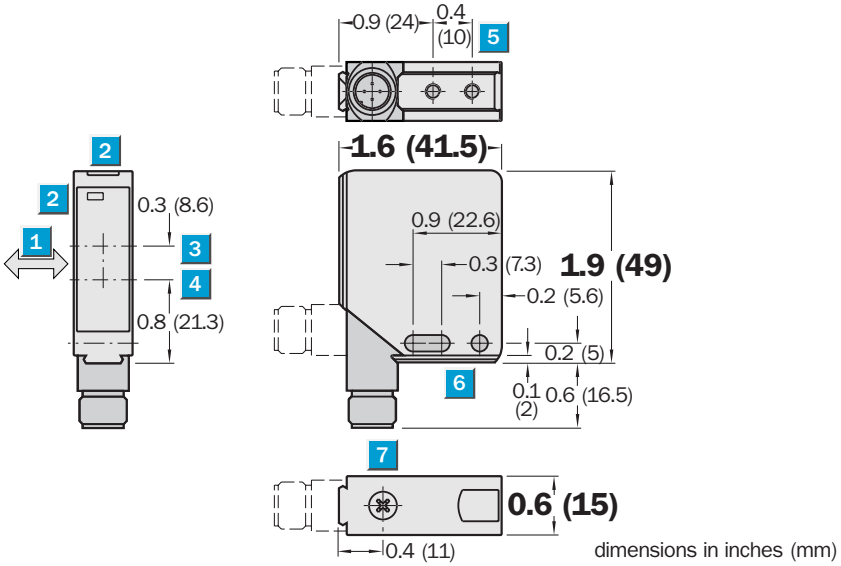

3.5 in ±0.4 in (90 mm ±10 mm)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Fast response time
- Focused light spot allows for long-range contrast sensing
- PNP and NPN in the same switch
- Outputs short circuit protected
- Power supply reverse polarity protected

WT 12-2

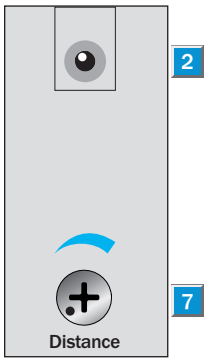
Dimensional Drawing



dimensions in inches (mm)

Adjustments

WT 12-2B523



1 Standard direction of the material being sensed
2 LED signal strength indicator
3 Center of optical axis, receiver
4 Center of optical axis, sender
5 M4 threaded mounting hole – 4 mm deep
6 Mounting holes Ø 4.2 mm
7 Sensing distance adjustment

Order Information

Type	Part no.
WT 12-2B523	1 016 111

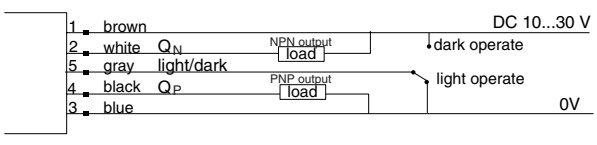
Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921

* 2 pieces included with delivery

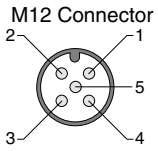
Technical Data	WT 12-2-	B523
Sensing range, adjustable	3.5 in ±0.4 in (90 mm ±10 mm)	
Light source[2], **light type**	LED, red light	
Light spot diameter	0.12 in at 3.2 in (3 mm at 80 mm)	
Supply voltage V_S	10...30 V DC[3]	
Ripple[4]	≤ 5 V_S	
Current consumption[5]	≤ 25 mA	
Switching outputs	PNP or NPN	
Output voltage HIGH	PNP: V_S (≤2.9 V); NPN: V_S	
Output voltage LOW	PNP: 0; NPN ≤ 1.5 V	
Max. output current I_A	100 mA	
Switching mode[6]	Light or dark switching via wire	
Response time[7]	≤ 330µs	
Max. switching frequency[8]	1.5 kHz	
Connection type	Plug, M12 5-pin	
VDE protection class[10]		
Circuit protection[11]	A, B, C	
Enclosure rating	IP 67/NEMA 6	
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	
	Storage -40...167°F (-40...75°C)	
Approximate weight	4.2 oz (120 g)	
Housing material	Die cast zinc	

1) Object with 90% remission (based on standard white to DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

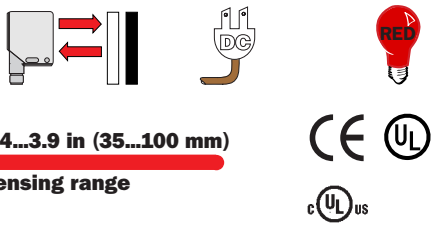


wire colors refer to standard cable, not included



WT 12-2

Proximity/Diffuse Sensors-Foreground Suppression



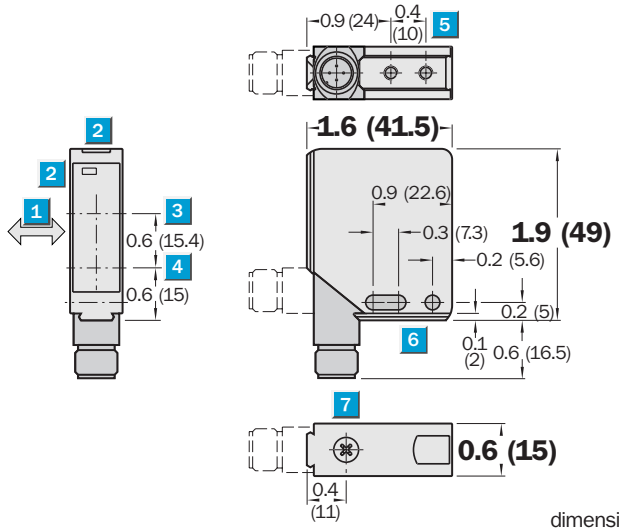
1.4...3.9 in (35...100 mm)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Insensitive to ambient light
- Signal strength indicator
- Crosstalk immunity
- Adjustable foreground suppression and sensing range
- Cable connections swivel 90° for easy installation

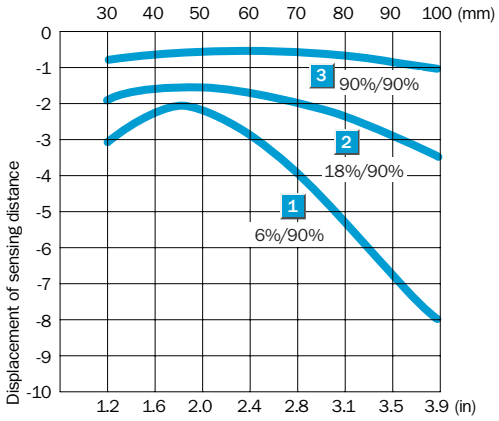
WT 12-2

Dimensional Drawing



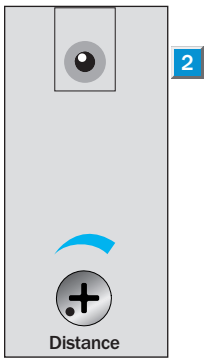
dimensions in inches (mm)

Foreground Suppression



Adjustments

All types



1 Standard direction of the material being sensed
2 LED signal strength indicator
3 Center of optical axis, receiver
4 Center of optical axis, sender
5 M4 threaded mounting hole – 4 mm deep
6 Mounting holes Ø 4.2 mm
7 Sensing range adjustment

Order Information

Type	Part no.
WT 12-2P440	1 016 150
WT 12-2P140	1 016 148
WT 12-2N440	1 016 146
WT 12-2N140	1 016 145

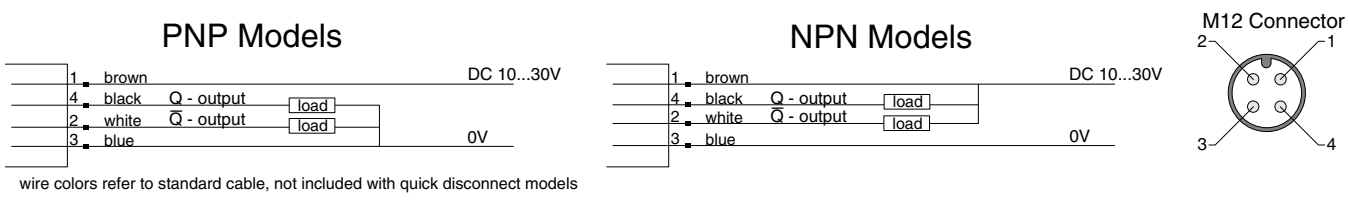
Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921

* 2 pieces included with delivery

Technical Data	WT 12-2-	P440	P140	N440	N140
Sensing range, adjustable	1.4...3.9 in (35...100 mm)	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■
Light spot size	0.1 x 0.1 in at 2.4 in (3 x 3 mm at 60 mm)	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■		
	≤ 40 mA			■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■		
	NPN, Q and $\overline{Q}$			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■
Max. switching frequency[6]	1500 Hz	■	■	■	■
Connection types	Cable[7], 2 m		■		■
	Plug, M12 4-pin	■		■	
VDE protection class[8]	⧈	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■		■	
	7.1 oz (200 g)		■		■
Housing material	Die cast zinc	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 12-2

Proximity/Diffuse Sensors-Background Rejection

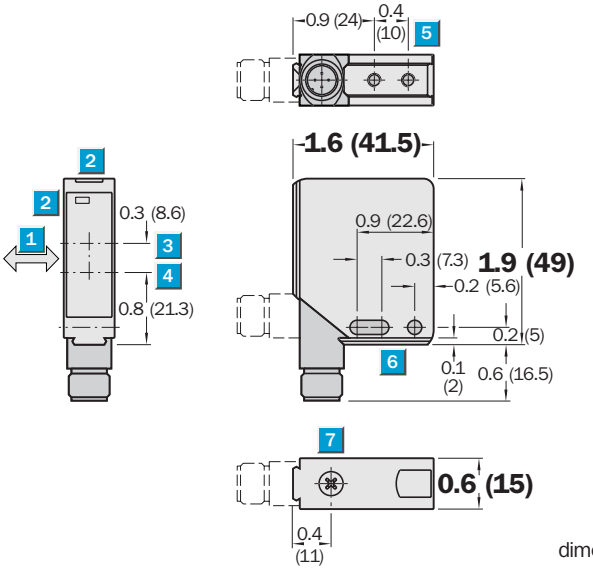
1.4...3.9 in (35...100 mm)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Ultra precise background rejection for demanding applications
- Signal strength indicator
- Crosstalk immunity
- Cable connections swivel 90° for easy installation

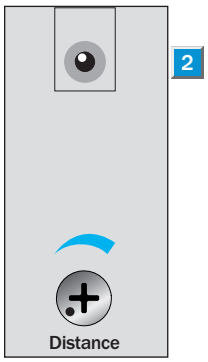
WT 12-2

Dimensional Drawing



dimensions in inches (mm)

Adjustments
WT 12-2-P460



1 Standard direction of the material being sensed
2 LED signal strength indicator
3 Center of optical axis, receiver
4 Center of optical axis, sender
5 M4 threaded mounting hole – 4 mm deep
6 Mounting holes Ø 4.2 mm
7 Sensing range adjustment

Order Information	
Type	**Part no.**
WT 12-2-P460	1 016 153

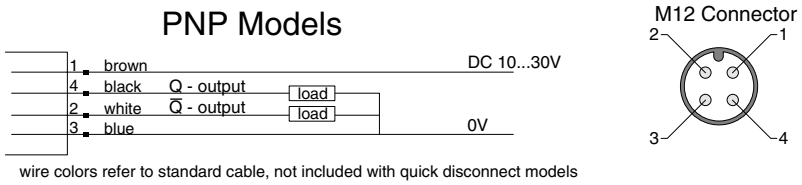
Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921

* 2 pieces included with delivery

Technical Data	WT 12-2-	P460
Sensing range, adjustable	1.4...3.9 in (35...100 mm)	
Background suppression	1.4...3.9 in (35...100 mm)	
Background suppression capability	% of set sensing distance (see previous page)	
Light source[1], **light type**	LED, red light	
Light spot diameter	0.08 in at 2.4 in (2 mm at 60 mm)	
Angle of divergence	1.9°	
Supply voltage V_S	10...30 V DC[2]	
Ripple[3]	≤ V_S	
Current consumption[4]	≤ 30 mA	
Switching outputs	PNP, Q and $\overline{Q}$	
Max. output current I_A	≤ 100 mA	
Switching mode[6]	Light or dark via complementary outputs	
Response time[5]	≤ 200 µs	
Max. switching frequency[6]	2.5 kHz	
Connection type	Plug, M12 4-pin	
VDE protection class[8]	□	
Circuit protection[9]	A, B, C	
Enclosure rating	IP 67/NEMA 6	
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	
	Storage -40...167°F (-40...75°C)	
Approximate weight	4.2 oz (120 g)	
Housing material	Die cast zinc	

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

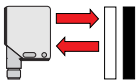
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WT 12-2

Proximity/Diffuse Sensors - Background Suppression



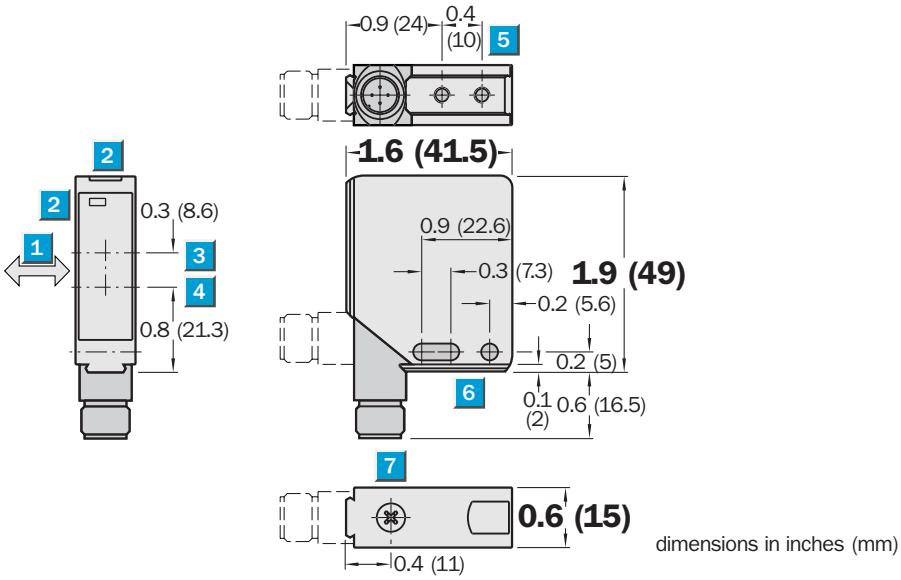

0.8...9.8 in (20...250 mm)
sensing range

Highlights

- Red light source for easy alignment
- Insensitive to ambient light
- M12 plug swivels 90° for easy installation
- Adjustable background suppression
- Rugged die cast metal housing
- Crosstalk immunity
- Signal strength indicator

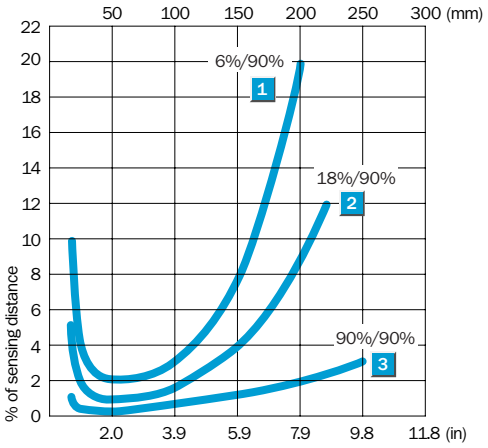
WT 12-2

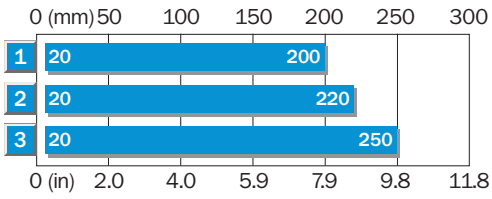
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

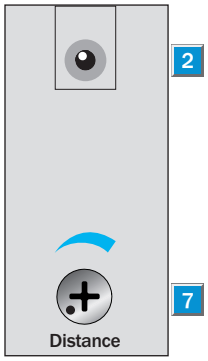




1	Sensing range on black, 6 % remission
2	Sensing range on grey, 18 % remission
3	Sensing range on white, 90 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Optical axis, receiver
4	Optical axis, sender
5	M4 threaded mounting hole – 4 mm deep
6	Mounting holes Ø 4.2 mm
7	Sensing range adjustment

Order Information

Type	Part no.
WT 12-2P430	1 016 134
WT 12-2P130	1 016 129
WT 12-2P830	1 016 130
WT 12-2N430	1 016 125
WT 12-2N130	1 016 122
WT 12-2N830	1 016 123

Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921

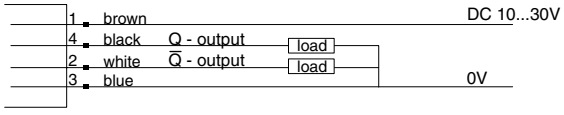
* 2 pieces included with delivery

Technical Data	WT 12-2-	P430	P130	P830	N430	N130	N830
Sensing range, adjustable	0.8...9.8 in (20...250 mm)	■	■	■	■	■	■
Background suppression	0.8...9.8 in (20...250 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■	■	■
Light spot diameter	0.4 in at 7.9 in (10 mm at 200 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■			
	≤ 40 mA				■	■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■			
	NPN, Q and $\overline{Q}$				■	■	■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■	■	■
Max. switching frequency[6]	1.5 kHz	■	■	■	■	■	■
Connection types	Cable[7], 2 m		■			■	
	Cable[7], 5 m			■			■
	Plug, M12 4-pin	■			■		
VDE protection class[8]	□	■	■		■	■	
	III			■			■
Circuit protection[9]	A, B, C	■	■		■	■	
	A, B, C, D			■			■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	4.2 oz (120 g)	■			■		
	7.1 oz (200 g)		■			■	
	9.9 oz (280 g)			■			■
Housing material	Die cast zinc	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) 2 m long, PVC, 5 mm Ø; do not bend below 0°C
8) Reference voltage 50 V DC; 250 V AC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

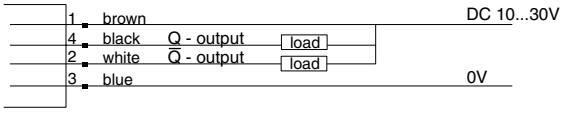
Connection Diagram

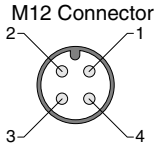
PNP Models



wire colors refer to standard cable, not included with quick disconnect models

NPN Models

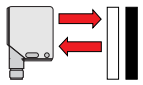




SICK

WT 12-2

Proximity/Diffuse Sensors - Background Suppression



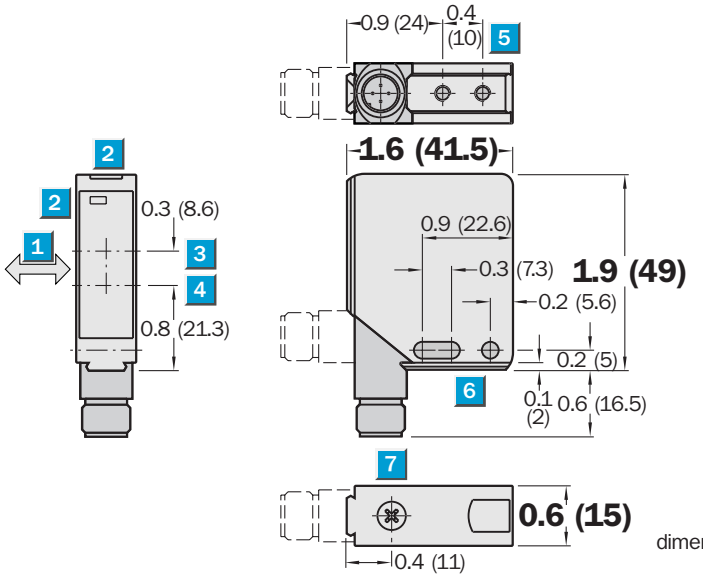

0.8...9.8 in (20...250 mm)
sensing range

Highlights

- Infrared light source
- Insensitive to ambient light
- M12 plug swivels 90° for easy installation
- Adjustable background suppression
- Rugged die cast metal housing
- Crosstalk immunity
- Signal strength indicator

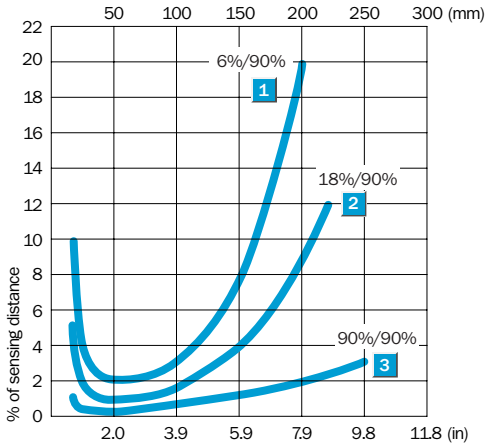
WT 12-2

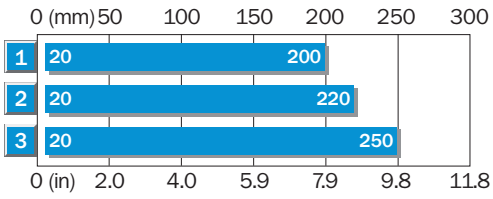
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

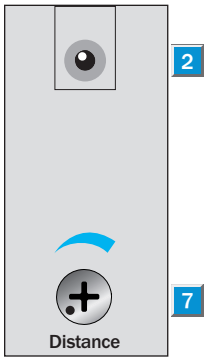




1	Sensing range on black, 6 % remission
2	Sensing range on grey, 18 % remission
3	Sensing range on white, 90 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Optical axis, receiver
4	Optical axis, sender
5	M4 threaded mounting hole – 4 mm deep
6	Mounting holes Ø 4.2 mm
7	Sensing range adjustment

Order Information

Type	Part no.
WT 12-2P410	1 016 131
WT 12-2P110	1 016 126
WT 12-2N410	1 016 124
WT 12-2N110	1 016 118

Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921

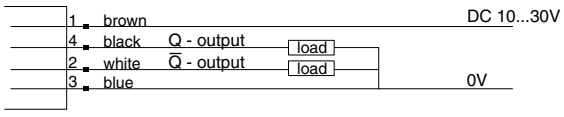
* 2 pieces included with delivery

Technical Data	WT 12-2-	P410	P110	N410	N110
Sensing range, adjustable	0.8...9.8 in (20...250 mm)	■	■	■	■
Background suppression	0.8...9.8 in (20...250 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■
Light spot diameter	0.4 in at 7.9 in (10 mm at 200 mm)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 40 mA	■	■		
	≤ 50 mA			■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■		
	NPN, Q and $\overline{Q}$			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■
Max. switching frequency[6]	1.5 kHz	■	■	■	■
Connection types	Cable[7], 2 m		■		■
	Plug, M12 4-pin	■		■	
VDE protection class[8]	□	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■		■	
	7.1 oz (200 g)		■		■
Housing material	Die cast zinc	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) 2 m long, PVC, 5 mm Ø; do not bend below 0°C
8) Reference voltage 50 V DC; 250 V AC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

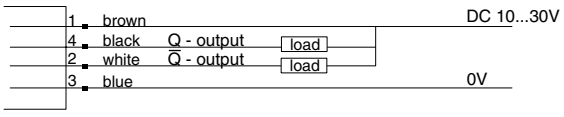
Connection Diagram

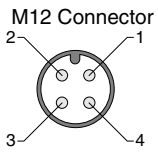
PNP Models



wire colors refer to standard cable, not included with quick disconnect models

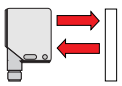
NPN Models





WT 12-2

Proximity/Diffuse Sensors-Energetic



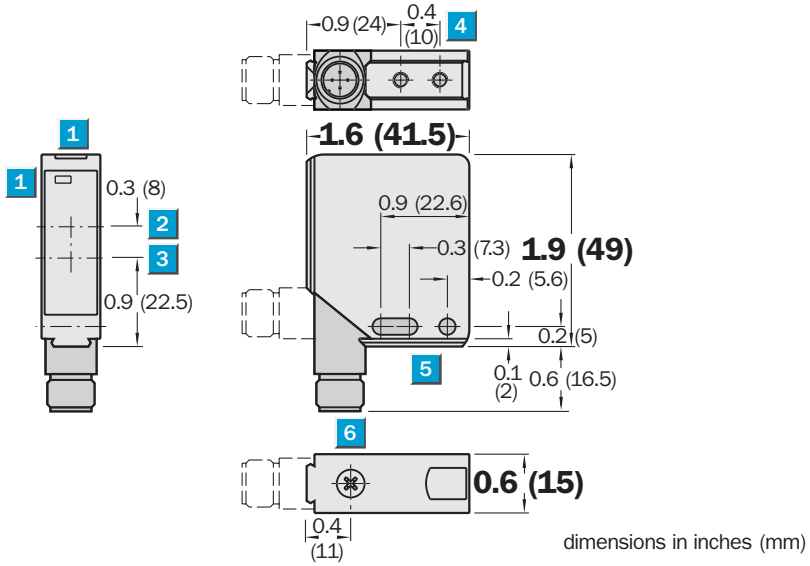

0.4...39.4 in (10...1000 mm)
sensing range

Highlights

- Rugged die cast metal housing
- Insensitive to ambient light
- Energetic proximity sensor with adjustable sensing range
- Crosstalk immunity
- Signal strength indicator
- Cable connections swivel 90° for easy installation

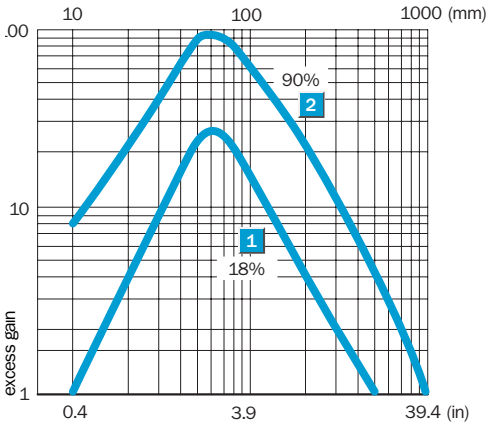
WT 12-2

Dimensional Drawing



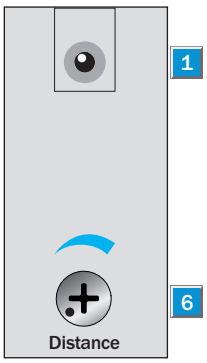
dimensions in inches (mm)

Excess Gain

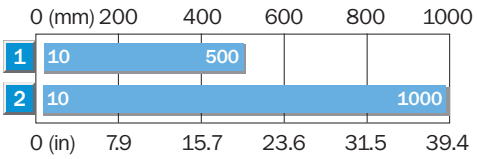


Adjustments

All types



1	LED signal strength indicator
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	M4 threaded mounting hole – 4 mm deep
5	Mounting holes Ø 4.2 mm
6	Sensing range adjustment



Maximum sensing range

1	Sensing range on grey, 18% remission
2	Sensing range on white, 90% remission

Order Information

Type	Part no.
WT 12-2P450	1 016 142
WT 12-2P150	1 016 140
WT 12-2N450	1 016 139
WT 12-2N150	1 016 138

Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921

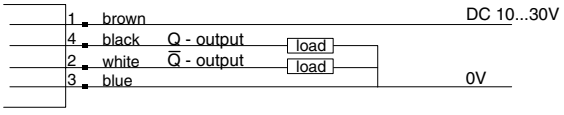
* 2 pieces included with delivery

Technical Data	WT 12-2-	P450	P150	N450	N150
Sensing range, adjustable	0.4...39.4 in (10...1000 mm)	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■
Light spot diameter	1.2 in at 23.6 in (30 mm at 600 mm)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■		
	≤ 40 mA			■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■		
	NPN, Q and $\overline{Q}$			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■
Max. switching frequency[6]	1500 Hz	■	■	■	■
Connection types	Cable[7], 2 m		■		■
	Plug, M12 4-pin	■		■	
VDE protection class[8]	⧈	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■		■	
	7.1 oz (200 g)		■		■
Housing material	Die cast zinc	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

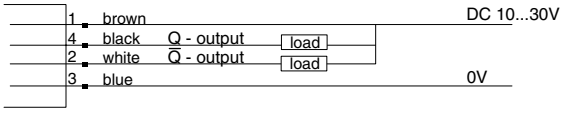
Connection Diagram

PNP Models

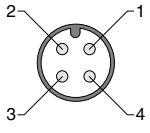


wire colors refer to standard cable, not included with quick disconnect models

NPN Models



M12 Connector



SICK

WT 12L-2

Proximity/Diffuse Sensors - Background Suppression

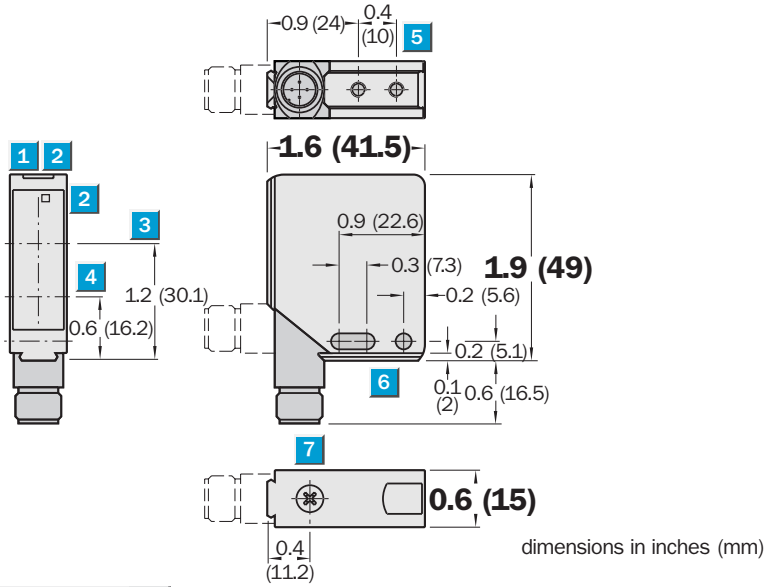
1.1...7.9 in (30...200 mm)
sensing range

Highlights

- Class II laser light for ultra-small light spot
- M12 plug connections swivel 90° for easy installation
- Adjustable and fixed background suppression
- Rugged die cast metal housing
- PNP and NPN in the same switch

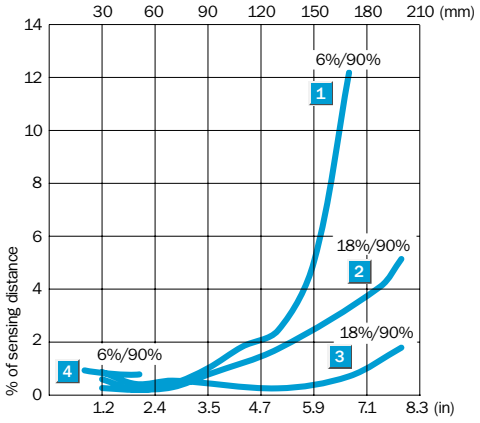
WT 12L-2

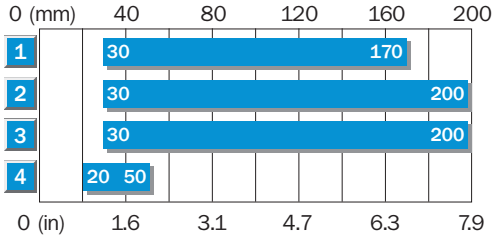
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

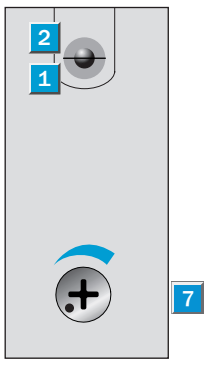




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission
4	Sensing range on black, 6% remission, fixed

Adjustments

WT 12L-2B530A01
WT 12L-2B540A01
WT 12L-2B550A01



1	LED power indicator, green
2	LED output indicator, yellow
3	Optical axis, receiver
4	Optical axis, sender
5	M4 threaded mounting hole – 4 mm deep
6	Mounting hole Ø 4.2 mm
7	Sensing range adjustment

* (not for fixed sensing ranges)

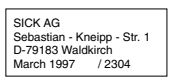
Order Information

Type	Part no.
WT 12L-2B510A01	1 018 472
WT 12L-2B530A01	1 018 553
WT 12L-2B540A01	1 018 474
WT 12L-2B550A01	1 018 473

Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps	921

Technical Data	WT 12L-2-	B510 A01	B530 A01	B540 A01	B550 A01					
Sensing range, adjustable	1.1...7.9 in (30...200 mm), 18% remission		■	■	■					
	Focus 1.7 in (45 mm)		■							
	Focus 3.1 in (80 mm)			■						
	Focus 3.9 in (100 mm)				■					
Background suppression	1.1...7.9 in (30...200 mm)									
Background suppression capability	% of set sensing distance (see previous pg)									
Sensing range, fixed, 6% remission	0.8...2.0 in, focus 1.8 in (20...50 mm, 45 mm)	■								
Light source[1]	Laser, 650 nm, pulsed	■	■	■	■					
Light spot diameter at focal point	0.004 in (0.1 mm)	■	■							
	0.008 in (0.2 mm)			■	■					
Supply voltage V_S	10...30 V DC[2]	■	■	■	■					
Ripple[3]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[4]	≤ 55 mA	■	■	■	■					
Switching output Q_N and Q_P	PNP, NPN	■	■	■	■					
Signal voltage HIGH	V_S – < 2 V, V_S	■	■	■	■					
Signal voltage LOW[5]	0 V, ≤ 1.5 V	■	■	■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operating mode	Light/dark switching[6] via control wire	■	■	■	■					
Control input L/D	0 V or open, light switching	■	■	■	■					
Control input L/D	V_S, dark switching	■	■	■	■					
Response time max. [7]	≤ 200 µs	■	■	■	■					
Max. switching frequency[8]	2.5 kHz	■	■	■	■					
Laser class	2 (IEC 825-1; EN 60825-1:97)	■	■	■	■					
VDE protection class[9]	□	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Circuit protection[10]	A, B, C	■	■	■	■					
Ambient temperature T_A	Operation 14...122°F (-10 ...50°C)	■	■	■	■					
	Storage -13...167°F (-25...75°C)	■	■	■	■					
Connection type	Plug, M12 5-pin	■	■	■	■					
Approximate weight	4.6 oz (130 g)	■	■	■	■					
Housing material	Die cast zinc	■	■	■	■					

1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) At T_A = 25°C and 100 mA output current
6) Reversible via control input L/D
7) Signal transit time with resistive load
8) At light/dark ratio 1:1
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Outputs protected against short-circuiting
C = Interference pulse suppression

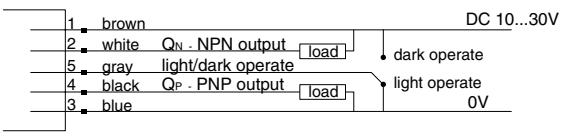


Beam Attenuator

The WT 12L -2 sensor is equipped with an M12 style quick disconnect. The cable can quickly and easily be removed in the event that personnel require access to the area where the sensor is mounted.

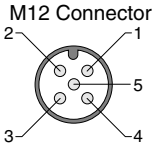
Connection Diagram

All Models



wire colors refer to standard cable, not included

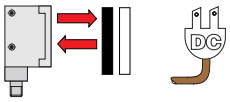
M12 Connector



SICK

WT 190

Proximity/Diffuse Sensors - Background Suppression



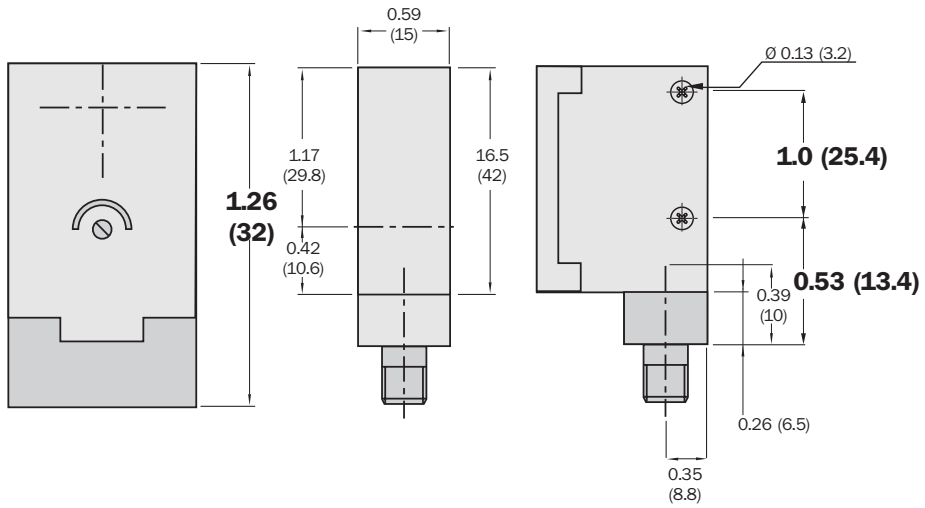
1.6...3.9 in (40...100 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Adjustable sensing range
- Red light for easy alignment
- Cable or M8 quick disconnect versions

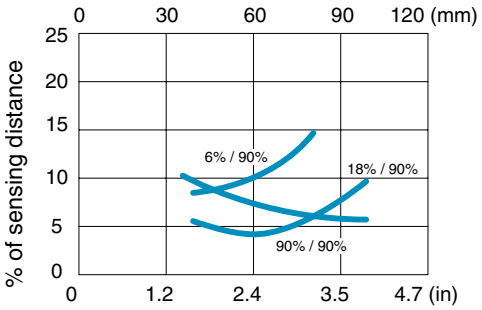
WT 190

Dimensional Drawing



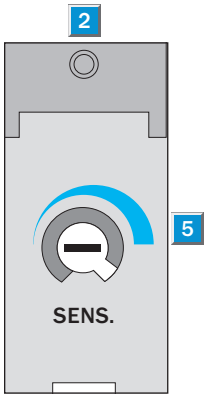
dimensions in inches (mm)

Background Suppression



Adjustments

All types



1 Standard direction of the material to be sensed
2 Transmission axis
3 Reception axis
4 Red LED signal strength indicator
5 Through bore hole Ø 3.2 mm, for M4 hexagon nut on both sides
6 Connection cable
7 Sensing distance adjustment (2 turns), over-turn protected
8 Position indicator for scanning distance setting (270°)

Order Information

Type	Part no.
WT 190-N142	6 009 951
WT 190-N440	6 009 953
WT 190-P142	6 009 954
WT 190-P440	6 009 956

Accessories	page
Cables and connectors	908
Mounting brackets*	

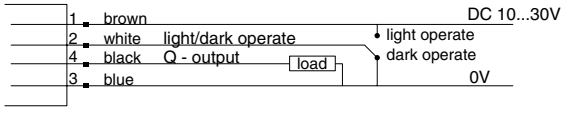
* included with delivery

Technical Data	WT 190-	P142	N142	P440	N440					
Sensing range, adjustable[1]	1.6...3.9 in (40...100 mm)	■	■	■	■					
Sensitivity	Adjustable, potentiometer 270°	■	■	■	■					
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■					
Light source[2], **light type**	LED, red light	■	■	■	■					
Light spot diameter	Approx. 0.4 in at 3.9 in (10 mm at 100 mm)	■	■	■	■					
Angle of divergence	Approx. 4°	■	■	■	■					
Supply voltage V_S	10...30 V DC	■	■	■	■					
Ripple[4]	6 V peak to peak	■	■	■	■					
Current consumption[5]	≤ 35 mA	■	■	■	■					
Switching outputs	PNP; open collector: Q	■		■						
	NPN; open collector: Q		■		■					
Max. output current I_A	100 mA	■	■	■	■					
Switching mode[6]	Light or dark switching selectable via wire	■	■	■	■					
Response time[7]	2 ms	■	■	■	■					
Max. switching frequency[8]	250 Hz	■	■	■	■					
Connection types	Cable	■	■							
	Plug, M8 4-pin			■	■					
VDE protection class[10]	⧫	■	■	■	■					
Circuit protection[11]	V_S	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	0.8 oz (23 g)	■	■	■	■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

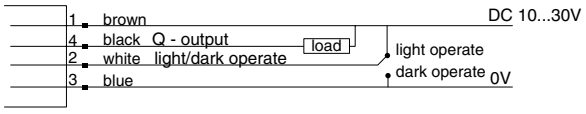
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Operating reserve < 50 %
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram

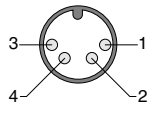
PNP Models



NPN Models



M8 Connector

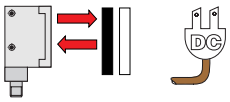


wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 190 Long

Proximity/Diffuse Sensors - Background Suppression



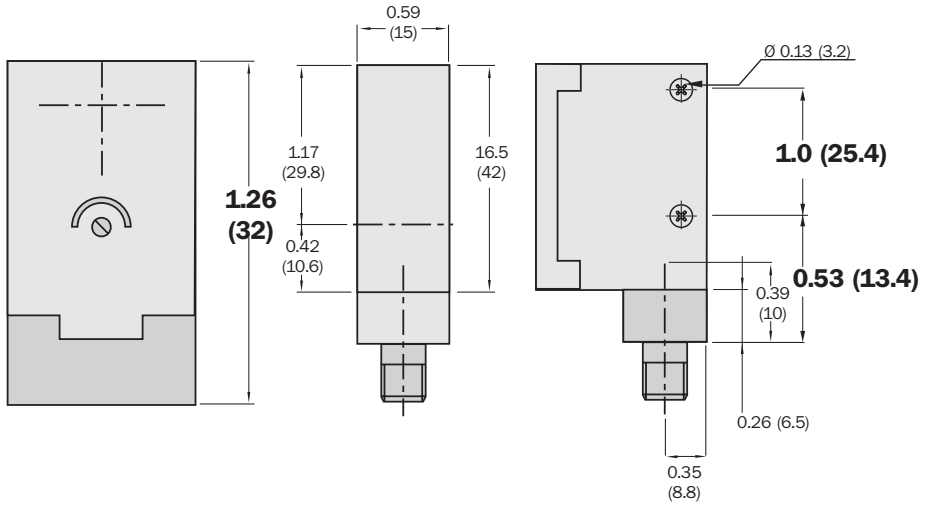
3.9...11.8 in (100...300 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Adjustable sensing range
- Red light for easy alignment
- Cable or M8 quick disconnect versions

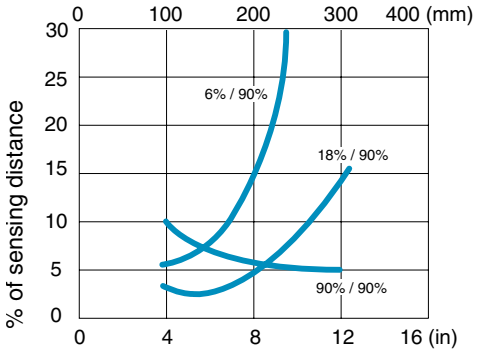
WT 190

Dimensional Drawing



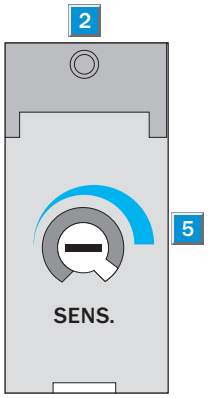
dimensions in inches (mm)

Background Suppression



Adjustments

All types



1. Standard direction of the material to be sensed
2. Transmission axis
3. Reception axis
4. Red LED signal strength indicator
5. Through bore hole Ø 3.2 mm, for M4 hexagon nut on both sides
6. Connection cable
7. Sensing distance adjustment (2 turns), over-turn protected
8. Position indicator for scanning distance setting (270°)

Order Information

Type	Part no.
WT 190-N162	6 009 960
WT 190-N460	6 010 577
WT 190-P162	6 010 578
WT 190-P460	6 010 580

Accessories	page
Cables and connectors	908
Mounting brackets*	

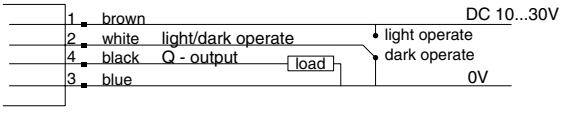
* included with delivery

Technical Data	WT 190-	P162	N162	P460	N460
Sensing range, adjustable[1]	3.9...11.8 in (100...300 mm)	■	■	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■
Light source[2], **light type**	LED, red light	■	■	■	■
Light spot diameter	Approx. 1.2 in at 11.8 in (30 mm at 300 mm)	■	■	■	■
Angle of divergence	Approx. 4.3°	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■
Ripple[4]	6 V peak to peak	■	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■	■
Switching outputs	PNP; open collector: Q	■		■	
	NPN; open collector: Q		■		■
Max. output current I_A	100 mA	■	■	■	■
Switching mode[6]	Light or dark switching selectable via wire	■	■	■	■
Response time[7]	2 ms	■	■	■	■
Max. switching frequency[8]	250 Hz	■	■	■	■
Connection types	Cable	■	■		
	Plug, M8 4-pin			■	■
VDE protection class[10]	⏀	■	■	■	■
Circuit protection[11]	V_S	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	0.8 oz (23 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

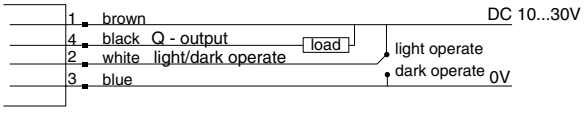
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Operating reserve < 50 %
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram

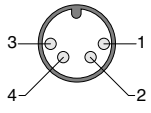
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

SICK

WTB 190T

Proximity/Diffuse Sensors - Background Suppression

2...3.9 in (50...100 mm)
sensing range

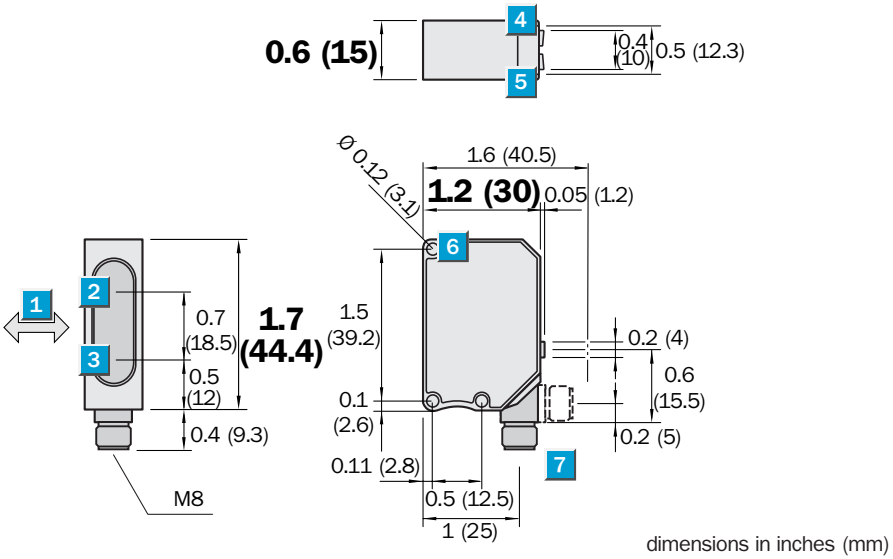
CE

Highlights

- Precise background suppression
- Small, precise red light spot enables fast equipment alignment
- Equipment setting via Teach-in procedure at the push of a button
- Programmable time delay 0-10s
- Equipment parameterization via selection mode at the push of a button
- Easy to read display with menu prompting enables convenient programming and parameterization

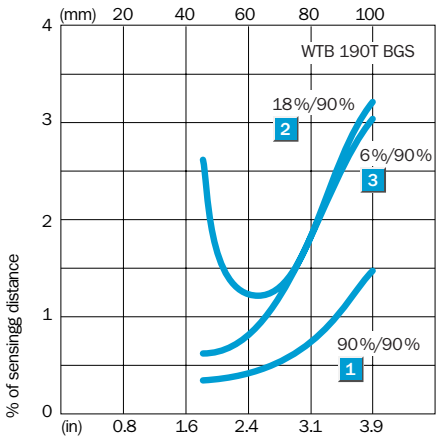
WTB 190T

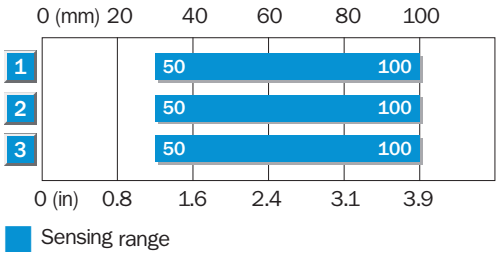
Dimensional Drawing



dimensions in inches (mm)

Background Suppression



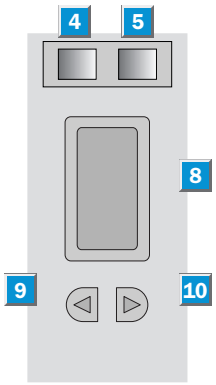


Sensing range

1	Sensing range on white, 90 % remission
2	Sensing range on grey, 18 % remission
3	Sensing range on black, 6 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Orange LED indicator: output active
5	Green LED indicator: light reception with excess gain > 1.1
6	Mounting holes, Ø approx. 3.1 mm
7	Plug 4-pin, M8 or cable 2 m
8	Numerical display
9	Select mode button
10	Teach-in button

Order Information

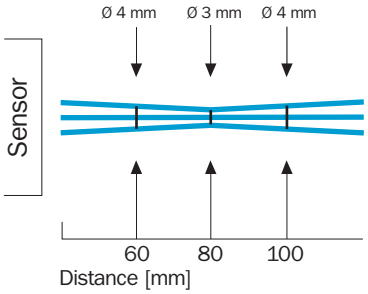
Type	Part no.
WTB 190T-P132	6 022 835
WTB 190T-P430	6 022 838
WTB 190T-N132	6 022 831
WTB 190T-N430	6 022 834

Accessories	page
Cables and connectors	908

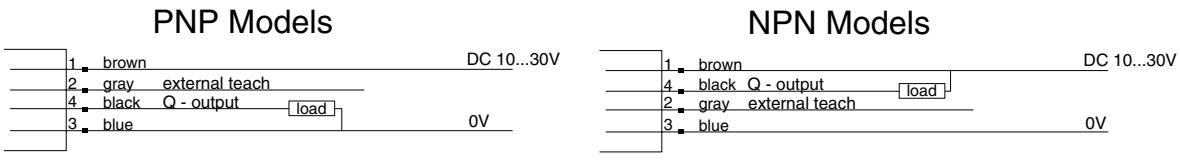
Technical Data	WTB 190T-	P132	P430	N132	N430
Sensing range, adjustable	2...3.9 in (50... 100 mm)[1]	■	■	■	■
Sensitivity control	Teach-in, External Teach (ET)	■	■	■	■
	Teach-in via button, menu guided	■	■	■	■
Light source[2]	LED, red light	■	■	■	■
Light spot diameter	0.2 in at 3.9 in (4 mm at distance of 100 mm)	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[3]	■	■	■	■
Ripple[4]	10%	■	■	■	■
Current consumption[5]	40 mA	■	■	■	■
Switching outputs	PNP, Q, open collector	■	■		
	NPN, Q, open collector			■	■
Output current I_A max.	100 mA	■	■	■	■
Switching type	Light/dark switching[6], programmable	■	■	■	■
Response time[7]	2.5 ms	■	■	■	■
Switching frequency max.[8]	200/s	■	■	■	■
Timer mode (dLY)	0... 10 s[6], programmable	■	■	■	■
Timer function	Nor: Normal Mode	■	■	■	■
	Ond: On Delay Mode, on delay	■	■	■	■
	0Fd: Off Delay Mode, off delay	■	■	■	■
Connection types:	Cable, PVC, 2 m[9]; 4 x 0.2 mm², ø 4.2 mm	■		■	
	Plug, 4-pin M8		■		■
VDE protection class[10]	⏚	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	With cable 2 m, approx. 4.2 oz (120 g)	■		■	
	With plug approx. 7.1 oz (200 g)		■		■
Housing material	Housing: ABS; optic: PMMA	■	■	■	■

1) Object with 90% reflectance (with reference to standard white according to DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Menu guided display via "Select button"
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Light spot diameter



Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WTB 190T

Proximity/Diffuse Sensors - Background Suppression

3.9...11.8 in (100...300 mm)

sensing range

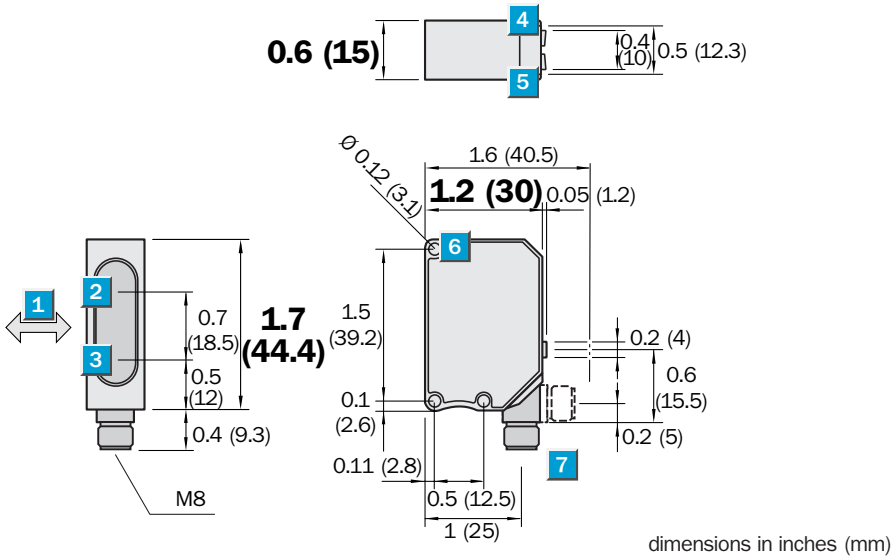
CE

Highlights

- Precise background suppression
- Small, precise red light spot enables fast equipment alignment
- Equipment setting via Teach-in procedure at the push of a button
- Programmable time delay 0-10s
- Equipment parameterization via selection mode at the push of a button
- Easy to read display with menu prompting enables convenient programming and parameterization

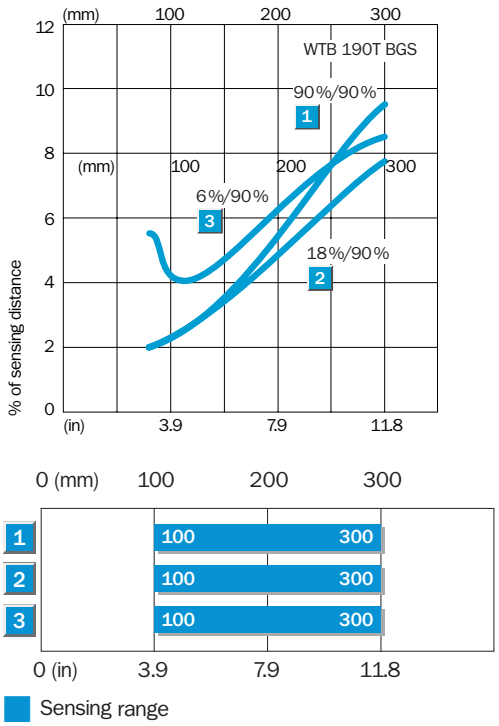
WTB 190T

Dimensional Drawing



dimensions in inches (mm)

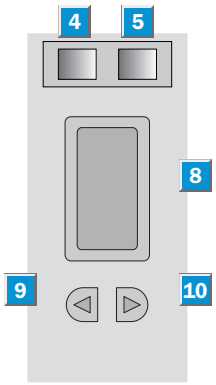
Background Suppression



1	Sensing range on white, 90% remission
2	Sensing range on grey, 18% remission
3	Sensing range on black, 6% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Orange LED indicator: output active
5	Green LED indicator: light reception with excess gain > 1.1
6	Mounting holes, Ø approx. 3.1 mm
7	Plug 4-pin, M8 or cable 2 m
8	Numerical display
9	Select mode button
10	Teach-in button

Order Information

Type	Part no.
WTB 190T-P162	6 022 843
WTB 190T-P460	6 022 846
WTB 190T-N162	6 022 839
WTB 190T-N460	6 022 842

Accessories

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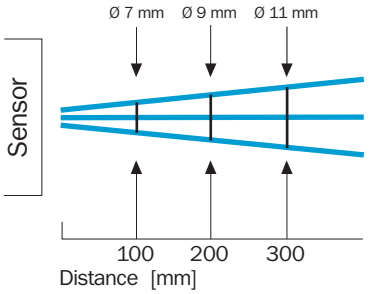
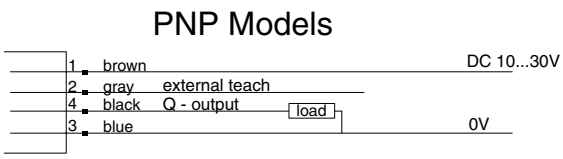
Technical Data	WTB 190T-	P162	P460	N162	N460
Sensing range, adjustable	3.9...11.8 in (100... 300 mm)[1]	■	■	■	■
Sensitivity control	Teach-in, External Teach (ET)	■	■	■	■
	Teach-in via button, menu guided	■	■	■	■
Light source[2]	LED, red light	■	■	■	■
Light spot diameter	0.4 in at 11.8 in (11 mm at distance of 300 mm)	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[3]	■	■	■	■
Ripple[4]	10%	■	■	■	■
Current consumption[5]	40 mA	■	■	■	■
Switching outputs	PNP, Q, open collector	■	■		
	NPN, Q, open collector			■	■
Output current I_A max.	100 mA	■	■	■	■
Switching type	Light/dark switching[6], programmable	■	■	■	■
Response time[7]	2.5 ms	■	■	■	■
Switching frequency max.[8]	200/s	■	■	■	■
Timer mode (dLY)	0... 10 s[6], programmable	■	■	■	■
Timer function	Nor: Normal Mode	■	■	■	■
	Ond: On Delay Mode, on delay	■	■	■	■
	0Fd: Off Delay Mode, off delay	■	■	■	■
Connection types:	Cable, PVC, 2 m[9]; 4 x 0.2 mm², ø 4.2 mm	■		■	
	Plug, 4-pin M8		■		■
VDE protection class[10]	⏚	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	With cable 2 m, approx. 4.2 oz (120 g)	■		■	
	With plug approx. 7.1 oz (200 g)		■		■
Housing material	Housing: ABS; optic: PMMA	■	■	■	■

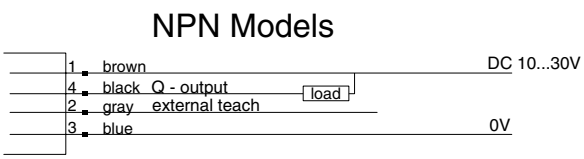
1) Object with 90% reflectance (with reference to standard white according to DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Menu guided display via "Select button"
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Output Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

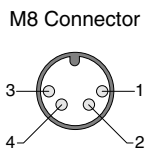
Light spot diameter



Connection Diagram







wire colors refer to standard cable, not included with quick disconnect models

WTV 190T

Proximity/Diffuse Sensors - Foreground Suppression

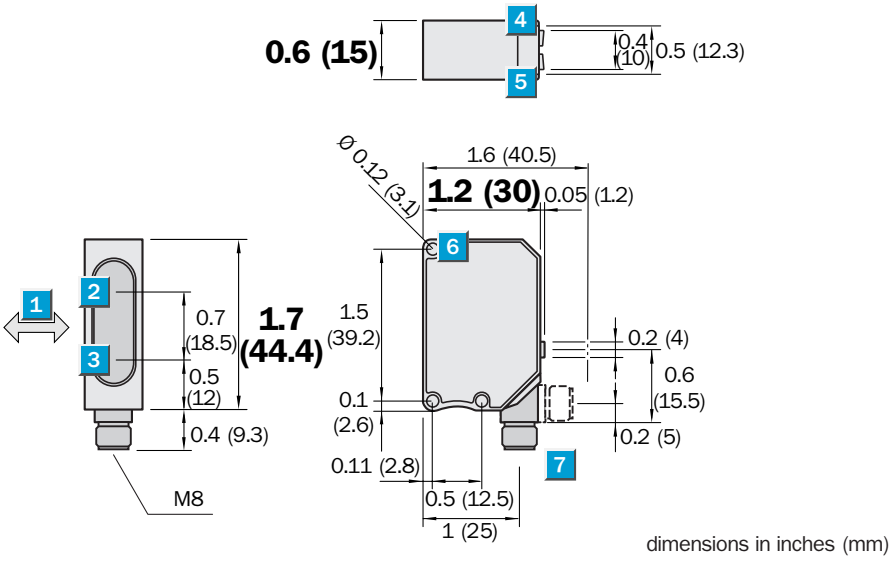
2...3.9 in (50...100 mm)
sensing range

Highlights

- Precise foreground suppression
- Small, precise red light spot enables fast equipment alignment
- Equipment setting via Teach-in procedure at the push of a button
- Programmable time delay 0-10s
- Equipment parameterization via selection mode at the push of a button
- Easy to read display with menu prompting enables convenient programming and parameterization

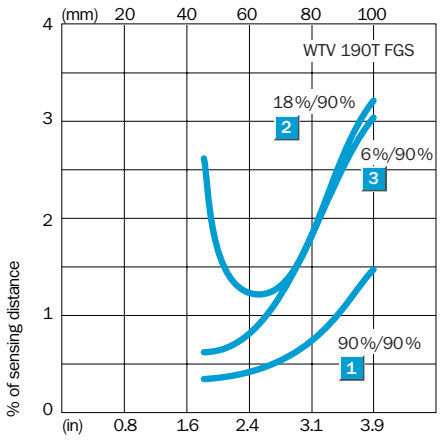
WTV 190T

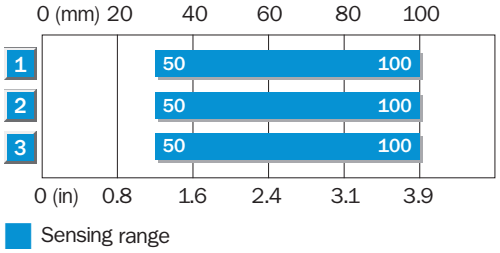
Dimensional Drawing



dimensions in inches (mm)

Foreground Suppression



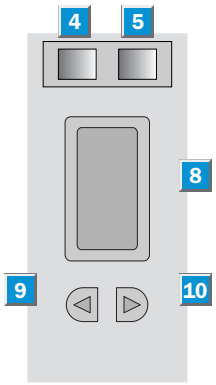


Sensing range

1	Sensing range on white, 90 % remission
2	Sensing range on grey, 18 % remission
3	Sensing range on black, 6 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Orange LED indicator: output active
5	Green LED indicator: light reception with excess gain > 1.1
6	Mounting holes, Ø approx. 3.1 mm
7	Plug 4-pin, M8 or cable 2 m
8	Numerical display
9	Select mode button
10	Teach-in button

Order Information

Type	Part no.
WTV 190T-P132	6 022 851
WTV 190T-P430	6 022 854
WTV 190T-N132	6 022 847
WTV 190T-N430	6 022 850

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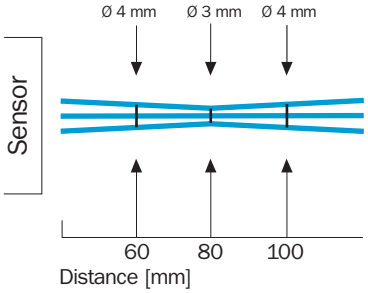
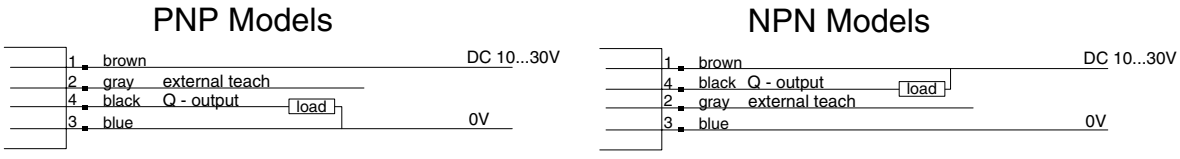
Technical Data	WTV 190T-	P132	P430	N132	N430
Sensing range, adjustable	2...3.9 in (50... 100 mm)[1]	■	■	■	■
Sensitivity control	Teach-in, External Teach (ET)	■	■	■	■
	Teach-in via button, menu guided	■	■	■	■
Light source[2]	LED, red light	■	■	■	■
Light spot diameter	0.2 in at 3.9 in (4 mm at distance of 100 mm)	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[3]	■	■	■	■
Ripple[4]	10%	■	■	■	■
Current consumption[5]	40 mA	■	■	■	■
Switching outputs	PNP, Q, open collector	■	■		
	NPN, Q, open collector			■	■
Output current I_A max.	100 mA	■	■	■	■
Switching type	Light/dark switching[6], programmable	■	■	■	■
Response time[7]	2.5 ms	■	■	■	■
Switching frequency max.[8]	200/s	■	■	■	■
Timer mode (dLY)	0... 10 s[6], programmable	■	■	■	■
Timer function	Nor: Normal Mode	■	■	■	■
	Ond: On Delay Mode, on delay	■	■	■	■
	0Fd: Off Delay Mode, off delay	■	■	■	■
Connection types:	Cable, PVC, 2 m[9]; 4 x 0.2 mm², ø 4.2 mm	■		■	
	Plug, 4-pin M8		■		■
VDE protection class[10]	⏀	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	With cable 2 m, approx. 4.2 oz (120 g)	■		■	
	With plug approx. 7.1 oz (200 g)		■		■
Housing material	Housing: ABS; optic: PMMA	■	■	■	■

1) Object with 90% reflectance (with reference to standard white according to DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Menu guided display via "Select button"
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Output Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Light spot diameter



Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WTV 190T

Proximity/Diffuse Sensors - Foreground Suppression

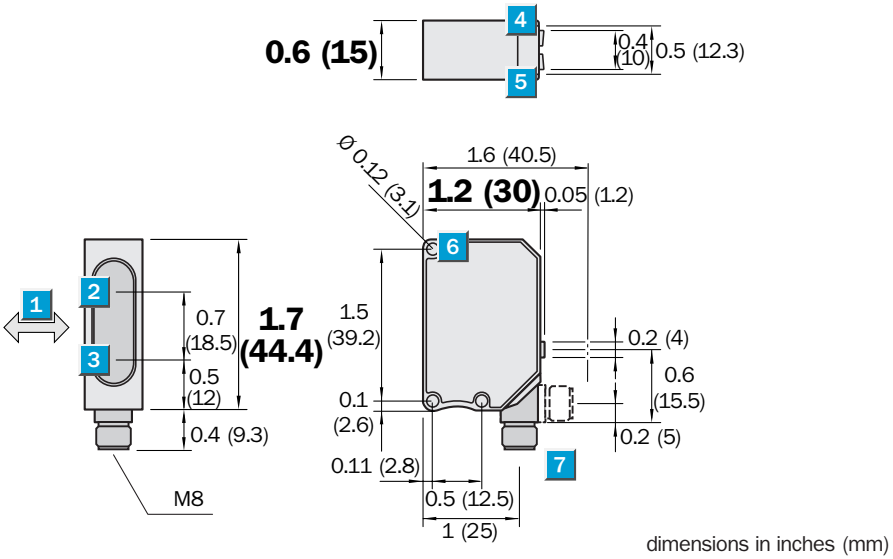
3.9...11.8 in (100...300 mm)
sensing range

Highlights

- Precise foreground suppression
- Small, precise red light spot enables fast equipment alignment
- Equipment setting via Teach-in procedure at the push of a button
- Programmable time delay 0-10s
- Equipment parameterization via selection mode at the push of a button
- Easy to read display with menu prompting enables convenient programming and parameterization

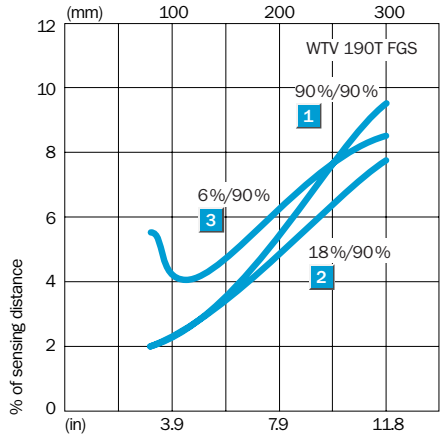
WTV 190T

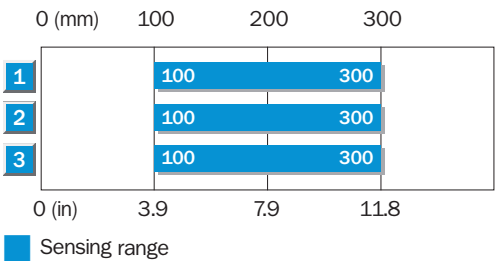
Dimensional Drawing



dimensions in inches (mm)

Foreground Suppression

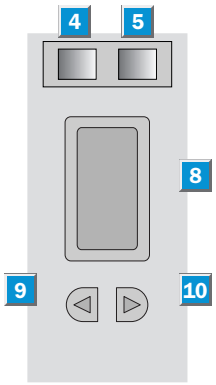




1	Sensing range on white, 90% remission
2	Sensing range on grey, 18% remission
3	Sensing range on black, 6% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Orange LED indicator: output active
5	Green LED indicator: light reception with excess gain > 1.1
6	Mounting holes, Ø approx. 3.1 mm
7	Plug 4-pin, M8 or cable 2 m
8	Numerical display
9	Select mode button
10	Teach-in button

Order Information

Type	Part no.
WTV 190T-P162	6 022 859
WTV 190T-P460	6 022 862
WTV 190T-N162	6 022 855
WTV 190T-N460	6 022 858

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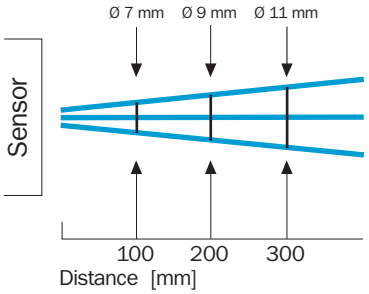
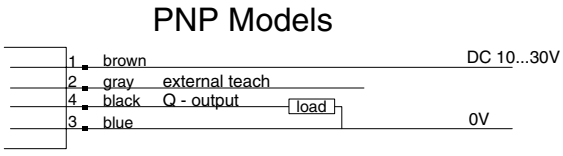
Technical Data	WTV 190T-	P162	P460	N162	N460
Sensing range, adjustable	3.9...11.8 in (100... 300 mm)[1]	■	■	■	■
Sensitivity control	Teach-in, External Teach (ET)	■	■	■	■
	Teach-in via button, menu guided	■	■	■	■
Light source[2]	LED, red light	■	■	■	■
Light spot diameter	0.4 in at 11.8 in (11 mm at distance of 300 mm)	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[3]	■	■	■	■
Ripple[4]	10%	■	■	■	■
Current consumption[5]	40 mA	■	■	■	■
Switching outputs	PNP, Q, open collector	■	■		
	NPN, Q, open collector			■	■
Output current I_A max.	100 mA	■	■	■	■
Switching type	Light/dark switching[6], programmable	■	■	■	■
Response time[7]	2.5 ms	■	■	■	■
Switching frequency max.[8]	200/s	■	■	■	■
Timer mode (dLY)	0... 10 s[6], programmable	■	■	■	■
Timer function	Nor: Normal Mode	■	■	■	■
	Ond: On Delay Mode, on delay	■	■	■	■
	0Fd: Off Delay Mode, off delay	■	■	■	■
Connection types:	Cable, PVC, 2 m[9]; 4 x 0.2 mm², ø 4.2 mm	■		■	
	Plug, 4-pin M8		■		■
VDE protection class[10]	⏚	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	With cable 2 m, approx. 4.2 oz (120 g)	■		■	
	With plug approx. 7.1 oz (200 g)		■		■
Housing material	Housing: ABS; optic: PMMA	■	■	■	■

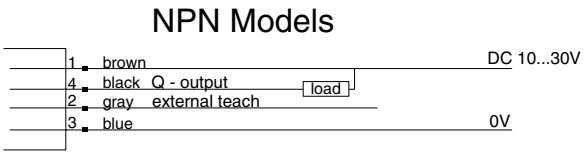
1) Object with 90% reflectance (with reference to standard white according to DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Menu guided display via "Select button"
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Output Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

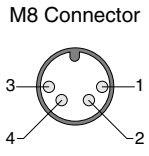
Light spot diameter



Connection Diagram



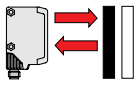




wire colors refer to standard cable, not included with quick disconnect models

WT 250

Proximity/Diffuse Sensors - Background Suppression



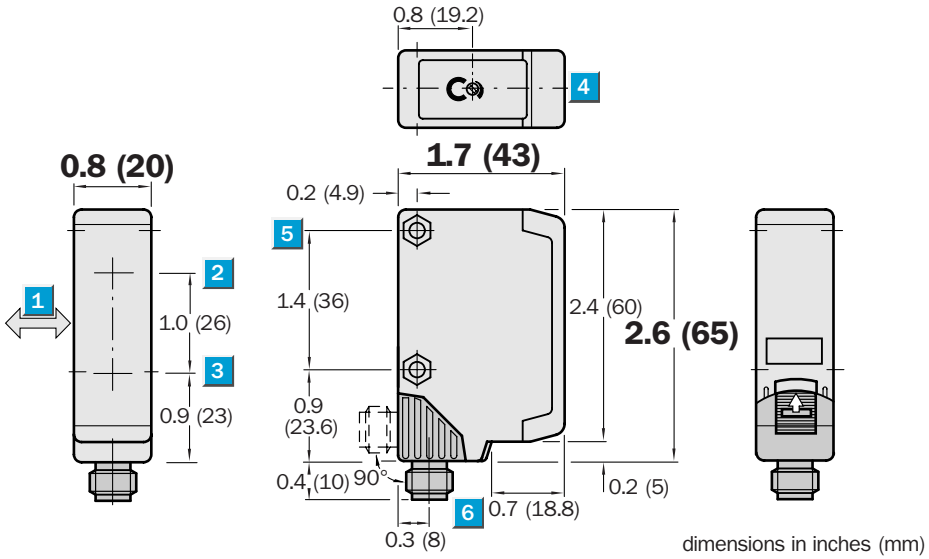

0.2...12.2 in (5...310 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Adjustable sensing range
- Red light for easy alignment
- M12 connections swivel 90° for easy installation
- Cable or M12 quick disconnect versions
- Easy mounting with included bracket

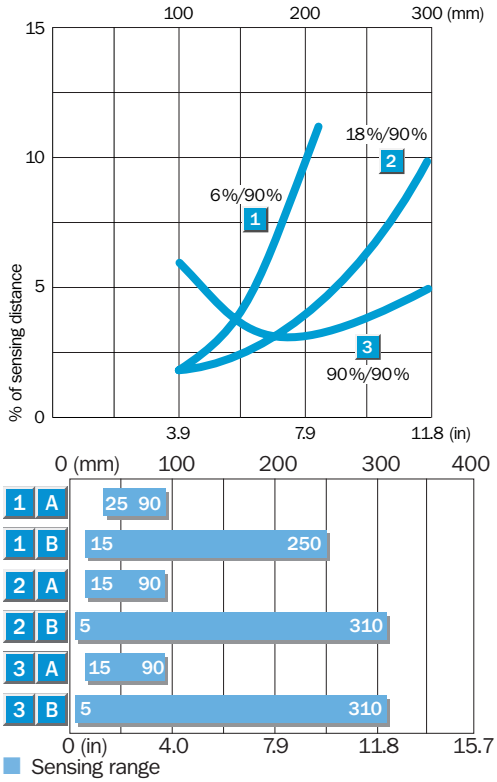
WT 250

Dimensional Drawing



dimensions in inches (mm)

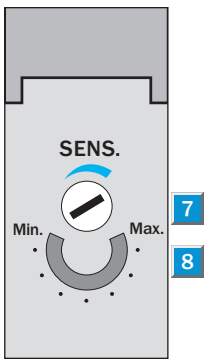
Background Suppression



1	Sensing range on black[11], white background
2	Sensing range on gray[11], white background
3	Sensing range on white[11], white background
A	Sensing range control set to MIN
B	Sensing range control set to MAX

Adjustments

All types



1	Standard direction of the material to be sensed
2	Transmission axis
3	Reception axis
4	Red LED signal strength indicator
5	Through borehole Ø 4.2 mm, for M4 hexagon nut on both sides
6	Connection cable or M12 4-pin plug; plug position rotatable by 90° (V > H) V ➔ vertical final position H ➔ horizontal final position; can be locked with slider
7	Sensing range adjustment (2 turns), over-turn protected
8	Position indicator for sensing range setting (270°)

Order Information

Type	Part no.
WT 250-P142	6 010 619
WT 250-P440	6 010 621
WT 250-N142	6 010 616
WT 250-N440	6 010 618

Accessories	page
Cables and connectors M 12	909
Mounting brackets*	924

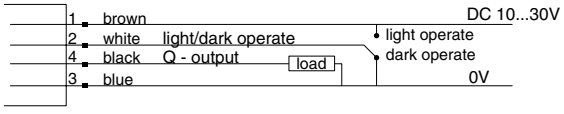
* included with delivery

Technical Data	WT 250-	P142	P440	N142	N440
Sensing range, adjustable	0.2...12.2 in (5...310 mm)[1]	■	■	■	■
Background suppression	0.4...3.5 in (10...310 mm)[1]	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■
Sensitivity	Potentiometer, 2 turns, with position indicator	■	■	■	■
Light source,[2] light type	LED, visible red light	■	■	■	■
Light spot diameter	Approx. 1.4 in at 19.7 in (35 mm at 500 mm)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■
Ripple[4]	≤ 5 V_{SS}	■	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Light receiver, switching type	Light/dark switching via control wire:	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 2 ms	■	■	■	■
Max. switching frequency[7]	250 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8] 4 x 0.18 mm², Ø 3.8 mm	■		■	
	Plug, M12 4-pin, 90° rotatable		■		■
VDE protection class[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■	
	1.4 oz (40 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

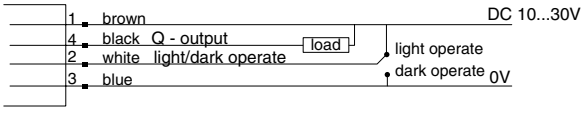
1) 90% remission of material sensed (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) Limit value
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With dark/light ratio 1:1, without time level
8) Do not bend cable below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
D = Output overcurrent and short-circuit protected
11) Black = 6% remission
Gray = 18% remission
White = 90% remission

Connection Diagram

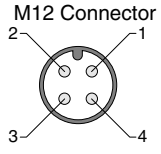
PNP Models



NPN Models



M12 Connector



SICK

WT 250

Proximity/Diffuse Sensors- Background Suppression

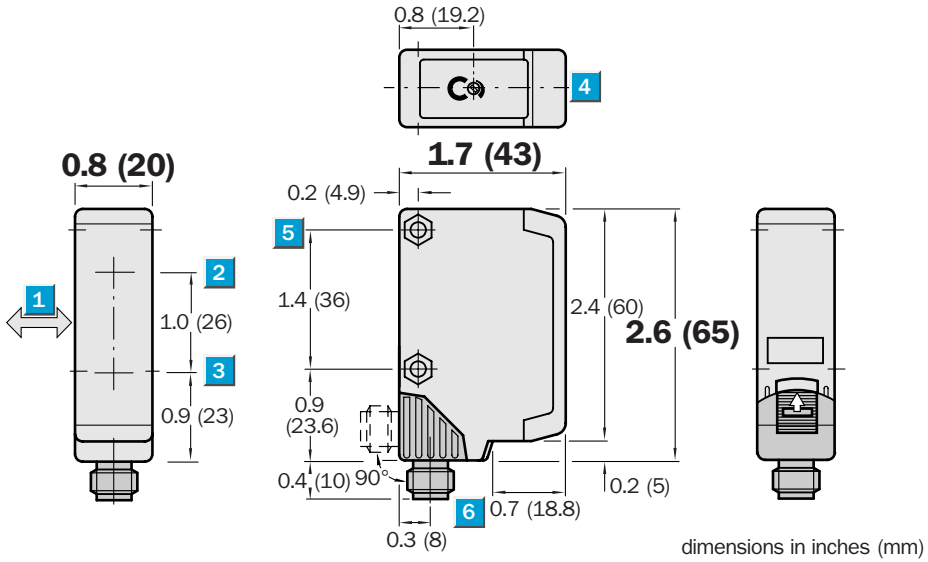
0.4...23.6 in (10...600 mm)
sensing range

Highlights

- Adjustable background suppression
- Adjustable sensing range
- Rugged plastic housing
- Visible red light for easy alignment
- Cable or M12 quick disconnect versions
- Easy mounting with included bracket
- M12 plug rotatable by 90°

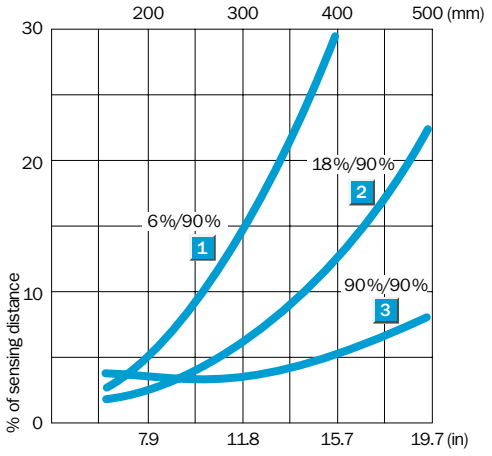
WT 250

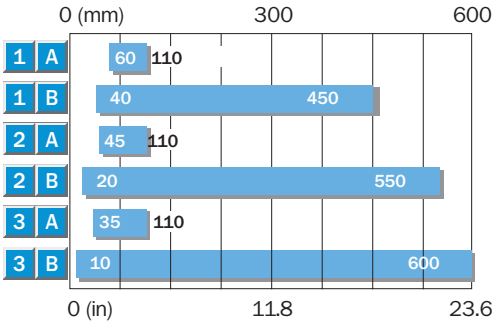
Dimensional Drawing



dimensions in inches (mm)

BAckground Suppression

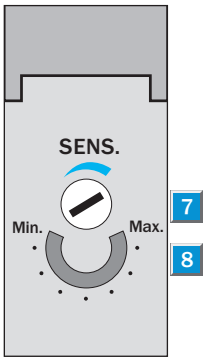




1	Sensing range on black[11], white background
2	Sensing range on gray[11], white background
3	Sensing range on white[11], white background
A	Sensing range control set to MIN
B	Sensing range control set to MAX

Adjustments

All types



1	Standard direction of the material to be sensed
2	Center of optical axis, sender
3	Center of optical axis, receiver
4	LED signal strength indicator
5	Through borehole Ø 4.2 mm, for M4 hexagon nut on both sides
6	Connection cable or M12 4-pin plug; plug position rotatable by 90° (V > H), V ➤ vertical final position H ➤ horizontal final position; can be locked with slider
7	Sensing range adjustment (2 turns), over-turn protected
8	Position indicator for sensing range setting (270°)

Order Information

Type	Part no.
WT 250-P162	6 010 704
WT 250-P460	6 010 706
WT 250-N162	6 010 701
WT 250-N460	6 010 703

Accessories	page
Cables and connectors	909
Mounting brackets*	924

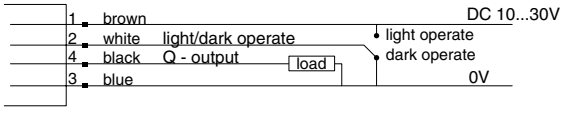
* included with delivery

Technical Data	WT 250-	P162	P460	N162	N460
Sensing range, adjustable	0.4...23.6 in (10...600 mm)[1]	■	■	■	■
Background suppression	0.8...21.7 in (20...550 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■
Sensitivity	Potentiometer, 2 turns, with position indicator	■	■	■	■
Light source[2], light type	LED, red light	■	■	■	■
Light spot diameter	Approx. 1.4...19.7 in (35 mm at 500 mm)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■
Ripple[4]	≤ 5 V_{SS}	■	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via control wire:	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 2 ms	■	■	■	■
Max. switching frequency[7]	250 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8] 4 x 0.18 mm², Ø 3.8 mm	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■	
	1.4 oz (40 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

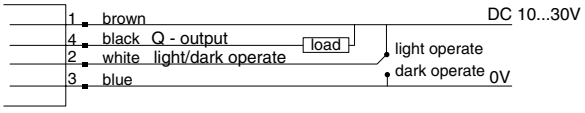
1) 90% remission of material sensed (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) Limit value
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With dark/light ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
D = Output overcurrent and short-circuit protected
11) Black = 6% remission
Gray = 18% remission
White = 90% remission

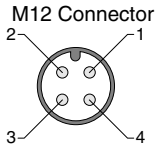
Connection Diagram

PNP Models



NPN Models



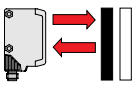


wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 250

Proximity/Diffuse Sensors- Background Suppression



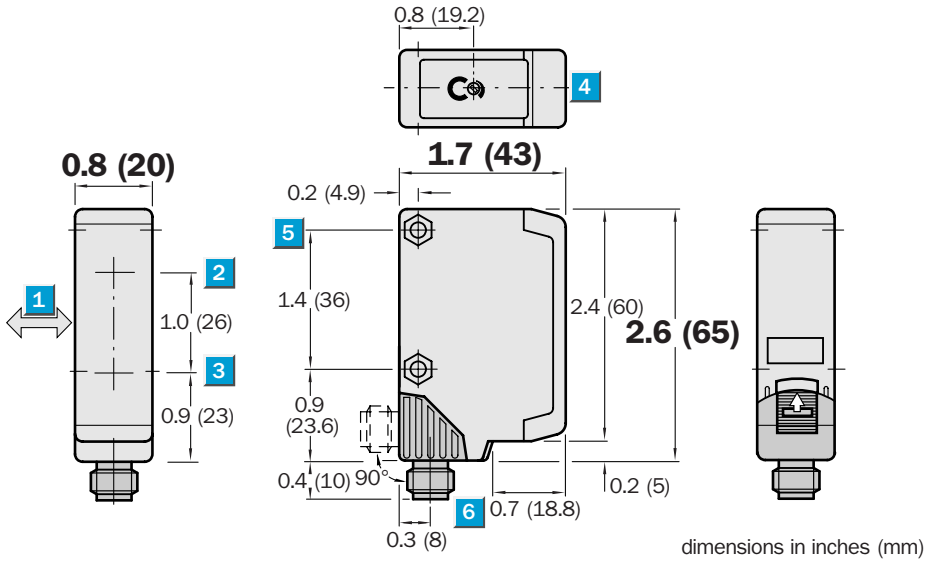

0.4...23.6 in (10...1100 mm)
sensing range

Highlights

- Adjustable background suppression
- Adjustable sensing range
- Rugged plastic housing
- Visible red light for easy alignment
- Cable or M12 quick disconnect versions
- Easy mounting with included bracket
- M12 plug rotatable by 90°

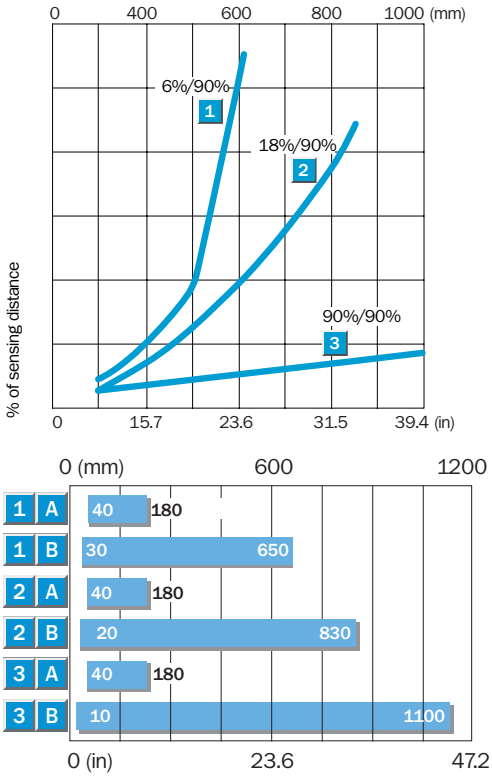
WT 250

Dimensional Drawing



dimensions in inches (mm)

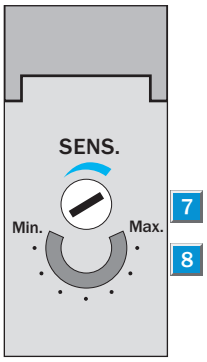
BAckground Suppression



1	Sensing range on black[11], white background
2	Sensing range on gray[11], white background
3	Sensing range on white[11], white background
A	Sensing range control set to MIN
B	Sensing range control set to MAX

Adjustments

All types



1	Standard direction of the material to be sensed
2	Center of optical axis, sender
3	Center of optical axis, receiver
4	LED signal strength indicator
5	Through borehole Ø 4.2 mm, for M4 hexagon nut on both sides
6	Connection cable or M12 4-pin plug; plug position rotatable by 90° (V > H), V ➤ vertical final position H ➤ horizontal final position; can be locked with slider
7	Sensing range adjustment (2 turns), over-turn protected
8	Position indicator for sensing range setting (270°)

Order Information

Type	Part no.
WT 250-P172	6 012 647
WT 250-P470	6 012 649
WT 250-N172	6 012 644
WT 250-N470	6 012 646

Accessories	page
Cables and connectors	909
Mounting brackets*	924

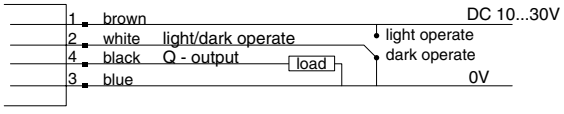
* included with delivery

Technical Data	WT 250-	P172	P470	N172	N470
Sensing range, adjustable	0.4...43.3 in (10...1100 mm)[1]	■	■	■	■
Background suppression	0.8...39.4 in (20...1000 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■
Sensitivity	Potentiometer, 2 turns, with position indicator	■	■	■	■
Light source[2], light type	LED, red light	■	■	■	■
Light spot diameter	Approx. 2.8...39.4 in (70 mm at 1000 mm)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■
Ripple[4]	≤ 5 V_{SS}	■	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via control wire:	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 2 ms	■	■	■	■
Max. switching frequency[7]	250 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8] 4 x 0.18 mm², Ø 3.8 mm	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■	
	1.4 oz (40 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

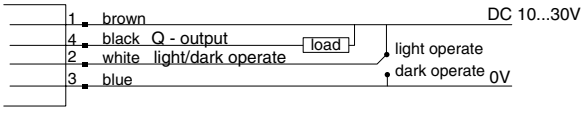
1) 90% remission of material sensed (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) Limit value
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With dark/light ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
D = Output overcurrent and short-circuit protected
11) Black = 6% remission
Gray = 18% remission
White = 90% remission

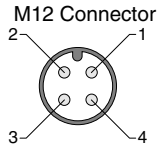
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 14

Proximity/Diffuse Sensors- Background Suppression

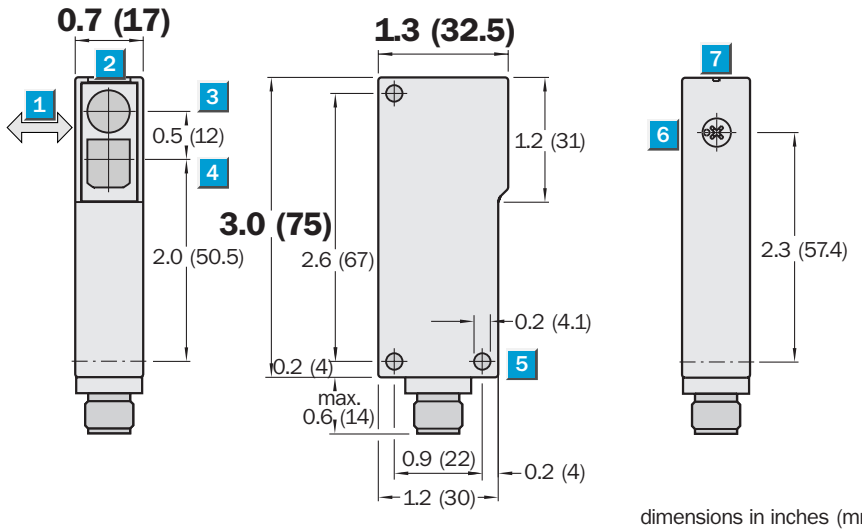

0.8...19.7 in (20...500 mm)
sensing range

Highlights

- Rugged plastic housing
- Infrared light source
- Adjustable background suppression
- Signal strength indicator
- Outputs short circuit protected
- Power supply reverse polarity protected

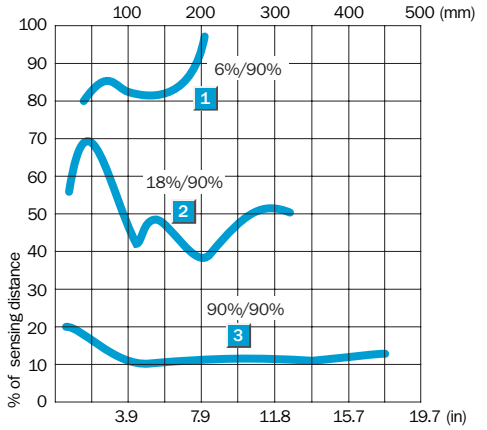
WT 14

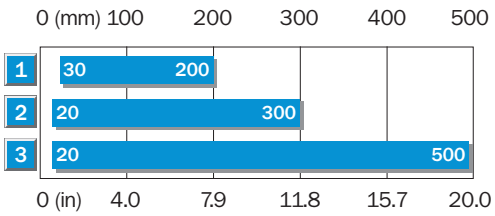
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

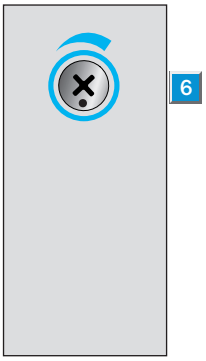




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 14-P420



1	Standard direction of the material being sensed
2	Output indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 4.1 mm
6	Sensing range adjustment
7	Alignment sight

Order Information

Type	Part no.
WT 14-P420	1 016 659

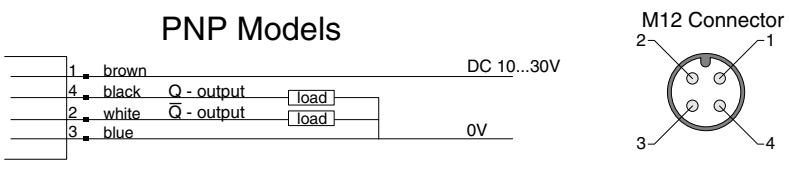
Accessories

	page
Cables and connectors	909
Mounting brackets	922, 923

Technical Data	WT 14-	P420
Sensing range, adjustable	0.8...19.7 in (20...500 mm)	
Background suppression	3.1...19.7 in (80...500 mm)	
Background suppression capability	% of set sensing distance (see previous pg)	
Light source[1], light type	LED, infrared light	
Light spot diameter	0.6 in at 11.8 in (15 mm at 300 mm)	
Angle of divergence	Approx. 2.9°	
Supply voltage V_S	24 V DC (± 25%)	
Ripple[2]	≤ 5 V_{SS}	
Current consumption[3]	≤ 30 mA	
Switching outputs	PNP, Q and $\overline{Q}$	
Output current I_A max.	100 mA	
Response time[4]	2.5 ms	
Max. switching frequency[5]	200 Hz	
Connection type	Plug, M12 4-pin	
VDE protection class[6]	□	
Circuit protection[7]	A, B, C	
Enclosure rating	IP 65/NEMA 4	
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	
	Storage -40...158°F (-40...70°C)	
Approximate weight	1.4 oz (40 g)	
Housing material	Glass fiber reinforced ABS	

1) Average service life 100,000 h at T_A = 25°C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WT 14

Proximity/Diffuse Sensors-Energetic

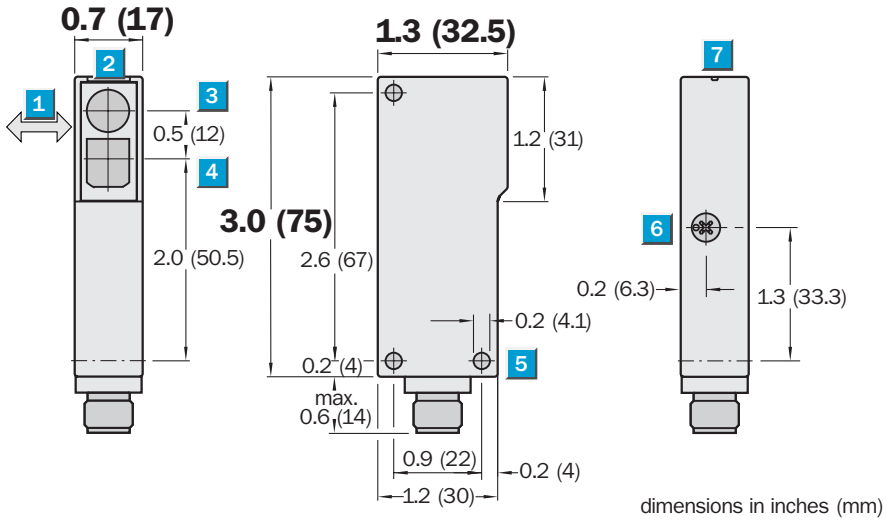
2.0...59.0 in (50...1500 mm)
sensing range

Highlights

- Rugged plastic housing
- Cable or M12 quick disconnect versions
- Infrared light
- Adjustable sensitivity

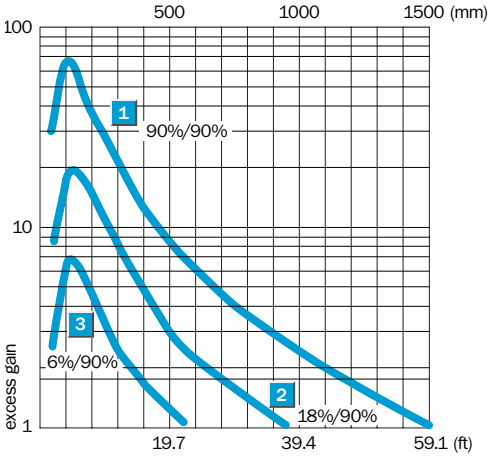
WT 14

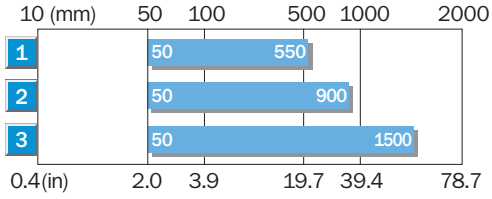
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

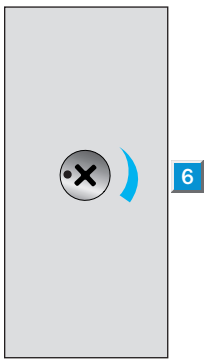




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Output indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 4.1 mm
6	Sensing range adjustment
7	Alignment sight

Order Information

Type	Part no.
WT 14-P112	1 012 922
WT 14-P410	1 012 923

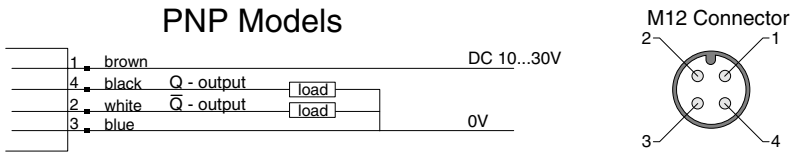
Accessories

	page
Cables and connectors	909
Mounting brackets	922, 923

Technical Data	WT 14-	P112	P410							
Sensing range, adjustable	2.0...59.0 in (50...1500 mm)	■	■							
Light source[1], **light type**	LED, infrared light	■	■							
Light spot diameter	3.9 in at 39.4 in (150 mm at 1000 mm)	■	■							
Supply voltage V_S	24 V DC (± 25%)	■	■							
Ripple[2]	≤ 5 V_{SS}	■	■							
Current consumption[3]	≤ 25 mA	■	■							
Switching outputs	PNP, Q and $\overline{Q}$	■	■							
Output current I_A max.	100 mA	■	■							
Response time[4]	2.5 ms	■	■							
Max. switching frequency[5]	200 Hz	■	■							
Connection types	Cable[6], 2 m	■								
	Plug, M12 4-pin		■							
VDE protection class[7]	□	■	■							
Circuit protection[8]	A, B, C	■	■							
Enclosure rating	IP 65/NEMA 4	■	■							
		■	■							
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	■	■							
	Storage -40...158°F (-40...70°C)	■	■							
Approximate weight	1.4 oz (40 g)		■							
	4.2 oz (120 g)	■								
Housing material	Glass fiber reinforced ABS	■	■							

1) Average service life 100,000 h at T_A = 25°C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0°C
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

SICK

WTV 18-2

Proximity/Diffuse Sensors-Background Rejection

2.4...7.9 in (60...200 mm)
sensing range

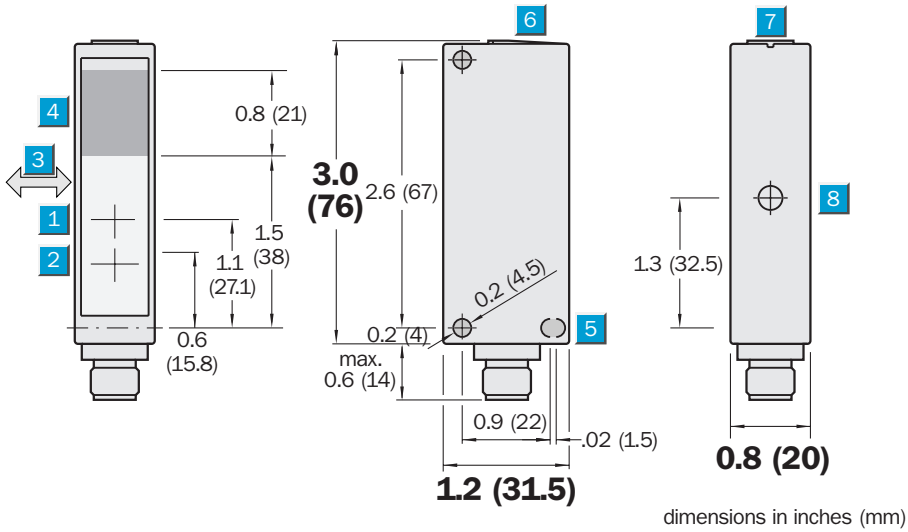
CE

Highlights

- Rugged plastic housing
- Immune to ambient light
- Ultra-precise background suppression for demanding applications
- Signal strength indicator
- Special optics means no false readings on shiny objects
- Crosstalk immunity

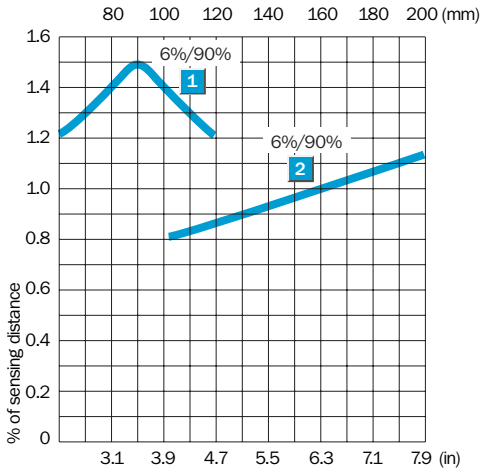
WTV 18-2

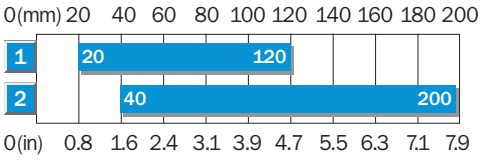
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

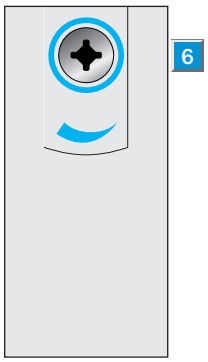




1	Sensing range on black, 6% remission with P 410
2	Sensing range on black, 6% remission with P 420

Adjustments

All types



1	Center of optical axis, sender, WTV 18-2P 410
2	Center of optical axis, sender, WTV 18-2P 420
3	Standard direction of the material being sensed
4	Receiving range
5	Mounting hole Ø 4.5 mm
6	Sensing range adjustment
7	Alignment sight
8	Status indicator

Order Information

Type	Part no.
WTV 18-2P410	1 016 198
WTV 18-2P420	1 016 243

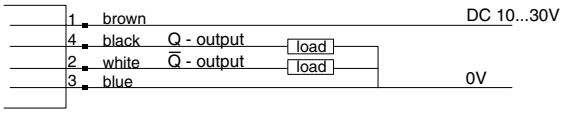
Accessories	page
Cables and connectors	909
Mounting brackets	922, 923

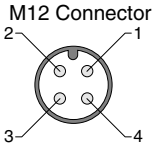
Technical Data	WTV 18-2-	P410	P420							
Sensing range, adjustable	2.4...4.7 in (60...120 mm)	■								
	3.9...7.9 in (100...200 mm)		■							
Light source[1], **light type**	LED, infrared light	■	■							
Light spot diameter	0.3 in at 4.7 in (8 mm at 120 mm)	■								
	0.3 in at 7.9 in (8 mm at 200 mm)		■							
Angle of divergence	Approx. 3.8°	■	■							
Supply voltage V_S	10...30 V DC[2]	■	■							
Ripple[3]	≤ 5 V_{SS}	■	■							
Current consumption[4]	< 30 mA	■	■							
Switching outputs	PNP, Q and $\overline{Q}$	■	■							
Output current I_A max.	100 mA	■	■							
PNP; signal voltage HIGH	V_S – (< 1.5 V)	■	■							
PNP; signal voltage LOW	Approx. 0 V	■	■							
Response time[5]	2 ms	■	■							
Max. switching frequency[6]	250 Hz	■	■							
Connection type	Plug, M12 4-pin	■	■							
VDE protection class[7]	□	■	■							
Circuit protection[8]	A, B, C	■	■							
Enclosure rating	IP 67/NEMA 6	■	■							
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	■	■							
	Storage -13...167°F (-25...75°C)	■	■							
Approximate weight	3.5 oz (100 g)	■	■							
Housing material	Glass fiber reinforced ABS	■	■							

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

All Models





wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 18-2 Short Range

Proximity/Diffuse Sensors - Background Suppression

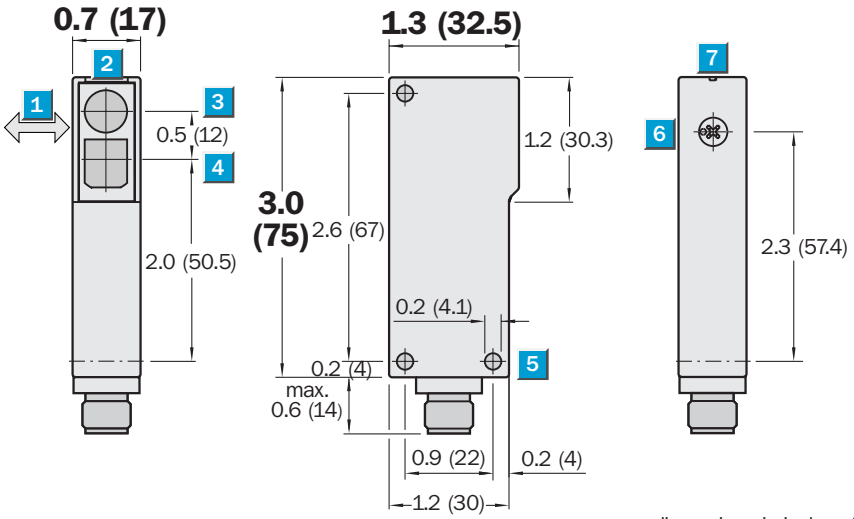
0.4...9.8 in (10...250 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Insensitive to ambient light
- Crosstalk immunity
- Signal strength indicator
- Fast response time
- Cable or M12 quick disconnect versions

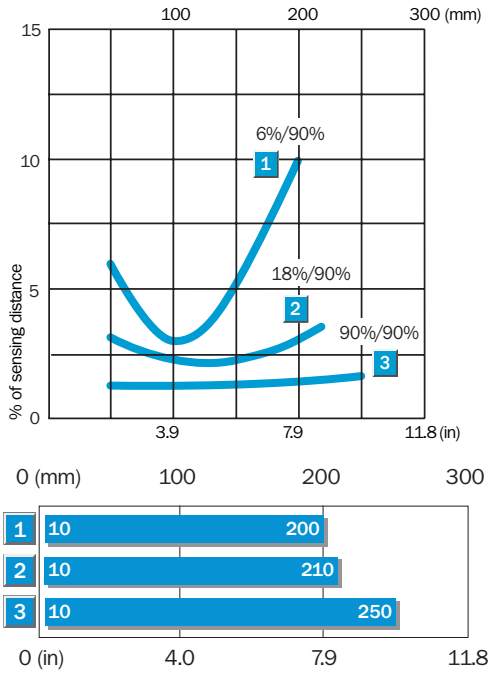
WT 18-2

Dimensional Drawing



dimensions in inches (mm)

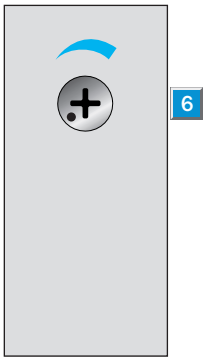
Background Suppression



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Optical axis, sender
4	Optical axis, receiver
5	Mounting hole Ø 4.1 mm
6	Sensing range adjustment
7	Alignment sight

Order Information

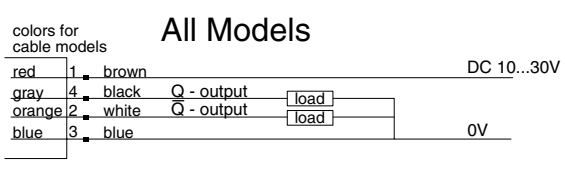
Type	Part no.
WT 18-2P172	1 016 079
WT 18-2P470	1 016 016
WT 18-2P182	1 016 266
WT 18-2P480	1 016 267

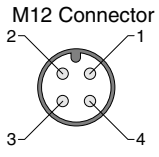
Accessories	page
Cables and connectors	909
Mounting brackets	922, 923

Technical Data	WT 18-2-	P172	P470	P182	P480
Sensing range, adjustable	0.4...9.8 in (10...250 mm)	■	■	■	■
Background suppression	2...9.8 in (50...250 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■
Light source[1], light type	LED, red light			■	■
	LED, infrared light	■	■		
Light spot diameter	0.4 in at 7.9 in (10 mm at 200 mm)	■	■	■	■
Angle of divergence	Approx 2.9°				
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	< 25 mA	■	■	■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.9 V)	■	■	■	■
PNP; signal voltage LOW	Approx. 0 V	■	■	■	■
Response time[5]	< 700 µs	■	■	■	■
Max. switching frequency[6]	700 Hz	■	■	■	■
Connection types	Cable[7], 2 m	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[8]	□	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 18-2

Proximity/Diffuse Sensors- Background Suppression

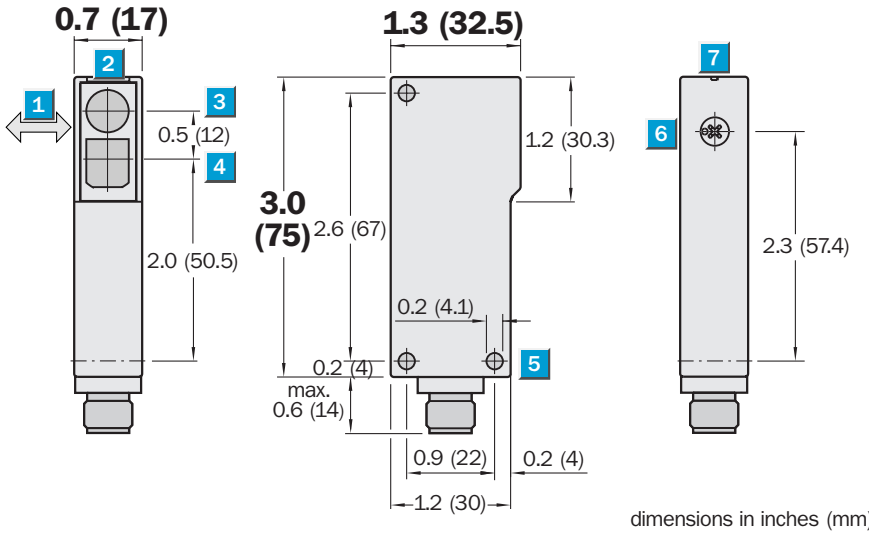
0.8...23.6 in (20...600 mm)
sensing range

Highlights

- Adjustable background suppression
- Insensitive to ambient light sources
- Crosstalk immunity
- Rugged plastic housing
- Cable or M12 quick disconnect versions
- Signal strength indicator
- Visible red light for easy alignment

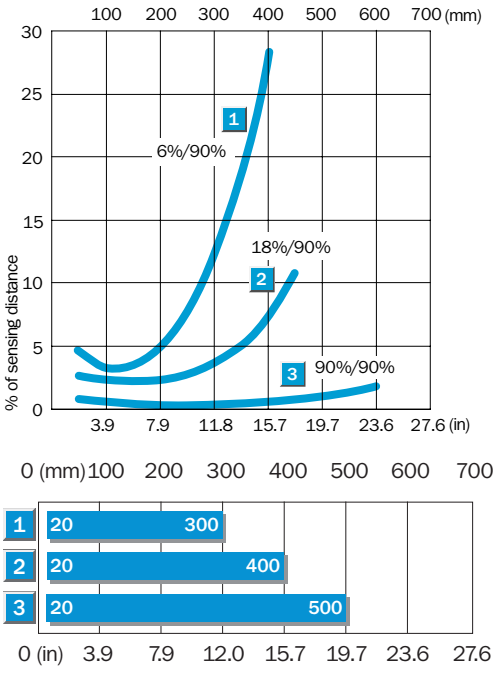
WT 18-2

Dimensional Drawing



dimensions in inches (mm)

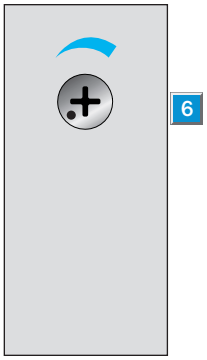
Background Suppression



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Optical axis, sender
4	Optical axis, receiver
5	Mounting hole Ø 4.1 mm
6	Sensing range adjustment
7	Alignment sight

Order Information

Type	Part no.
WT 18-2P132	1 012 892
WT 18-2P430	1 012 897
WT 18-2N132	1 012 882
WT 18-2N430	1 012 884

Accessories

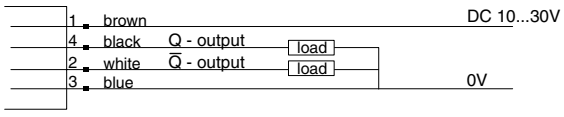
	page
Cables and connectors	909
Mounting brackets	922, 923

Technical Data	WT 18-2-	P132	P430	N132	N430
Sensing range, adjustable	0.8...23.6 in (20...600 mm)	■	■	■	■
Background suppression	2.0...23.6 in (50...600 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■
Light spot diameter	0.6 in at 11.8 in (15 mm at 300 mm)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	< 25 mA	■	■		
	< 35 mA			■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■		
	NPN, Q and $\overline{Q}$			■	■
Output current I_A max.	100 mA	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.9 V)	■	■		
PNP; signal voltage LOW	Approx. 0 V	■	■		
NPN; signal voltage HIGH	Approx. V_S			■	■
NPN; signal voltage LOW	< 1.5 V			■	■
Response time[5]	< 700 µs	■	■	■	■
Max. switching frequency[6]	700 Hz	■	■	■	■
Connection types	Cable[7], 2 m	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[8]	□	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

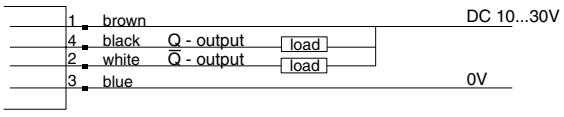
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

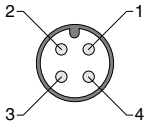
PNP Models



NPN Models



M12 Connector

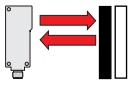


wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 18-2

Proximity/Diffuse Sensors- Background Suppression




0.8...27.6 in (20...700 mm)
sensing range

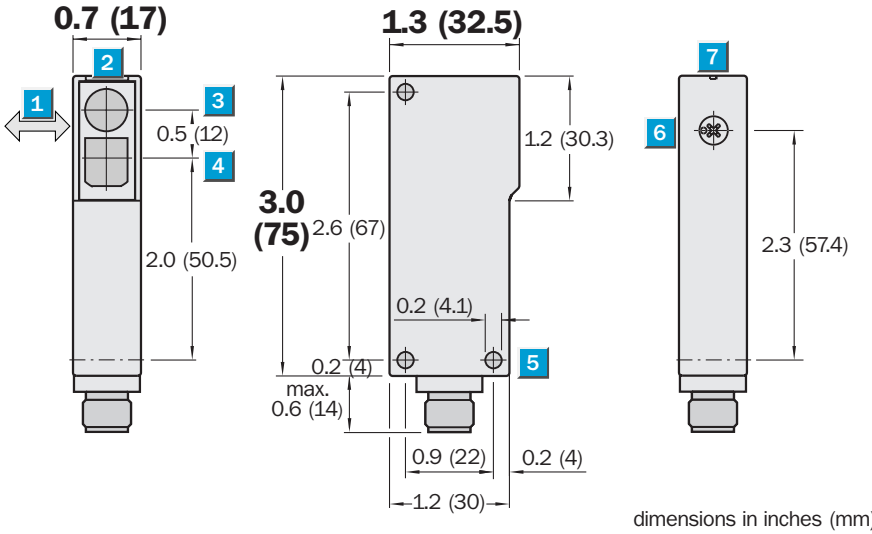
CE

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Insensitive to ambient light sources
- Crosstalk immunity
- Adjustable sensing range
- Cable or M12 quick disconnect versions
- Signal strength indicator

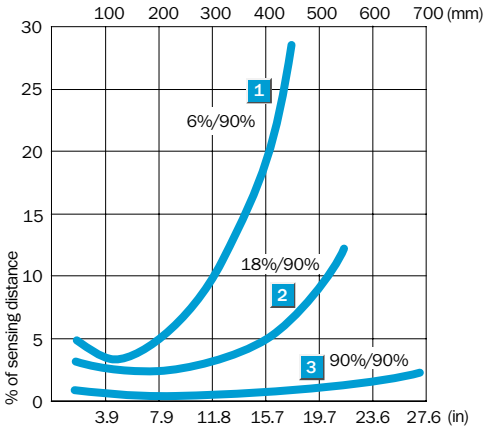
WT 18-2

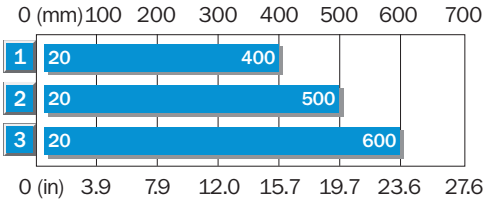
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

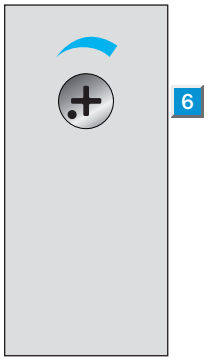




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Optical axis, sender
4	Optical axis, receiver
5	Mounting hole Ø 4.1 mm
6	Sensing range adjustment
7	Alignment sight

Order Information

Type	Part no.
WT 18-2P112	1 012 887
WT 18-2P115	1 012 890
WT 18-2P410	1 012 895
WT 18-2P610	1 012 900
WT 18-2N112	1 012 879
WT 18-2N115	1 012 881
WT 18-2N610	1 012 885
WT 18-2N410	1 015 149

Accessories

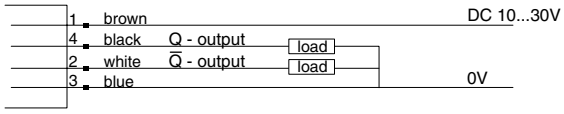
	page
Cables and connectors	909
Mounting brackets	922, 923

Technical Data	WT 18-2-	P112	P115	P410	P610	N112	N115	N410	N610
Sensing range, adjustable	0.8...27.6 in (20...700 mm)	■	■	■	■	■	■	■	■
Background suppression	2.0...27.6 in (50...700 mm)	■	■	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■	■	■	■
Light source[1], light type	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	0.8 in at 15.7 in (20 mm at 400 mm)	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	< 25 mA	■	■	■	■				
	< 45 mA					■	■	■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■	■				
	NPN, Q and $\overline{Q}$					■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.9 V)	■	■	■	■				
PNP; signal voltage LOW	Approx. 0 V	■	■	■	■				
NPN; signal voltage HIGH	Approx. V_S					■	■	■	■
NPN; signal voltage LOW	< 1.5 V					■	■	■	■
Response time[5]	< 700 µs	■	■	■	■	■	■	■	■
Max. switching frequency[6]	700 Hz	■	■	■	■	■	■	■	■
Connection types	Cable[7], 2 m	■				■			
	Cable[7], 5 m		■				■		
	Plug, M12 4-pin			■				■	
	Plug, square 6-pin				■				■
VDE protection class[8]	□	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■		■	■	■	
	IP 65				■				■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

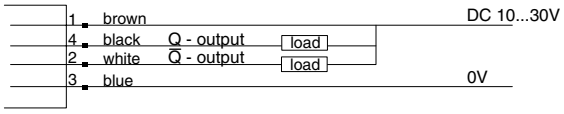
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

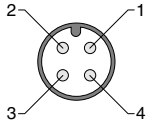
PNP Models



NPN Models

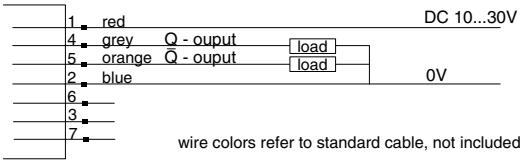


M12 Connector



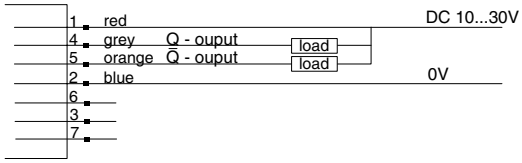
wire colors refer to standard cable, not included with quick disconnect models

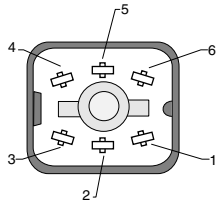
PNP



wire colors refer to standard cable, not included

NPN





SICK

WT 18-2 Long Range

Proximity/Diffuse Sensors- Background Suppression

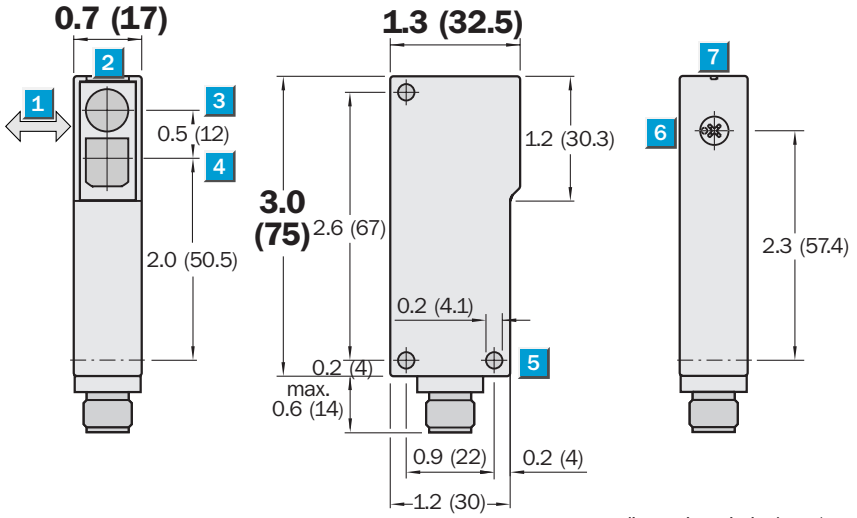
0.8...39.4 in (20...1000 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Insensitive to ambient light sources
- Crosstalk immunity
- Signal strength indicator
- Adjustable sensing range
- Cable or M12 quick disconnect versions

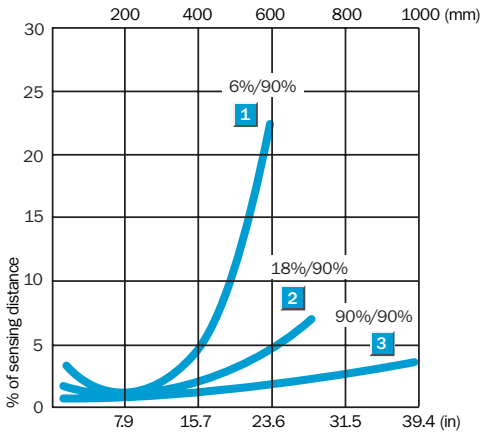
WT 18-2

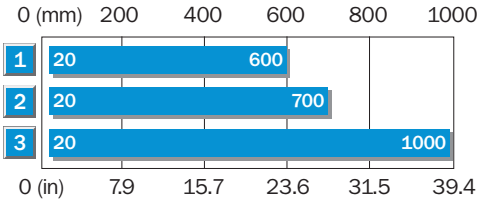
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

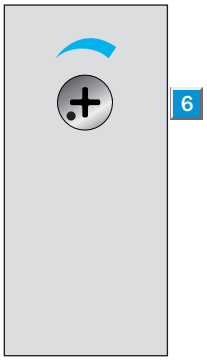




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 4.1 mm
6	Sensing range adjustment
7	Alignment sight

Order Information

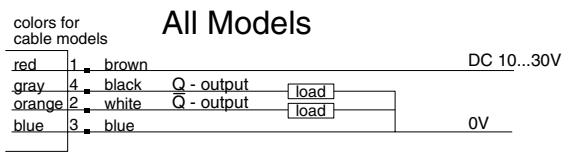
Type	Part no.
WT 18-2P122	1 012 921
WT 18-2P420	1 012 919

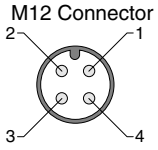
Accessories	page
Cables and connectors	902
Mounting brackets	922, 923

Technical Data	WT 18-2-	P122	P420
Sensing range, adjustable	0.8...39.4 in (20...1000 mm)		
Background suppression	2.0...39.4 in (50...1000 mm)		
Background suppression capability	% of set sensing distance (see previous page)		
Light source[1], **light type**	LED, infrared light		
Light spot diameter	1.2 in at 23.6 in (30 mm at 600 mm)		
Angle of divergence	Approx. 3°		
Supply voltage V_S	10...30 V DC[2]		
Ripple[3]	≤ 5 V_{SS}		
Current consumption[4]	< 25 mA		
Switching outputs	PNP, Q and $\overline{Q}$		
Output current I_A max.	100 mA		
PNP; signal voltage HIGH	V_S – (< 2.9 V)		
PNP; signal voltage LOW	Approx. 0 V		
Response time[5]	< 700 µs		
Max. switching frequency[6]	700 Hz		
Connection types	Cable[7], 2 m		
	Plug, M12 4-pin		
VDE protection class[8]	□		
Circuit protection[9]	A, B, C		
Enclosure rating	IP 67/NEMA 6		
Ambient temperature T_A	Operation -40...140°F (-40...60°C)		
	Storage -40...167°F (-40...75°C)		
Approximate weight	3.5 oz (100 g)		
Housing material	Glass fiber reinforced ABS		

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models

WT 23

Proximity/Diffuse Sensors- Background Suppression

1.2...39.4 in (30...1000 mm)
sensing range

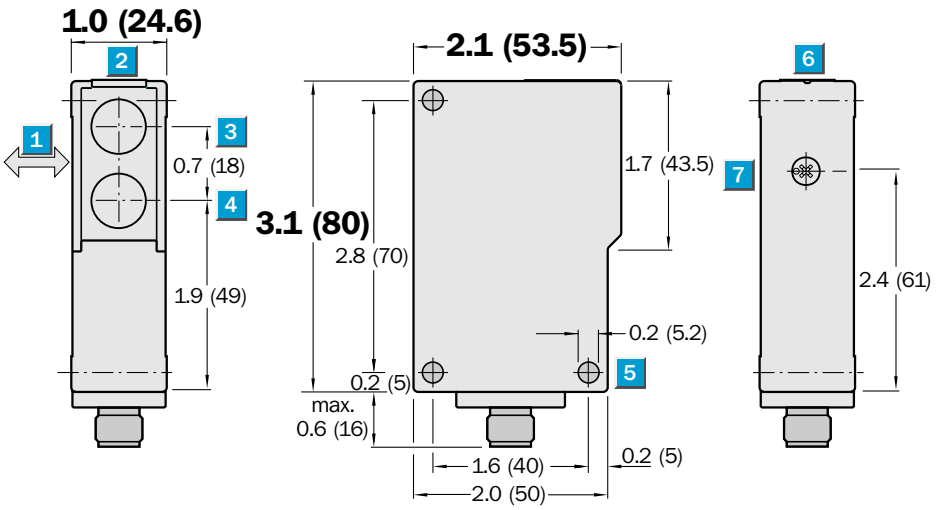
CE

Highlights

- Rugged plastic housing
- Adjustable background suppression sensor in a low cost housing
- Signal strength indicator
- M12 quick disconnect

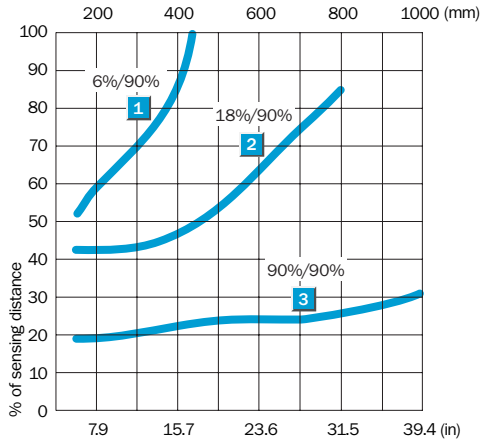
WT 23

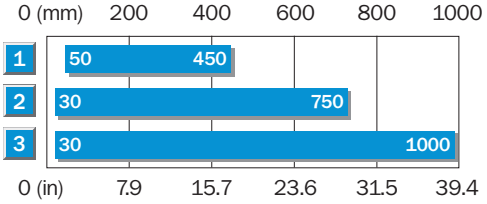
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

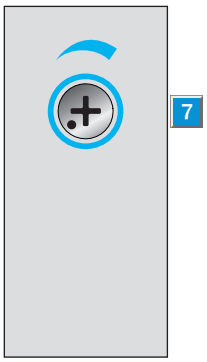




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 23-F420



1	Standard direction of the material being sensed
2	Status indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.2 mm
6	Alignment sight
7	Sensitivity adjustment

Order Information

Type	Part no.
WT 23-F420	1 016 667

Accessories

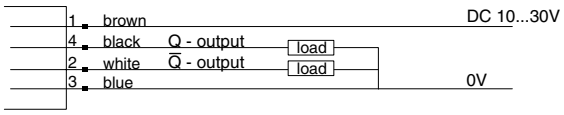
	page
Cables and connectors	909
Mounting brackets	923, 924, 935

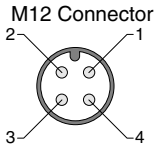
Technical Data	WT 23-	F420								
Sensing range, adjustable	1.2...39.4 in (30...1000 mm)									
Background suppression	3.9...39.4 in (100...1000 mm)									
Background suppression capability	% of set sensing distance (see previous page)									
Light source[1], **light type**	LED, infrared light									
Light spot diameter	1.2 in at 31.5 in (30 mm at 800 mm)									
Angle of divergence	Approx 2.1°									
Supply voltage V_S	12...24 V DC[2]									
Ripple[3]	≤ 5 V_{SS}									
Current consumption[4]	≤ 30 mA									
Switching outputs	PNP, Q and $\overline{Q}$									
Output current I_A max.	100 mA									
Response time[5]	2.5 ms									
Max. switching frequency[6]	200 Hz									
Connection type	Plug, M12 4-pin									
VDE protection class[7]	⧈									
Circuit protection[8]	A, B, C									
Enclosure rating	IP 65/NEMA 4									
Ambient temperature T_A	Operation -13...140°F (-25...60°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	4.2 oz (120 g)									
Housing material	Glass fiber reinforced ABS									

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Withstand voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

PNP Models





wire colors refer to standard cable, not included with quick disconnect models

WT 23

Proximity/Diffuse Sensors-Energetic

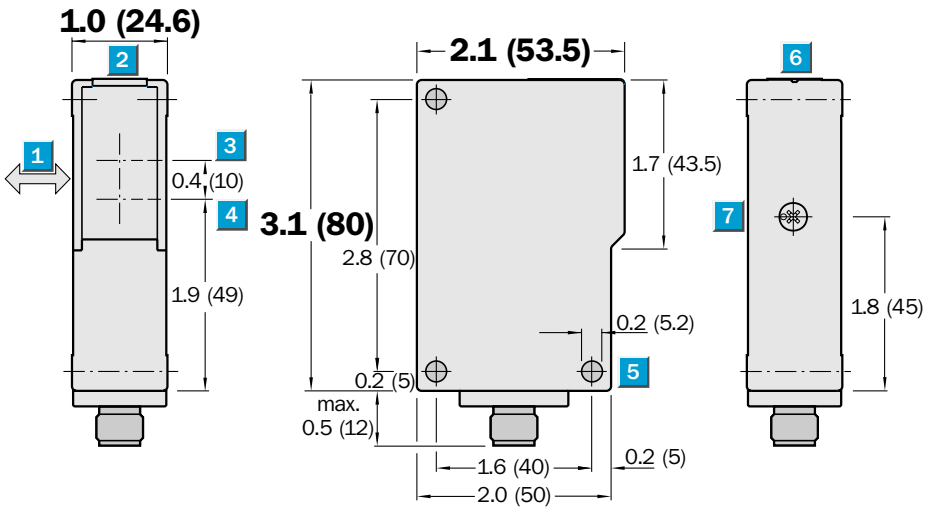
11.8...78.7 in (300...2000 mm)
sensing range

Highlights

- Infrared light
- Adjustable energetic photoelectric proximity sensor
- Low-cost sensor
- M12 quick disconnect version

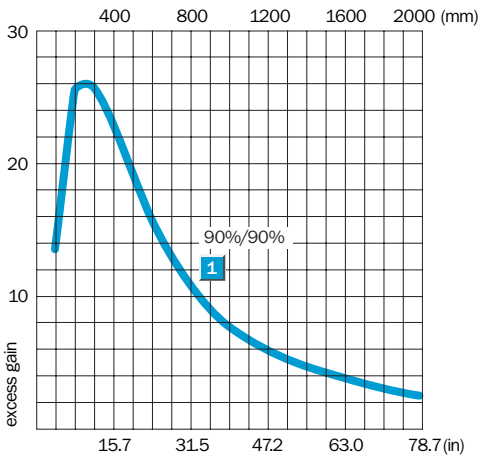
WT 23

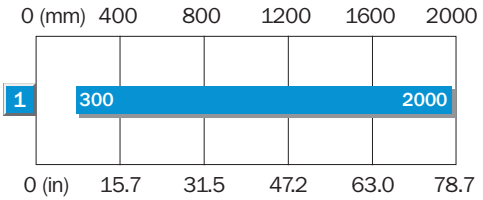
Dimensional Drawing



dimensions in inches (mm)

Excess Gain





1 Sensing range on white, 90% remission

Adjustments

WT 23-F410

1 Standard direction of the material being sensed
2 Output indicator
3 Center of optical axis, sender
4 Center of optical axis, receiver
5 Mounting hole Ø 5.2 mm
6 Alignment sight
7 Sensitivity adjustment

Order Information

Type	Part no.
WT 23-F410	1 015 925

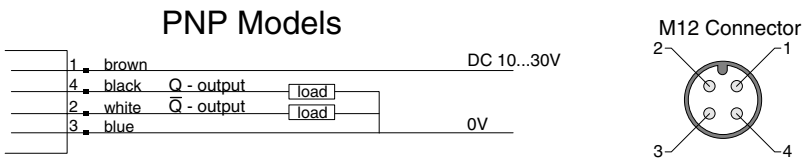
Accessories

	page
Cables and connectors	909
Mounting brackets	923, 924, 935

Technical Data	WT 23-	F410
Sensing range, adjustable	11.8...78.7 in (300…2000 mm)	
Light source[1]**, light type**	LED, infrared light	
Light spot diameter	7.9 in at 78.7 in (200 mm at 2000 mm)	
Supply voltage V_S	12…24 V DC[2]	
Ripple[3]	≤ 5 V_{SS}	
Current consumption[4]	≤ 25 mA	
Switching outputs	PNP, Q and $\overline{Q}$	
Output current I_A max.	100 mA	
Response time[6]	2.5 ms	
Max. switching frequency[7]	250 Hz	
Connection type	Plug, M12 4-pin	
VDE protection class[9]	□	
Circuit protection[10]	A, B, C	
Enclosure rating	IP 65	
Ambient temperature T_A	Operation -13...140°F (-25…60°C)	
	Storage -40...158°F (-40…70°C)	
Approximate weight	3.5 oz (100 g)	
Housing material	Glass fiber reinforced ABS	

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
5) Provide suitable spark suppression for inductive or capacitive loads
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC, 250 V AC
10) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

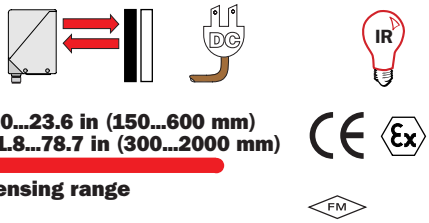
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WT 24 Exi

Proximity/Diffuse Sensors-Background Suppression



6.0...23.6 in (150...600 mm)
11.8...78.7 in (300...2000 mm)

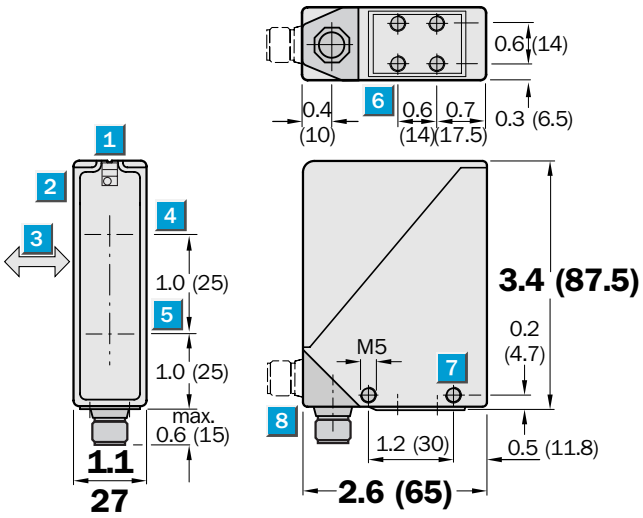
sensing range

Highlights

- Infrared light source
- Rugged die cast metal housing
- Adjustable background suppression
- Explosion protection EEx ia IIC T6
- Adjustable sensing range
- FM approved for Class I, Division I hazardous environments
- Terminal chamber for connection flexibility
- Cable connections swivel 90 for easy installation

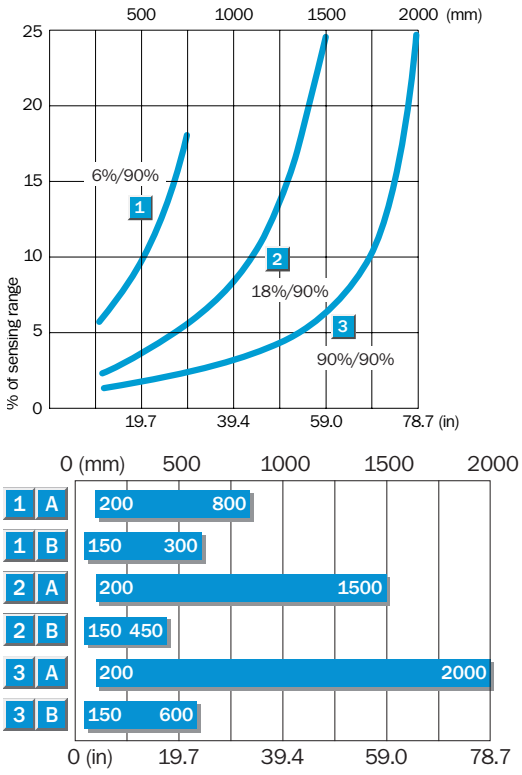
WT 24 Exi

Dimensional Drawing



dimensions in inches (mm)

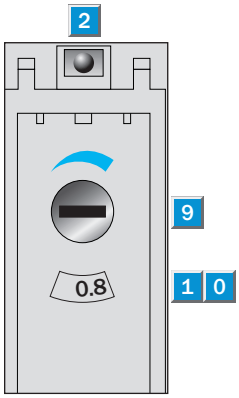
Background Suppression



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission
A	WT 24-X 2101/X 4101
B	WT 24-X 4601

Adjustments

All types



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of the material being sensed
4	Center of transmitter's optical axis
5	Center of receiver's optical axis
6	M5 threaded mounting hole – 8 mm deep
7	M5 threaded mounting hole
8	PG 9 cable gland or M12 plug, rotatable
9	Sensing range adjustment
10	Sensing range indicator

Order Information

Type	Part No.
WT 24-X2101	1 011 974
WT 24-X4101	1 011 973
WT 24-X4601	1 013 120

Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Power supply units	966

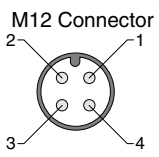
Technical Data	WT 24-	X2101	X4101	X4601
Sensing range, adjustable	11.8...78.7 in (300...2000 mm)	■	■	
	6.0...23.6 in (150...600 mm)			■
Light source[1], **light type**	LED, infrared light	■	■	■
Supply voltage V_S[2]	8.2 V DC (5...13.5 V)[3]	■	■	■
Ripple[4]	0.4 V_{SS}	■	■	■
Terminal capacitance	≤ 15 nF	■	■	■
Terminal inductance	≤ 75 µH	■	■	■
Current consumption[5]				
Light beam unbroken	≥ 2.2 mA	■	■	■
Light beam broken	≤ 1 mA	■	■	■
Switching output	Control current dependent on	■	■	■
	switching state (to NAMUR EN 50227)			
Switching mode	Light switching	■	■	■
Response time[6]	≤ 10 ms	■	■	■
Max. switching frequency[7]	50/s	■	■	■
Connection types	Plug, M12 4-pin		■	■
	PG 9 terminal connection	■		
Approval	PTB No. Ex97 D2034	■	■	■
VDE protection class[8]	□	■	■	■
Circuit protection[9]	A, C	■	■	■
Enclosure rating	IP 65	■	■	■
Ambient temperature T_A	Operation -4...122°F (-20...50°C)	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■
Housing material	Die cast zinc	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Supply with disconnector device EN 2 Ex
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected

C = Interference pulse suppression

Connection Diagram

wire colors refer to standard cable, not included



SICK

WT 24-2 Red

Proximity/Diffuse Sensors-Background Suppression

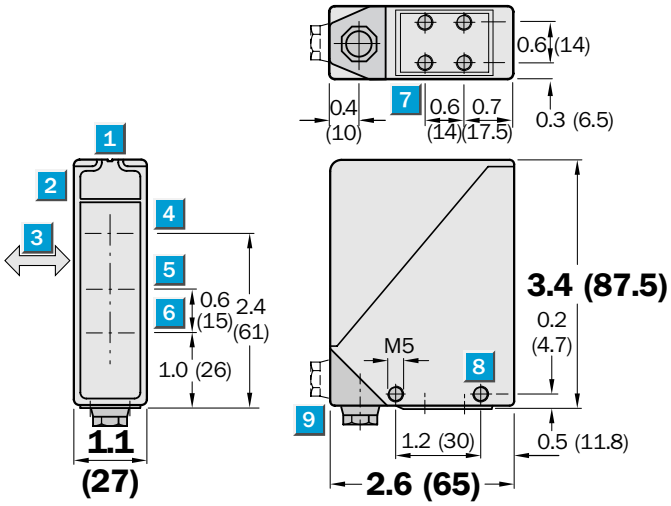
2.0...47.2 in (50...1200 mm)
sensing range

Highlights

- Robust metal housing
- Red light for easy alignment
- Adjustable background suppression
- Alarm output and test input
- Selectable time delays
- Crosstalk immunity
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

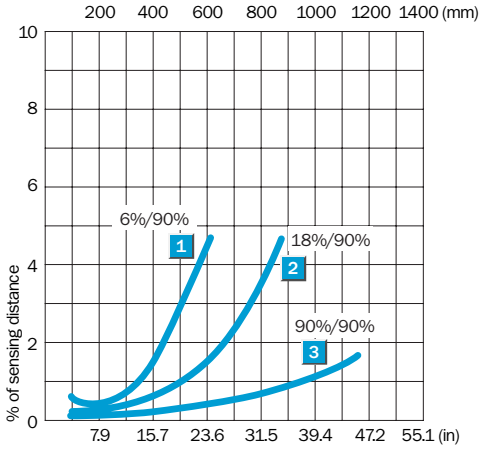
WT 24-2

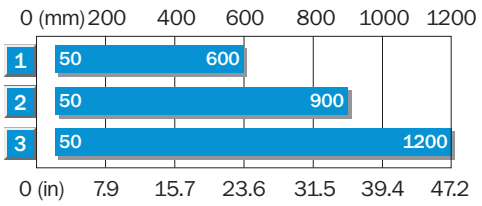
Dimensional Drawing



dimensions in inches (mm)

Background Suppression



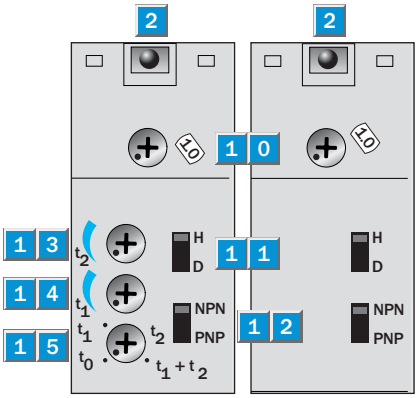


1	Sensing range on black[9]
2	Sensing range on gray[9]
3	Sensing range on white[9]

(see footnotes on next page)

Adjustments

WT 24-2B 250	WT 24-2B 240
WT 24-2V 250	WT 24-2B 440
	WT 24-2V 540



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of the material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver (close range)
6	Center of optical axis, receiver (far range)
7	M5 threaded mounting hole, 6 mm deep
8	M5 threaded mounting hole, through-hole
9	PG screw fixing and plug rotatable by 90°
10	Sensing range adjustment
11	Light/dark selector
12	NPN/PNP selector
13	Time control t_2 = OFF-delay
14	Time control t_1 = ON-delay
15	Time delay selector switch

Order Information

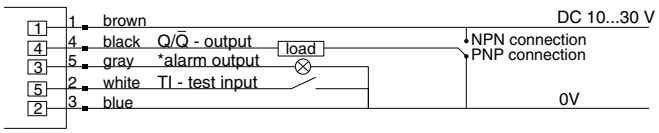
Type	Part no.
WT 24-2 B 240	1 017 813
WT 24-2 B 250	1 017 883
WT 24-2 B 440	1 016 934
WT 24-2 V 250	1 017 887
WT 24-2 V 540	1 017 888

Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Special Accessories	page
Dust shields	955
Weather hoods	955
Cooling plates	958

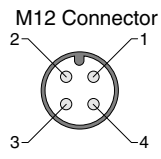
Technical Data	WT 24-2-	B240	B250	B440	V250	V540
Sensing range, adjustable	2.0...47.2 in (50...1200 mm)	■	■	■	■	■
Background suppression	3.9...47.2 in (100...1200 mm)	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■	■
Light spot diameter	Approx. 1.5 in at 47.2 in (40 mm at 1200 mm)	■	■	■	■	■
Angle of divergence	Approx 2°	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■
Ripple[3]	$< 5\ V_{SS}$	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■		■		■
	≤ 70 mA, front lens heating		■		■	
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■
Max. switching frequency[6]	1 kHz	■	■	■	■	■
Alarm output	PNP				■	■
Time delay	Adjustable, 0.5...10 sec		■		■	
Test input "TE"	Sender switched off	■	■	■	■	■
Sender OFF	PNP or NPN: TE to 0 V	■	■	■	■	■
Connection types	PG 9 terminal chamber	■	■		■	
	Plug, M12 4-pin			■		
	Plug, M12 5-pin					■
VDE protection class[7]	□	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■	■	■
Front lens heating			■		■	
Housing material	Die cast zinc	■	■	■	■	■

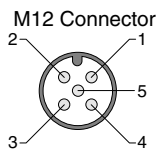
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
9) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



wire colors refer to standard cable, not included
* alarm output available on special models only





WT 24-2 IR

Proximity/Diffuse Sensors-Background Suppression

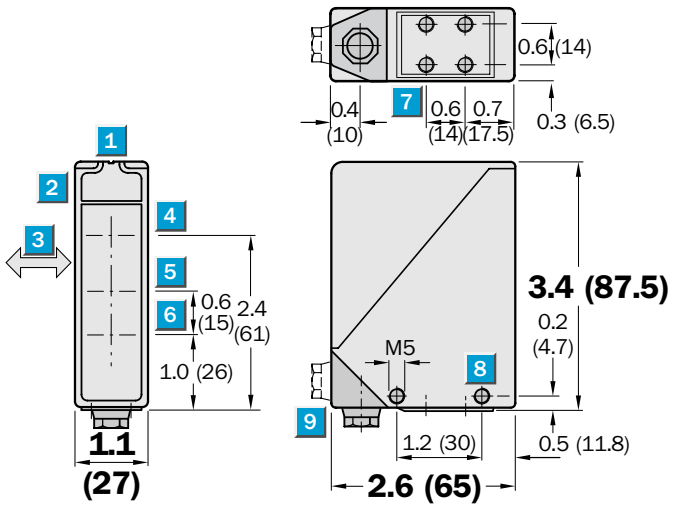
1.2...98.4 in (30...2500 mm)
sensing range

Highlights

- Robust metal housing
- Adjustable background suppression
- PNP and NPN in the same switch
- Alarm output and test input
- Crosstalk immunity
- Selectable time delays
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

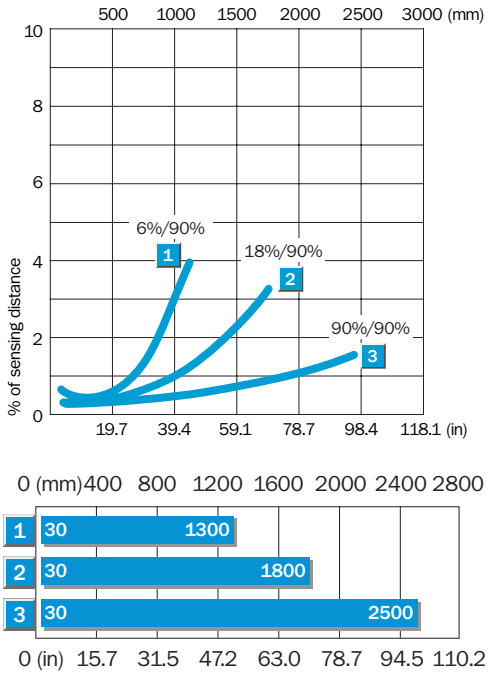
WT 24-2

Dimensional Drawing



dimensions in inches (mm)

Background Suppression

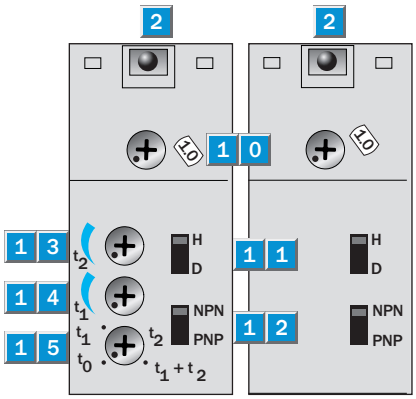


1	Sensing range on black[9]
2	Sensing range on gray[9]
3	Sensing range on white[9]

(see footnotes on next page)

Adjustments

WT 24-2B220	WT 24-2B210
WT 24-2B420	WT 24-2B410
WT 24-2V220	WT 24-2V510



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of the material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver (close range)
6	Center of optical axis, receiver (far range)
7	M5 threaded mounting hole, 6 mm deep
8	M5 threaded mounting hole, through-hole
9	PG screw fixing or plug rotatable by 90°
10	Sensing range adjustment
11	Light/dark selector
12	NPN/PNP selector
13	Time control t_2 = OFF-delay
14	Time control t_1 = ON-delay
15	Time delay selector switch

Order Information

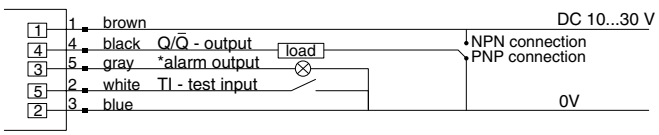
Type	Part no.
WT 24-2B210	1 016 931
WT 24-2B220	1 017 882
WT 24-2B410	1 016 933
WT 24-2B420	1 017 885
WT 24-2V220	1 017 886
WT 24-2V510	1 017 855

Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Special Accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

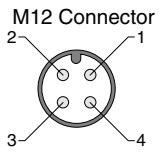
Technical Data	WT 24-2-	B210	B220	B410	B420	V220	V510
Sensing range, adjustable	1.2...98.4 in (30...2500 mm)	■	■	■	■	■	■
Background suppression	3.9...98.4 in (100...2500 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■	■	■
Light spot diameter	Approx. 3.2 in at 98.4 in (80 mm at 2500 mm)	■	■	■	■	■	■
Angle of divergence	Approx 1.8°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■		■			■
	≤ 70 mA, front lens heating		■		■	■	
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■	■
Max. switching frequency[6]	1 kHz	■	■	■	■	■	■
Alarm output	PNP					■	■
Time delay	Adjustable, 0.5…10 sec		■		■	■	
Test input "TE"	Sender switched off	■	■	■	■	■	■
Sender OFF	PNP or NPN: TE to 0 V	■	■	■	■	■	■
Connection types	PG 9 terminal chamber	■	■			■	
	Plug, M12 4-pin			■	■		
	Plug, M12 5-pin						■
VDE protection class[7]	□	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■	■	■	■
Front lens heating			■		■	■	
Housing material	Die cast zinc	■	■	■	■	■	■

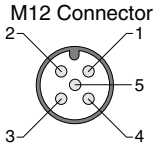
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
9) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



wire colors refer to standard cable, not included
* alarm output available on special models only





WT 34 Red

Proximity/Diffuse Sensors - Background Suppression

2.0 ... 47.2 in (50...1200 mm)

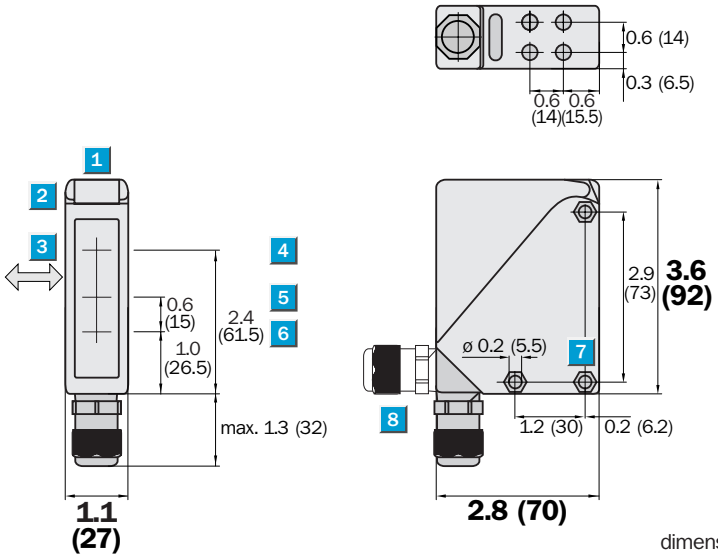
sensing range

Highlights

- Sturdy plastic housing
- Red light for easy alignment
- Adjustable background suppression
- Signal strength indicator
- Selectable time delays
- Terminal chamber for connection flexibility
- Cable connections swivel 90° for easy installation
- Alarm output and test input

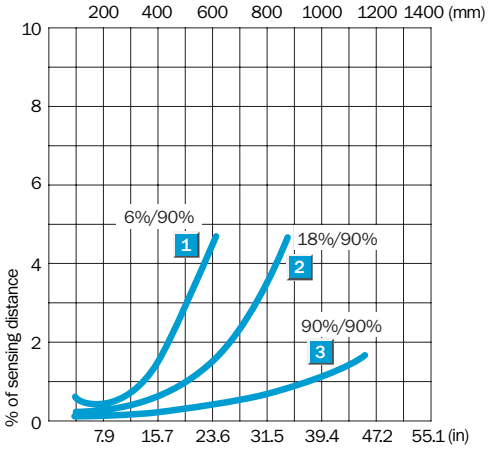
WT 34

Dimensional Drawing



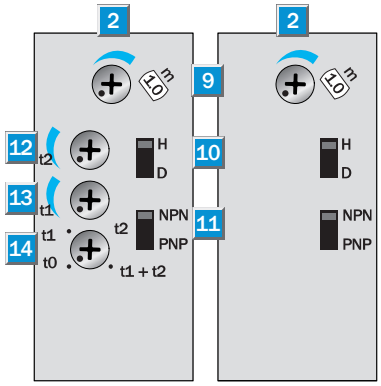
dimensions in inches (mm)

Background Suppression

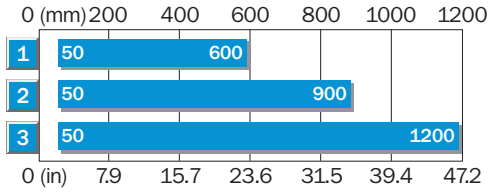


Adjustments

WT 34-V250	WT 34-V240
WT 34-B450	WT 34-B440
	WT 34-V540



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver at close range
6	Center of optical axis, receiver at long range
7	Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
8	M16 screw fixing or plug rotatable by 90°
9	Sensing range adjustment
10	Light/dark selector
11	NPN/PNP selector
12	Time control t_2 = OFF-delay
13	Time control t_1 = ON-delay
14	Time delay selector switch



1	Sensing range on black[9]
2	Sensing range on gray[9]
3	Sensing range on white[9]

(see footnotes on next page)

Order Information

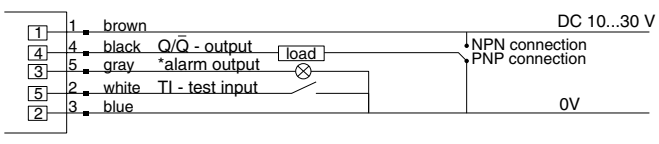
Type	Part no.
WT 34-V240	1 019 227
WT 34-V250	1 019 236
WT 34-B440	1 109 237
WT 34-B450	1 019 234
WT 34-V540	1 019 238

Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

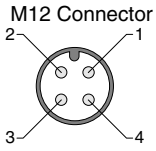
Technical Data	WT 34-	V240	V250	B440	B450	V540
Sensing range, adjustable	2.0...47.2 in (50...1200 mm)	■	■	■	■	■
Background suppression	3.9...47.2 in (100...1200 mm)	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■
Light source[1], light type	LED, red light	■	■	■	■	■
Light spot diameter	Approx. 1.6 in at 47.2 in (40 mm at 1200 mm)	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■
Ripple[3]	$< 5\ V_{PP}$	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■	■	■	■	■
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■
Alarm output	PNP	■	■			■
Time delay	Adjustable, 0.5 to 10 s		■		■	
Test input "TE"	Sender switched off	■	■	■	■	■
Sender off	PNP or NPN: TE to 0 V	■	■	■	■	■
Connection types	M16 terminal chamber	■	■			
	Plug, M12 4-pin			■	■	
	Plug, M12 5-pin					■
VDE protection class[7]	⊡	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■
Approximate weight	4.9 oz (140 g)	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■

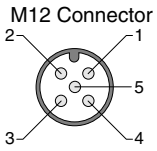
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal flight time with ohmic load
6) With light/dark ratio 1:1
7) Withstand voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
9) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



wire colors refer to standard cable, not included
* alarm output available on special models only





WT 34 IR

Proximity/Diffuse Sensors - Background Suppression

1.2...98.4 in (30...2500 mm)

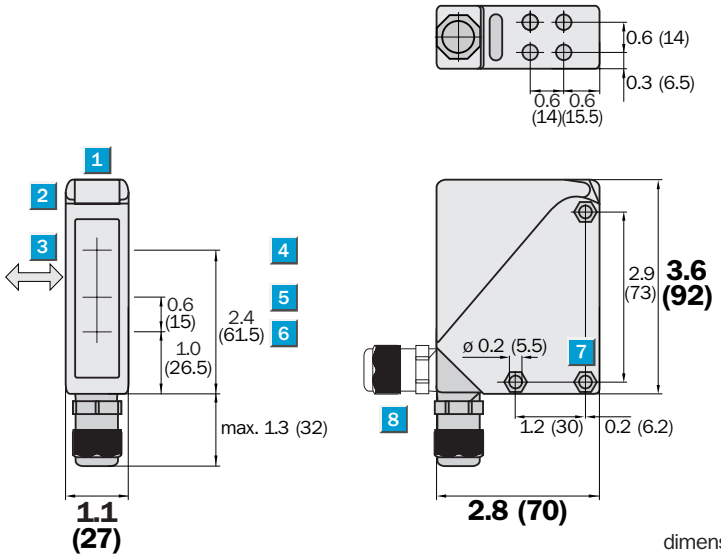
sensing range

Highlights

- Sturdy plastic housing
- Adjustable background suppression
- Signal strength indicator
- Alarm output and test input
- Selectable time delays
- Terminal chamber for connection flexibility
- Cable connections swivel 90° for easy installation

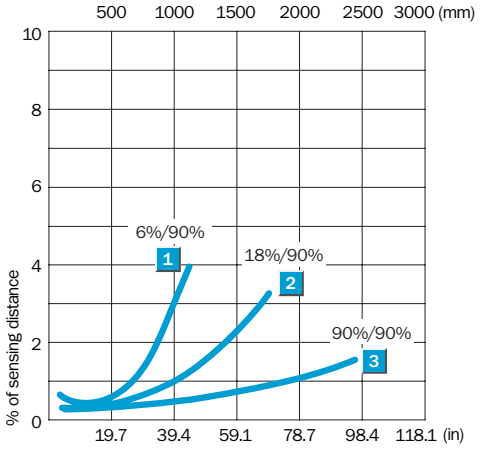
WT 34

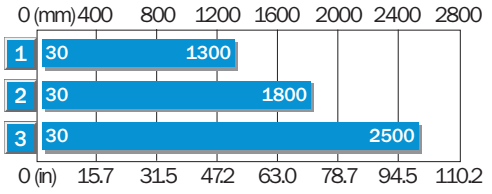
Dimensional Drawing



dimensions in inches (mm)

Background Suppression



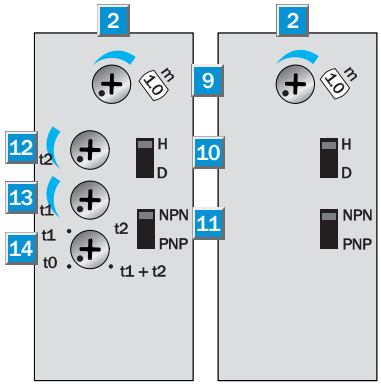


1	Sensing range on black[9]
2	Sensing range on gray[9]
3	Sensing range on white[9]

(see footnotes on next page)

Adjustments

WT 34-B420	WT 34-B410
WT 34-V220	WT 34-V210
	WT 34-V510



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver at close range
6	Center of optical axis, receiver at long range
7	Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
8	M16 screw fixing or plug rotatable by 90°
9	Sensing range adjustment
10	Light/dark selector
11	NPN/PNP selector
12	Time control t_2 = OFF-delay
13	Time control t_1 = ON-delay
14	Time delay selector switch

Order Information

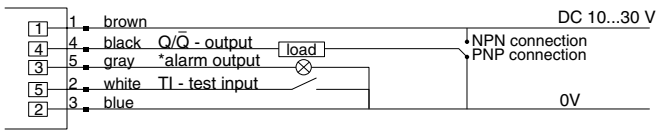
Type	Part no.
WT 34-V210	1 019 280
WT 34-V220	1 019 228
WT 34-B410	1 109 229
WT 34-B420	1 019 230
WT 34-V510	1 019 231

Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

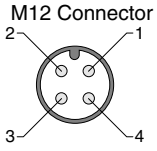
Technical Data	WT 34-	V210	V220	B410	B420	V510				
Sensing range, adjustable	1.2....98.4 in (30...2500 mm)	■	■	■	■	■				
Background suppression	3.9...98.4 in (100...2500 mm)	■	■	■	■	■				
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■				
Light source[1], light type	LED, infrared light	■	■	■	■	■				
Light spot diameter	Approx. 3.1 in at 98.4 in (80 mm at 2500 mm)	■	■	■	■	■				
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■				
Ripple[3]	$< 5\ V_{PP}$	■	■	■	■	■				
Current consumption[4]	≤ 50 mA	■	■	■	■	■				
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■				
Output current I_A max.	100 mA	■	■	■	■	■				
Response time[5]	≤ 500 µs	■	■	■	■	■				
Max. switching frequency[6]	1000 Hz	■	■	■	■	■				
Alarm output	Alarm, PNP	■	■			■				
Time delay	Adjustable, 0.5 to 10 s		■		■					
Test input "TE"	Sender switched off	■	■	■	■	■				
Sender off	PNP or NPN: TE to 0 V	■	■	■	■	■				
Connection types	M16 terminal chamber	■	■							
	Plug, M12 4-pin			■	■					
	Plug, M12 5-pin					■				
VDE protection class[7]	⧈	■	■	■	■	■				
Circuit protection[8]	A, B, C	■	■	■	■	■				
Enclosure rating	IP 67	■	■	■	■	■				
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■	■	■	■				
	Storage -40...167°F (-40...75°C)	■	■	■	■	■				
Approximate weight	4.9 oz (140 g)	■	■	■	■	■				
Housing material	Glass fiber reinforced ABS	■	■	■	■	■				

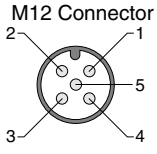
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal flight time with ohmic load
6) With light/dark ratio 1:1
7) Withstand voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
9) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



wire colors refer to standard cable, not included
* alarm output available on special models only





WT 260

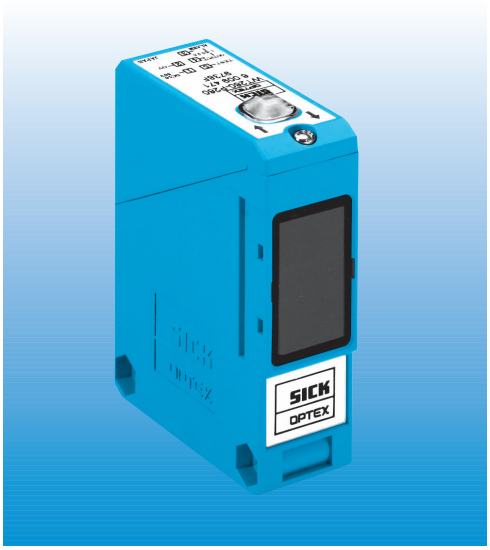
Proximity/Diffuse Sensors - Background Suppression

0...15 in (0...380 mm)
sensing range

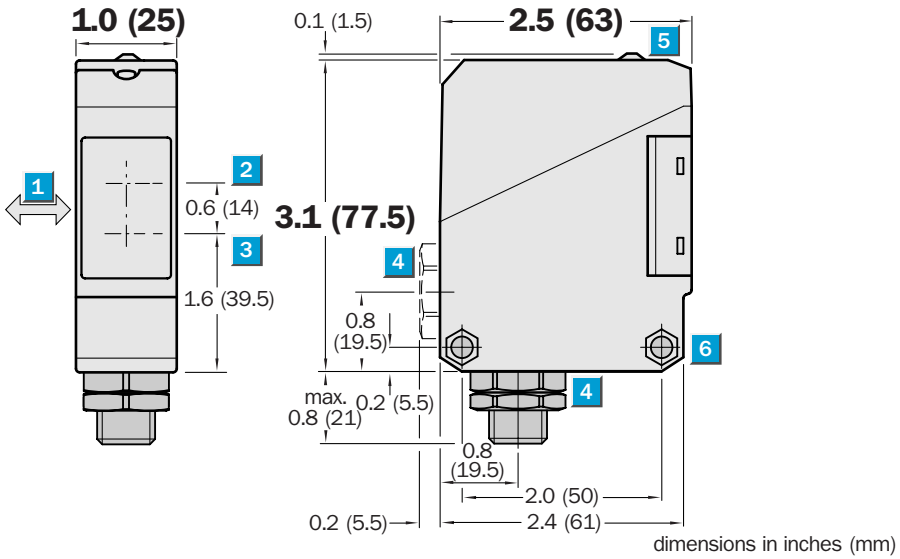
Highlights

- Reliable detection of dark objects even against light backgrounds
- Adjustable sensing range
- Rugged plastic housing
- Sensitivity adjustment
- Alarm output and test input
- Signal strength indicator

WT 260

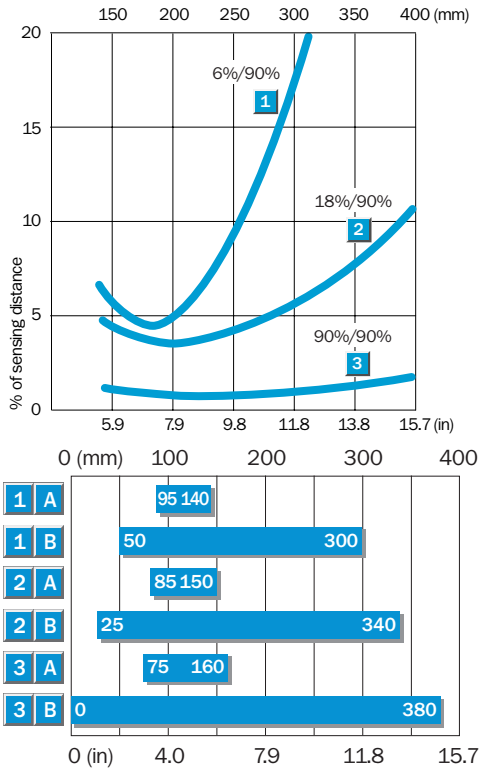


Dimensional Drawing



dimensions in inches (mm)

Background Suppression

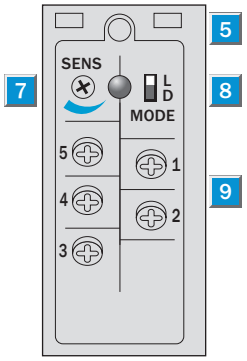


1	Sensing range on black[11]/background white
2	Sensing range on grey[11]/background white
3	Sensing range on white[11]/background white
A	Sensing range control set to MIN
B	Sensing range control set to MAX

see footnotes on next page

Adjustments

All types



1	Standard direction of material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or M12 equipment plug bottom
5	LED signal strength indicator, red
6	Through hole Ø 5.2 mm on both sides for M5 hex nut
7	Sensing range adjustment
8	Light/dark switching (L = light switching, D = dark switching)
9	Terminals

Order Information

Type	Part no.
WT 260-P260	6 009 471
WT 260-P460	1 011 540
WT 260-P560	1 011 541

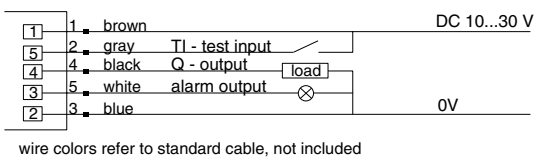
Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935

* included with delivery

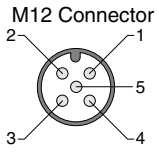
Technical Data	WT 260-	P260	P460	P560
Sensing range, adjustable	0...15 in (0...380 mm)[1]	■	■	■
Background suppression	1.0...15 in (25...380 mm)	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■	■
Light source[2], **light type**	LED, infrared light	■	■	■
Light spot diameter	Approx. 0.7 in at 11.8 in (17 mm at 300 mm)	■	■	■
Angle of divergence	Approx. 1.5°	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■
Ripple[4]	≤ 5 V_{SS}	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■
Output current I_A max.	100 mA	■	■	■
Light receiver, switching mode	Light/dark switching selectable via switch	■	■	■
Response time[6]	≤ 2 ms	■	■	■
Max. switching frequency[7]	250 Hz	■	■	■
Alarm output VMA[8]	100 mA, static	■		■
Test input "TE" sender off	PNP: TE to + V_S	■	■	■
Connection types	Terminal chamber	■		
	Plug, M12 4-pin		■	
	Plug, M12 5-pin			■
VDE protection class[9]	□	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■
Enclosure rating	IP 66/NEMA 4	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25 ...55°C)	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■
Approximate weight	4.2 oz (120 g)	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■

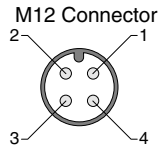
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Operating reserve < 50 %
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



wire colors refer to standard cable, not included

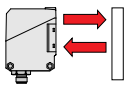




SICK

WT 260

Proximity/Diffuse Sensors-Energetic



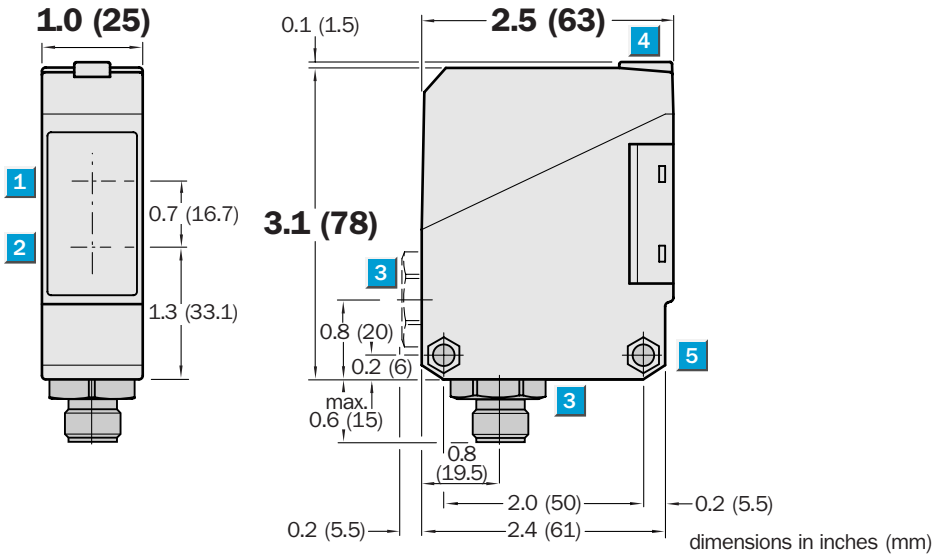

0.2...59.0 in (5...1500 mm)
sensing range

Highlights

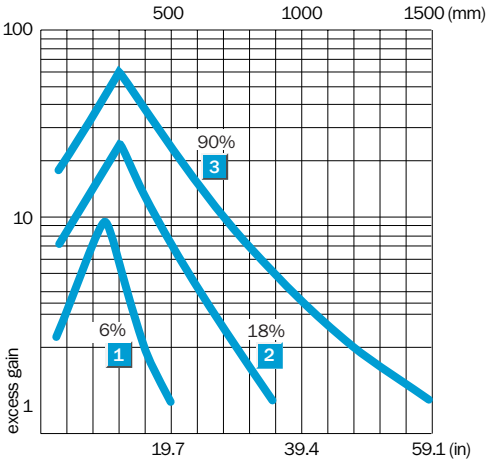
- Rugged plastic housing
- Adjustable sensitivity
- Terminal chamber or M12 4-pin plug for connection flexibility
- Test input
- Easy mounting with included bracket

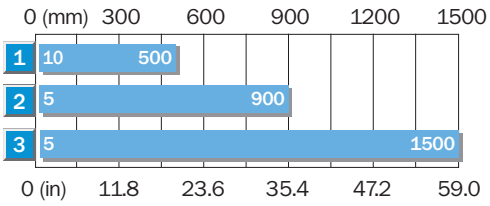
WT 260

Dimensional Drawing



Excess Gain

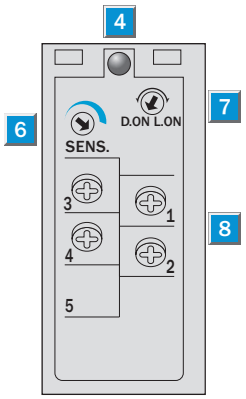




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or M12 equipment plug, bottom
4	LED signal strength indicator
5	Through hole Ø 5.2 mm on both sides for M5 hex nut
6	Sensitivity adjustment
7	Light/dark rotary switch L.ON = light switching, D.ON = dark switching
8	Terminals

Order Information

Type	Part no.
WT 260-F270	6 020 979
WT 260-F470	6 020 980
WT 260-E270	6 020 981
WT 260-E470	6 021 815

Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935

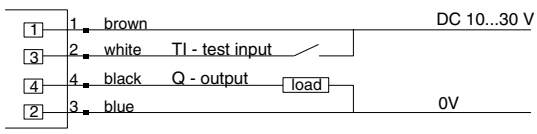
* included with delivery

Technical Data	WT 260-	F270	F470	E270	E470
Sensing range, adjustable[1]	0.2...59.0 in (5...1500 mm)	■	■	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■	■	■
Light source[2], **light type**	LED, red light	■	■	■	■
Light spot diameter	Approx. 1.8 in at 39.4 in (45 mm at 1000 mm)	■	■	■	■
Angle of divergence	Approx. 2.5°	■	■	■	■
Supply voltage V_s	10...30 V DC[3]	■	■	■	■
Ripple[4]	≤ 5 V_{SS}	■	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■
Response time[6]	≤ 1.5 ms	■	■	■	■
Max. switching frequency[7]	333 Hz	■	■	■	■
Test input "TE" sender off	PNP: TE to + V_S	■	■		
	NPN: TE to 0 V			■	■
Connection types	Terminal chamber	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[8]	□	■	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

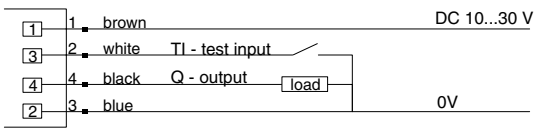
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_s connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

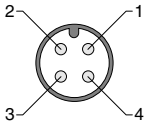
PNP Models



NPN Models



M12 Connector

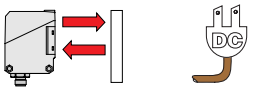


wire colors refer to standard cable, not included

SICK

WT 260 Long

Proximity/Diffuse Sensors-Energetic



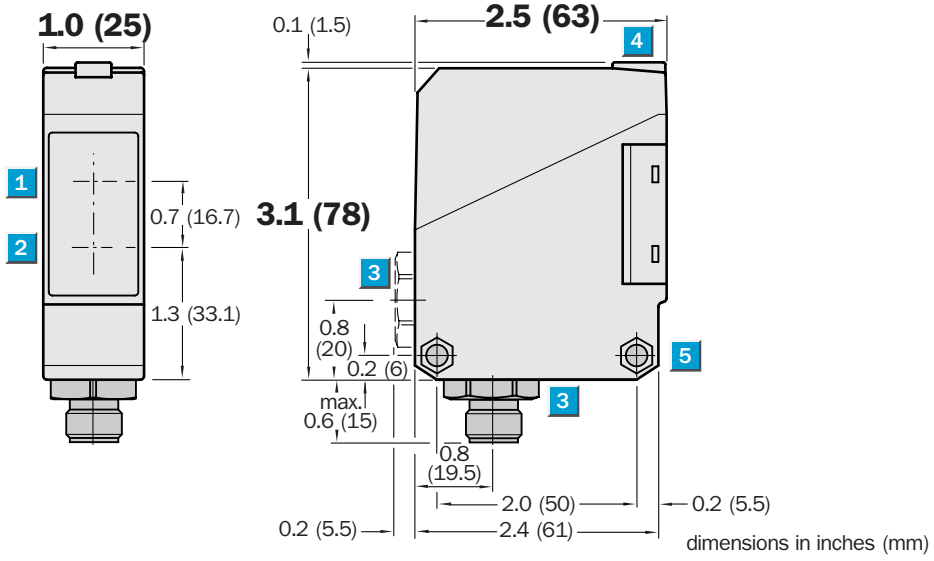
0.4...82.7 in (70...2100 mm)
sensing range

Highlights

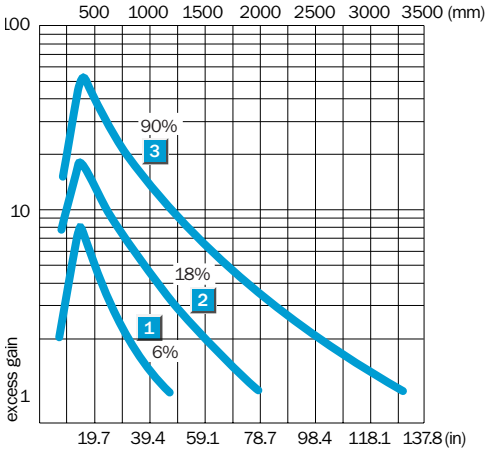
- Rugged plastic housing
- Adjustable sensitivity
- Test input
- Terminal chamber for connection flexibility
- Easy mounting with included bracket

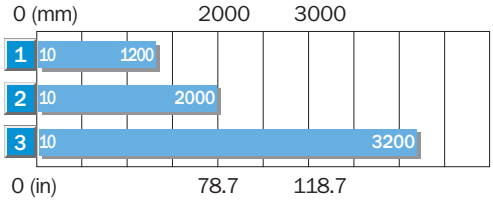
WT 260

Dimensional Drawing



Excess Gain

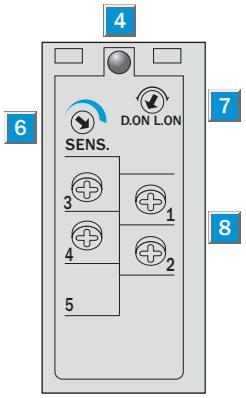




1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or M12 equipment plug, bottom
4 LED signal strength indicator, yellow,
5 Through hole Ø 5.2 mm on both sides for M5 hex nut
6 Sensitivity adjustment
7 Light/dark rotary switch
L.ON = light switching, D.ON = dark switching
8 Terminals

Order Information

Type	Part no.
WT 260-F280	6 020 982
WT 260-F480	6 020 983
WT 260-E280	6 020 984
WT 260-E480	6 021 816

Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935

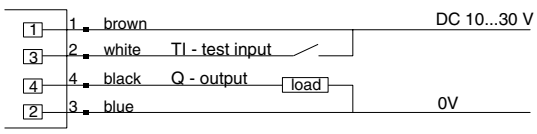
* included with delivery

Technical Data	WT 260-	F280	F480	E280	E480					
Sensing range, adjustable[1]	0.4...126.0 in (10...3200 mm)	■	■	■	■					
Sensitivity	Adjustable, potentiometer 270°	■	■	■	■					
Light source[2], **light type**	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 3.1 in at 98.4 in (80 mm at 2500 mm)	■	■	■	■					
Angle of divergence	Approx. 1.8°	■	■	■	■					
Supply voltage V_S	10...30 V DC[3]	■	■	■	■					
Ripple[4]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[5]	≤ 35 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light/dark switching via switch	■	■	■	■					
Response time[6]	≤ 5 ms	■	■	■	■					
Max. switching frequency[7]	100 Hz	■	■	■	■					
Test input "TE" sender off	PNP: TE to + V_S	■	■							
	NPN: TE to 0 V			■	■					
Connection types	Terminal chamber	■		■						
	Plug, M12 4-pin		■		■					
VDE protection class[8]	□	■	■	■	■					
Circuit protection[9]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	4.2 oz (120 g)	■	■	■	■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

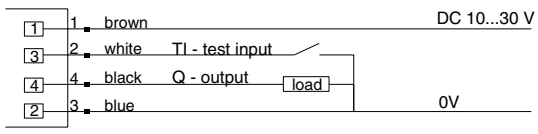
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

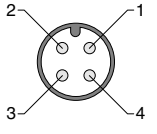
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

WT 260T

Proximity/Diffuse Sensors - Background Suppression

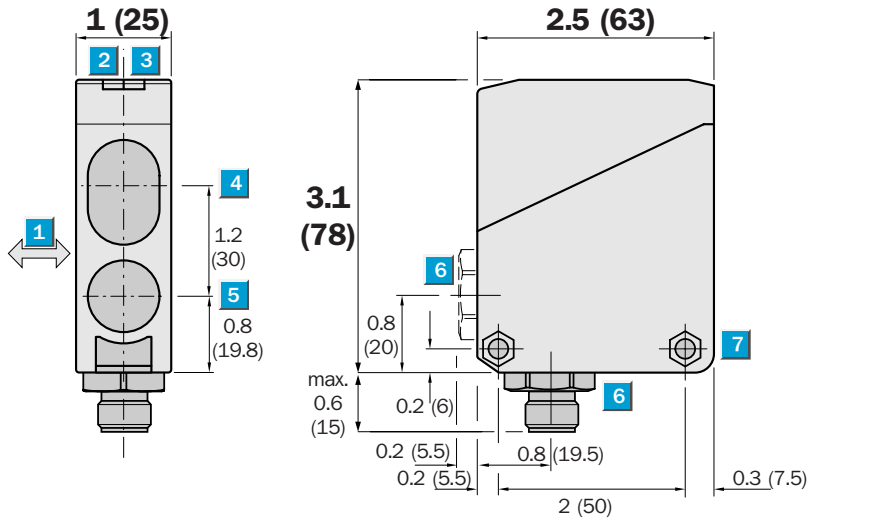
2.8...126.0 in (10...3200 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable sensitivity
- Test input
- Terminal chamber for connection flexibility
- Easy mounting with included bracket

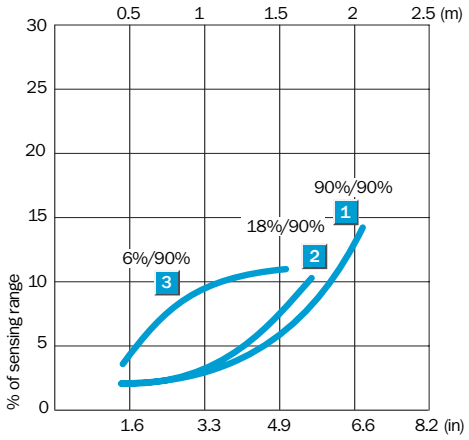
WT 260

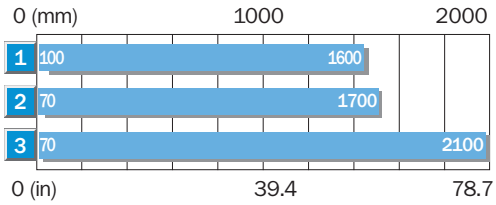
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

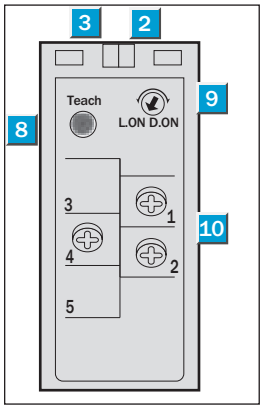




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of material being sensed
2	LED signal indicator orange, switching output active
3	LED signal indicator green, operating reserve
4	Center of optical axis, receiver
5	Center of optical axis, sender
6	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or M12 equipment plug, bottom (4-pin) LED signal strength indicator, yellow,
7	Through hole Ø 5.2 mm on both sides for M5 hex nut
8	Teach-in button (sensing range setting/ background suppression
9	Light/dark switching (L.ON = light switching, D.ON = dark switching)
10	Terminals

Order Information

Type	Part no.
WT 260T-P290	6 021 919
WT 260T-P490	6 021 920
WT 260T-N290	6 021 921
WT 260T-N490	6 021 922

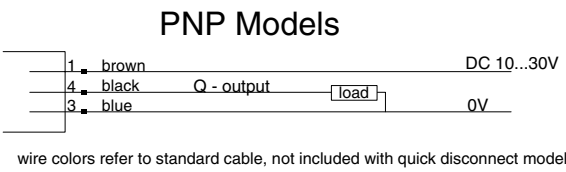
Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935

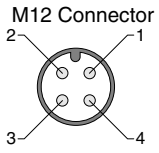
* included with delivery

Technical Data	WT 260T-	P290	P490	N290	N490
Sensing range, adjustable	2.8...82.7 in (70...2100 mm)[1]	■	■	■	■
Background suppression	3.9...78.7 in (100...2000 mm)	■	■	■	■
Sensing range setting	Automatic, per Teach-in	■	■	■	■
Light source[2], light type	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 7.9 in at 78.7 in (200 mm at 2000 mm)	■	■	■	■
Angle of divergence	Approx. 6°	■	■	■	■
Supply voltage V_S	10...30 V DC[3]	■	■	■	■
Ripple[4]	≤ 10 V_{SS}	■	■	■	■
Current consumption[5]	≤ 55 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Light receiver, switching mode	Light/dark switching selectable via switch	■	■	■	■
Response time[6]	≤ 5 ms	■	■	■	■
Max. switching frequency[7]	100 Hz	■	■	■	■
Connection types	Terminal chamber	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25 ...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Operating reserve < 50 %
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models.

WT 27-2 Red

Proximity/Diffuse Sensors-Background Suppression

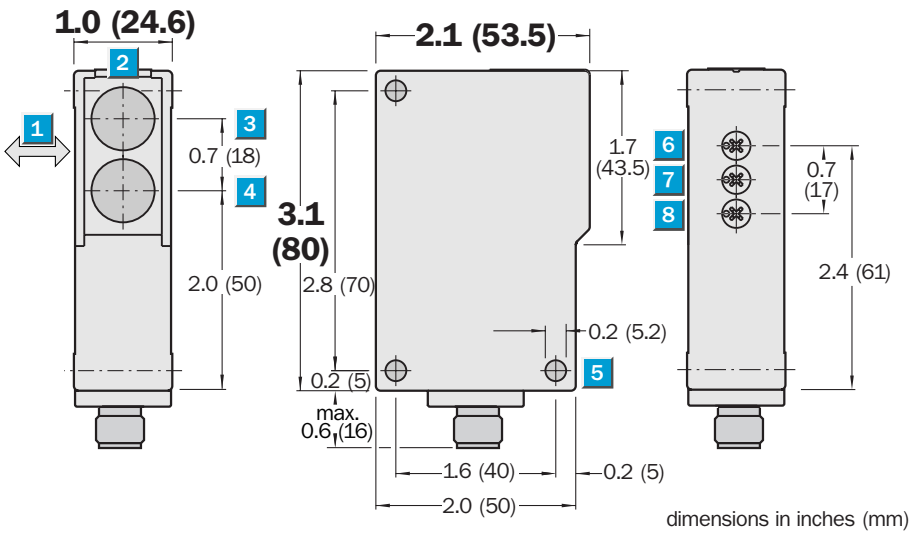
1.2...39.4 in (30...1000 mm)
sensing range

Highlights

- Red light for easy alignment
- Adjustable background suppression
- Crosstalk immunity
- Rugged plastic housing
- Signal strength indicator
- Adjustable sensing range

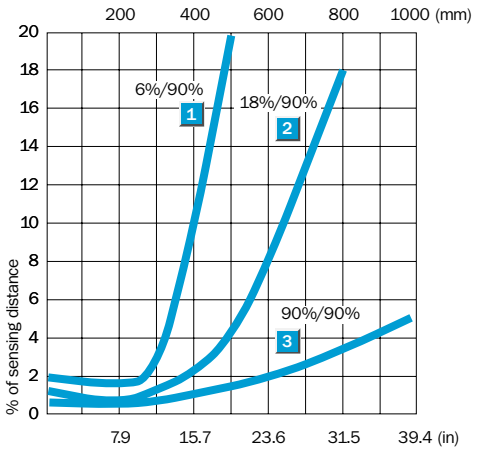
WT 27-2

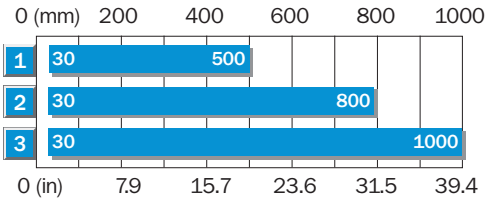
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

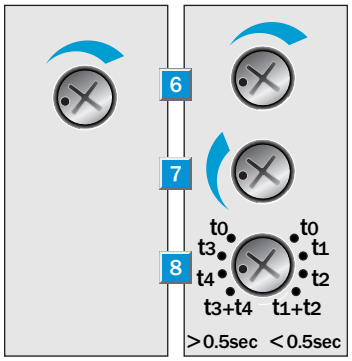




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 27-2F430	WT 27-2P630
WT 27-2F730	WT 27-2N630



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.2 mm
6	Sensitivity adjustment
7	Time control
8	Time delay selector switch

Switch-selectable Time Delay

0.5 – 10 s

- t_0 Without time delay
- t_3 OFF-delay from trailing edge of object
- t_4 ON-delay from leading edge of object
- $t_3 + t_4$ OFF- and ON-delay

0.02 – 0.5 s

- t_0 Without time delay
- t_1 OFF-delay from trailing edge of object
- t_2 ON-delay from leading edge of object
- $t_1 + t_2$ OFF- and ON-delay

Order Information

Type	Part no.
WT 27-2F430	1 015 082
WT 27-2P630	1 015 090
WT 27-2F730	1 015 084
WT 27-2N630	1 015 088

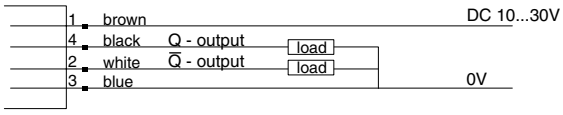
Accessories	page
Cables and connectors	909
Mounting brackets	923, 924, 935

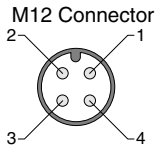
Technical Data	WT 27-2-	F430	P630	F730	N630					
Sensing range, adjustable	1.2...39.4 in (30...1000 mm)	■	■	■	■					
Background suppression	3.9...39.4 in (100...1000 mm)	■	■	■	■					
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■					
Light source[1], **light type**	LED, red light	■	■	■	■					
Light spot diameter	Approx. 0.6 in at 19.7 in (15 mm at 500 mm)	■	■	■	■					
Angle of divergence	Approx. 1.8°	■	■	■	■					
Supply voltage V_S	10...30 V DC[2]	■	■	■	■					
Ripple[3]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[4]	≤ 25 mA	■	■	■	■					
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■						
	NPN, Q and $\overline{Q}$				■					
Output current I_A max.	100 mA	■	■	■	■					
Response time[5]	2 ms	■	■	■	■					
Max. switching frequency[6]	250 Hz	■	■	■	■					
Selectable delay ranges	0.5...10 s/0.02...0.5 s		■		■					
Test input "TE", sender OFF	PNP: Test input to 0 V		■							
	NPN: Test input to V_S				■					
Connection types	Plug, square 6-pin		■		■					
	Plug, M12 4-pin	■								
	Plug, square 7-pin			■						
VDE protection class[7]	□	■	■	■	■					
Circuit protection[8]	A, B, C	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■		■						
	IP 65		■		■					
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■					
	Storage -40...167°F (-40...75°C)	■	■	■	■					
Approximate weight	3.5 oz (100 g)	■	■	■	■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

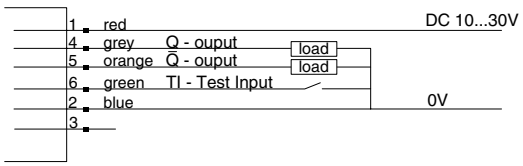
PNP Models



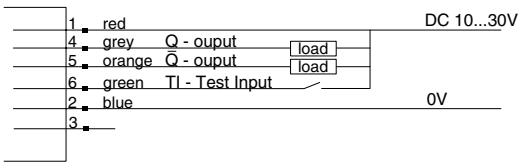


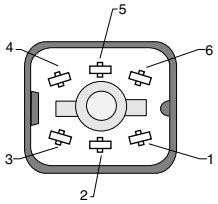
wire colors refer to standard cable, not included with quick disconnect models

PNP

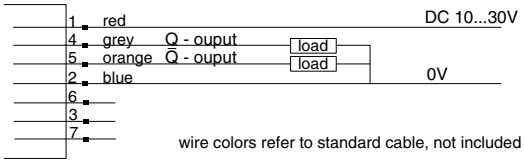


NPN

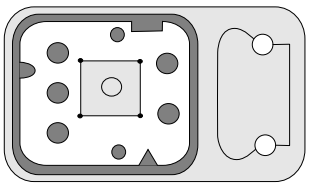




PNP



wire colors refer to standard cable, not included



SICK

WT 27-2 IR

Proximity/Diffuse Sensors-Background Suppression

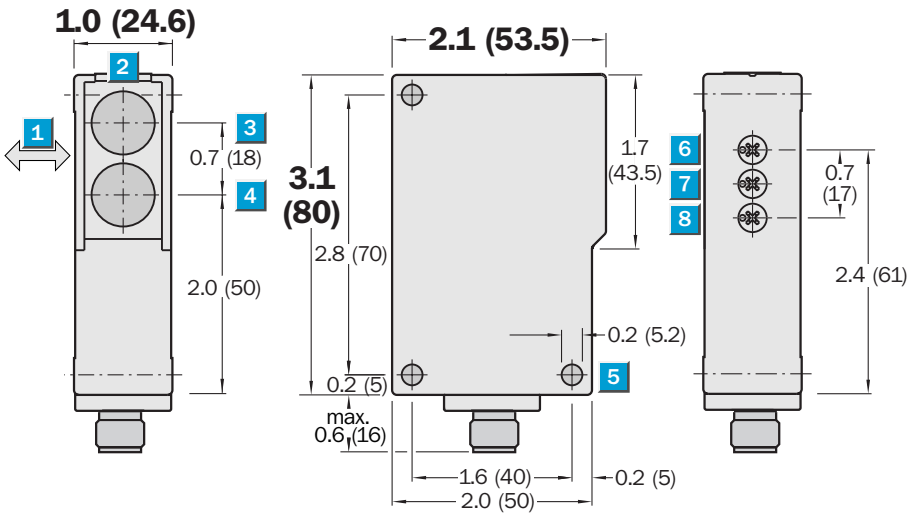
1.2...59.1 in (30...1500 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Selectable time delay
- Signal strength indicator
- Crosstalk immunity
- Adjustable sensing range
- Optional time delay
- Models available with integrated lens heater

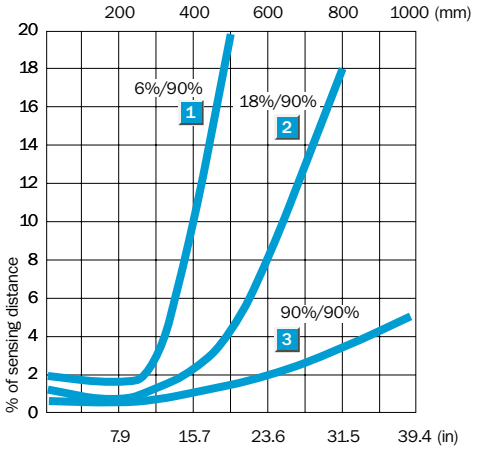
WT 27-2

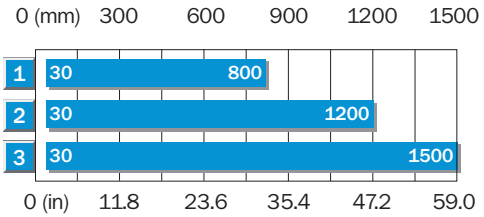
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

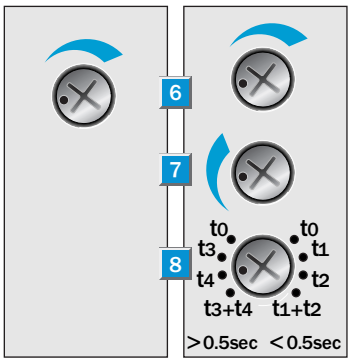




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 27-2F112	WT 27-2P 410
WT 27-2F410	WT 27-2P 610
WT 27-2F440	WT 27-2N 410
WT 27-2F710	WT 27-2N 610



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.2 mm
6	Sensitivity adjustment
7	Time control
8	Time delay selector switch

Switch-selectable Time Delay

0.5 – 10 s

- t_0 Without time delay
- t_3 OFF-delay from trailing edge of object
- t_4 ON-delay from leading edge of object
- $t_3 + t_4$ OFF- and ON-delay

0.02 – 0.5 s

- t_0 Without time delay
- t_1 OFF-delay from trailing edge of object
- t_2 ON-delay from leading edge of object
- $t_1 + t_2$ OFF- and ON-delay

Order Information

Type	Part no.
WT 27-2F112	1 015 076
WT 27-2F410	1 013 268
WT 27-2N410	1 016 030
WT 27-2F440	1 015 079
WT 27-2P410	1 015 138
WT 27-2P610	1 015 089
WT 27-2N610	1 015 087
WT 27-2F710	1 015 083

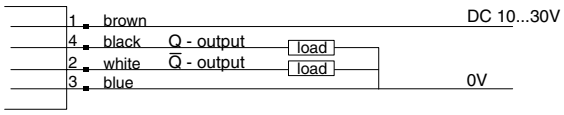
Accessories	page
Cables and connectors	909
Mounting brackets	923, 924, 935

Technical Data	WT 27-2-	F112	F410	N410	F440	P410	P610	N610	F710
Sensing range, adjustable	1.2...59.1 in (30...1500 mm)	■	■	■	■	■	■	■	■
Background suppression	3.9...59.1 in (100...1500 mm)	■	■	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 1.0 in at 31.5 in (25 mm at 800 mm)	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 1.8°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 25 mA	■	■	■		■	■	■	■
	≤ 35 mA, front screen heating				■				
Switching outputs	PNP, Q and $\overline{Q}$	■	■		■	■	■		■
	NPN, Q and $\overline{Q}$			■				■	
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Response time[5]	2 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	250 Hz	■	■	■	■	■	■	■	■
Selectable delay ranges	0.5...10 s/0.02...0.5 s			■		■	■	■	
Test input "TE", sender OFF	PNP : Test input to 0 V						■		
	NPN : Test input to V_S							■	
Connection types	Cable[7], 2 m	■							
	Plug, M12 4-pin		■	■	■	■			
	Plug, square 6-pin						■	■	
	Plug, square 7-pin								■
VDE protection class[8]	⧈	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■			■
	IP 65						■	■	
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■	■	■	■	■
Front screen heating					■				
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

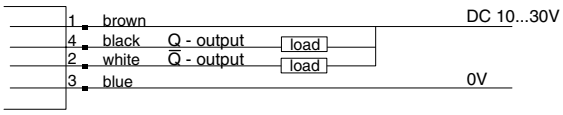
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0 °C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

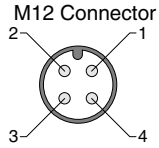
PNP Models



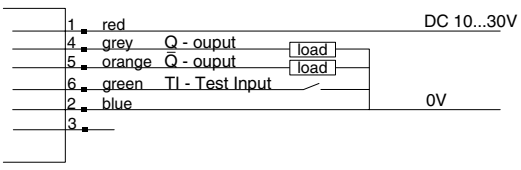
NPN Models



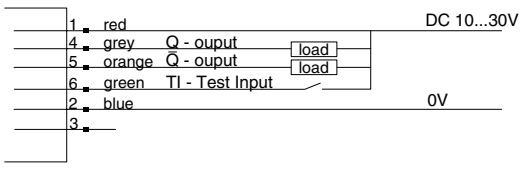
M12 Connector

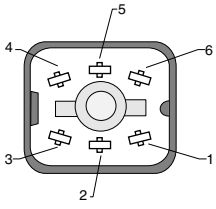


PNP

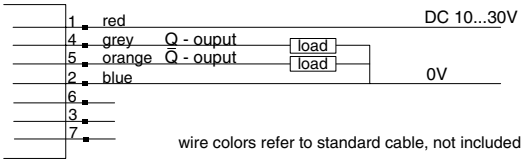


NPN

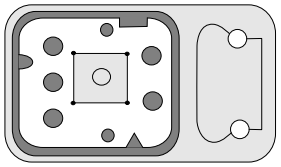




PNP



wire colors refer to standard cable, not included



SICK

WT 27 L-2

Proximity/Diffuse Sensors - Background Suppression

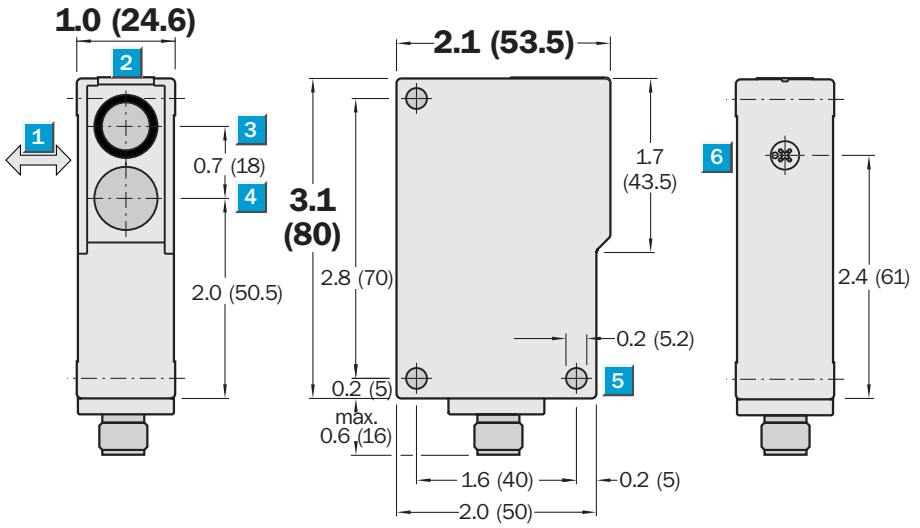
3.9...31.5 in (100...800 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Laser, LED, red light source
- Signal strength indicator
- Crosstalk immunity

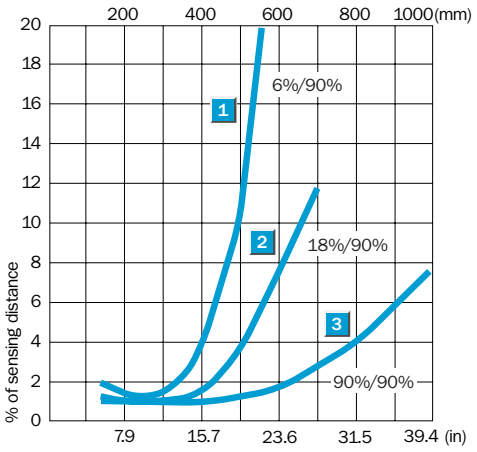
WT 27 L-2

Dimensional Drawing



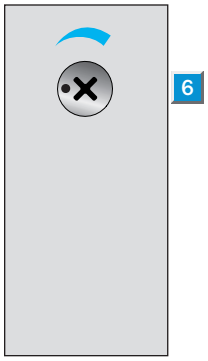
dimensions in inches (mm)

Background Suppression

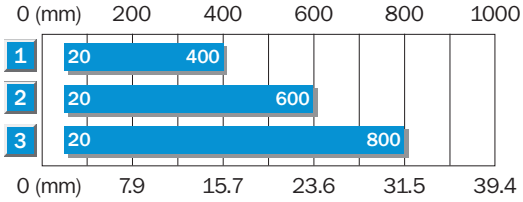


Adjustments

WT 27L-2F 430



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Optical axis, sender
4	Optic axis, receiver
5	Mounting hole ⌀ 5.2 mm
6	Sensitivity adjustment



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Order Information

Type	Part no.
WT 27L-2F430A	1 016 247

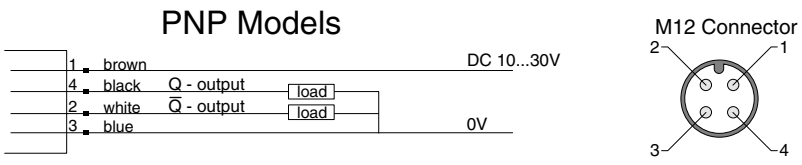
Accessories

	page
Cables and connectors	909
Mounting brackets	923, 924, 935

Technical Data	WT 27L-2-	F430A
Sensing range, adjustable	3.9...31.5 in (100...800 mm)	
Light source[1], **light type**	LED laser, red light	
Light spot diameter	Approx. 0.08 in at 15.7 in (2 mm at 400 mm)	
Supply voltage V_S	10...30 V DC[2]	
Ripple[3]	≤ 5 V_{SS}	
Current consumption[4]	≤ 35 mA	
Switching outputs	PNP, Q and $\overline{Q}$	
Output current I_A max.	100 mA	
Response time[5]	500 µs	
Max. switching frequency[6]	1000/s	
Connection type	Plug, M12 4-pin	
VDE protection class[7]	□	
Laser class[8]	2 (IEC 825/VDE 0837)	
Circuit protection[9]	A, B, C	
Enclosure rating	IP 67	
Ambient temperature T_A	Operation 14...113°F (-10...45°C)	
	Storage 14...167°F (-10...75°C)	
Approximate weight	3.5 oz (100 g)	
Housing material	ABS	

1) Average service life 50,000 h at $T_A = +25$ °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal flight time with ohmic load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) Low power. Eyes normally protected by averting reaction and eyelid closing reflex.
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

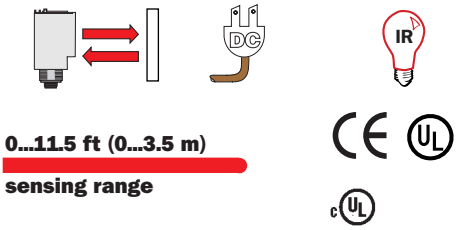
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WT 2000

Proximity/Diffuse Sensors-Energetic

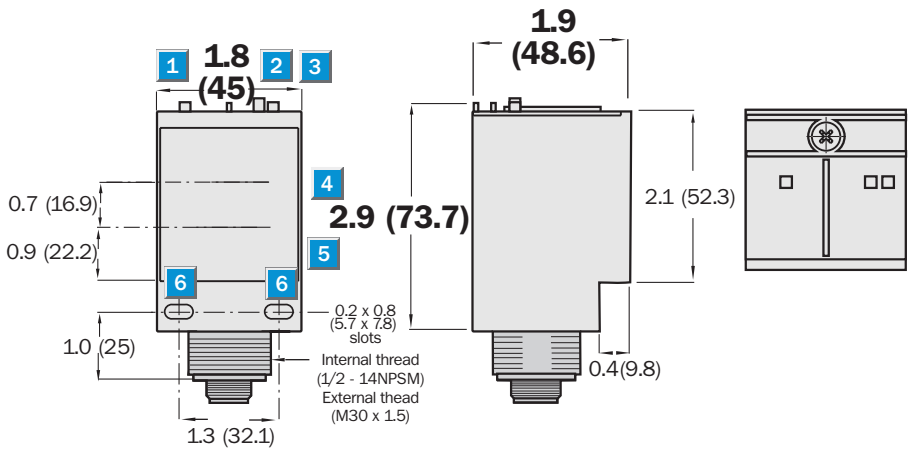


Highlights

- Rugged plastic housing
- Signal strength indicator
- Adjustable sensing range
- Selectable time delays
- Crosstalk immunity
- Alarm output
- Cable or M12 quick disconnect versions

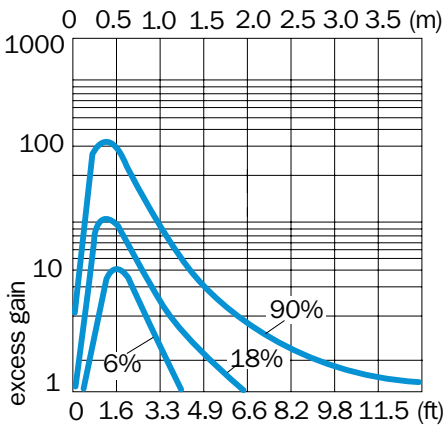
WT 2000

Dimensional Drawing



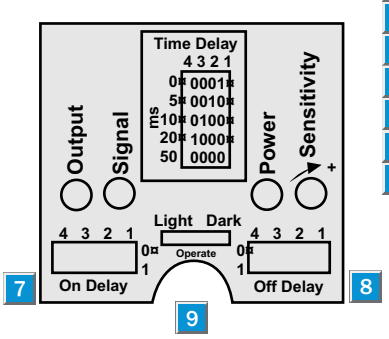
dimensions in inches (mm)

Excess Gain

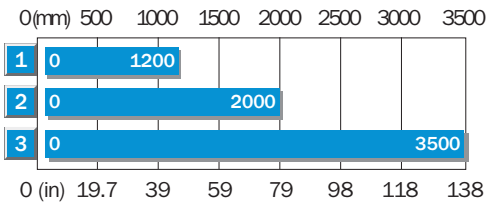


Adjustments

All types



1	LED power indicator (green)
2	LED signal strength indicator (red)
3	LED output indicator (yellow)
4	Center of optical axis, sender
5	Center of optical axis, receiver
6	Mounting through-hole Ø 0.2 x 0.8 mm,
7	ON delay selector
8	OFF delay selector
9	Light/dark switching selector



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Order Information

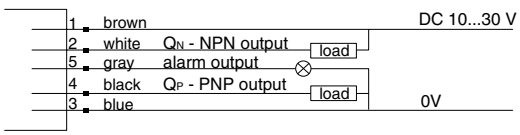
Type	Part no.
WT 2000-B1102	7 023 056
WT 2000-B1112	7 023 057
WT 2000-B1122	7 023 058
WT 2000-B5100	7 023 059
WT 2000-B5110	7 023 060
WT 2000-B5120	7 023 061
WT 2000-B4100	7 024 001

Accessories	page
Cables and connectors	909
Mounting brackets	927

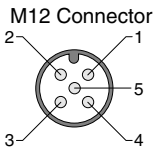
Technical Data	WT 2000-	B1102	B1112	B1122	B5100	B5110	B5120	B4100
Sensing range, adjustable	0...11.5 ft (0...3.5 m)	■	■	■	■	■	■	■
Light source[1], light type	LED, infrared light, 880 nm	■	■	■	■	■	■	■
Light spot diameter	Approx. 2.2 in at 8.2 ft (55 mm at 2.5 m)	■	■	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V	■	■	■	■	■	■	■
Current consumption[4]	≤ 80 mA	■	■	■	■	■	■	■
Switching outputs	PNP or NPN, Q and $\overline{Q}$	■	■	■	■	■	■	■
Voltage drop (Max.)	2 V	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■
Response time[5]	≤ 1 ms	■	■	■	■	■	■	■
Max. switching frequency[6]	500 Hz	■	■	■	■	■	■	■
Alarm output	PNP	■	■	■	■	■	■	■
Time delay settings	0, 5, 10, 20 or 50 ms		■	■		■	■	
OFF delay			■			■		
ON/OFF delay				■			■	
Connection types	Cable, 2 m, PVC	■	■	■				
	Plug, M12 5-pin				■	■	■	
	Plug, M12 4-pin							■
VDE protection class[8]	□	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■	■

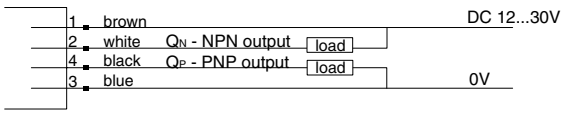
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

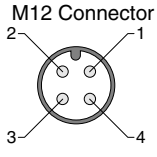
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models







SICK

WT 36

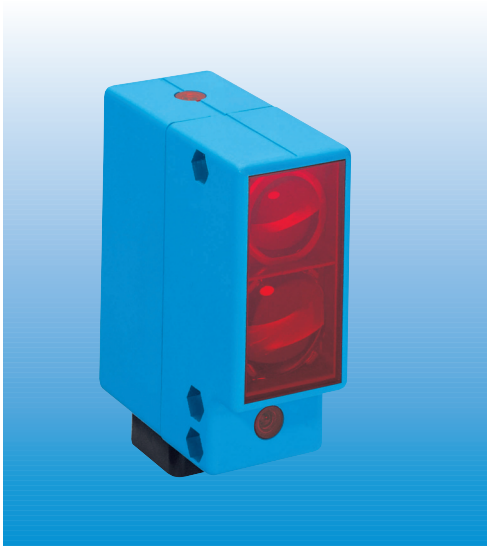
Proximity/Diffuse Sensors-Background Suppression

7.9...31.5 in (200....800 mm)
sensing range

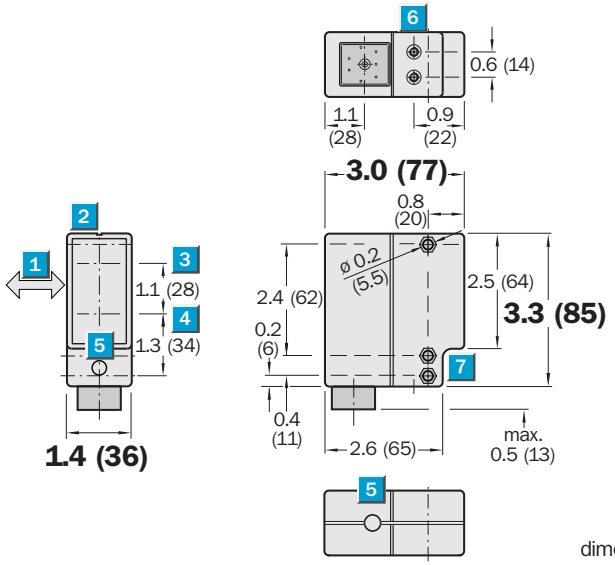
Highlights

- Rugged plastic housing
- Infrared light source
- Adjustable background suppression
- Selectable time delays

WT 36

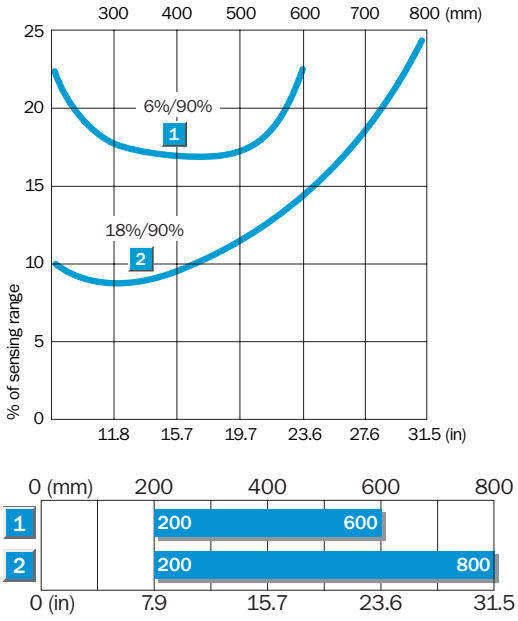


Dimensional Drawing



dimensions in inches (mm)

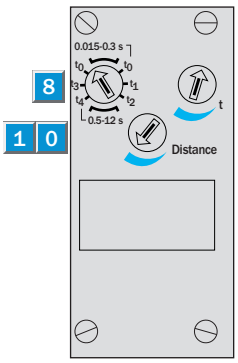
Background Suppression



1	Sensing range on black, 6 % remission
2	Sensing range on grey, 18 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Alignment sight
3	Center of optical axis, receiver
4	Center of optical axis, sender
5	LED signal strength indicator
6	M5 threaded mounting hole – 5.5 mm deep
7	Mounting holes, recesses on both sides for M5 hex nuts
8	Time delay selector switch with DC, switches with UC
9	Time control
10	Sensing range adjustment

Order Information

Type	Part no.
WT 36-N410	1 011 109
WT 36-P410	1 011 108
WT 36-N710	1 006 370
WT 36-P710	1 006 047
WT 36-N210	1 010 109
WT 36-P210	1 010 108

Accessories	page
Cables and connectors	909
Mounting brackets	924

Technical Data	WT 36-	N410	P410	N710	P710	N210	P210
Sensing range, adjustable	7.9...31.5 in (200...800 mm)	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■	■	■
Light spot diameter	Approx. 0.6 in at 31.5 in (15 mm at 800 mm)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP, Q and $\overline{Q}$		■		■		■
	NPN, Q and $\overline{Q}$	■		■		■	
Output current I_A max.	200 mA	■	■	■	■	■	■
Response time[6]	2 ms	■	■	■	■	■	■
Max. switching frequency[7]	250/s	■	■	■	■	■	■
Test input "TE", sender OFF	PNP: Test input to 0 V		■		■		■
	NPN: Test input to V_S	■		■		■	
		■	■	■	■		
Connection types	Plug, M12 4-pin	■	■				
	Plug, square 7-pin			■	■		
	PG 11 terminal chamber					■	■
VDE protection class[8]	□	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 65			■	■		
	IP 67	■	■			■	■
Ambient temperature T_A	Operation -40...131°F (-40...55°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	7.1 oz (200 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■

1) Average service life 100,000 h at $T_A = +25$ °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Provide suitable spark suppression for inductive or capacitive loads
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC, 250 V AC
9) A = V_S connections reverse-polarity protected
B = Output Q_N and Q_P short-circuit protected
C = Interference pulse suppression

Switch-selectable Time Delay

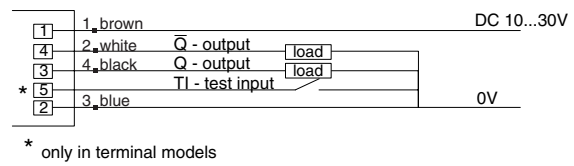
0.015 – 0.3 s with DC only

t_0 without time delay
t_1 ON-delay
t_2 OFF-delay

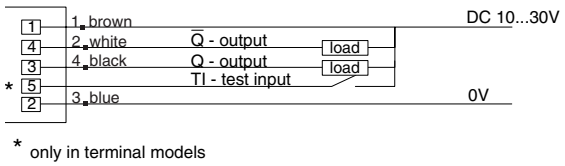
0.5 – 12 s with DC

t_0 without time delay
t_3 ON-delay
t_4 OFF-delay

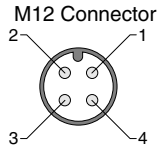
Connection Diagram

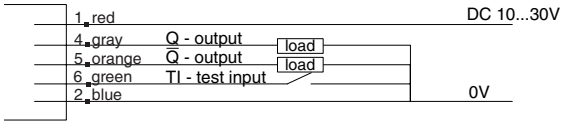


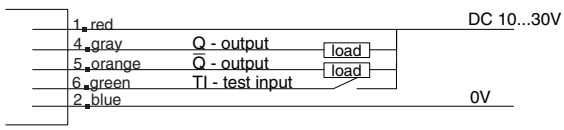
* only in terminal models

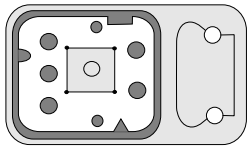


* only in terminal models









SICK

WT 45

Proximity/Diffuse Sensors-Background Suppression

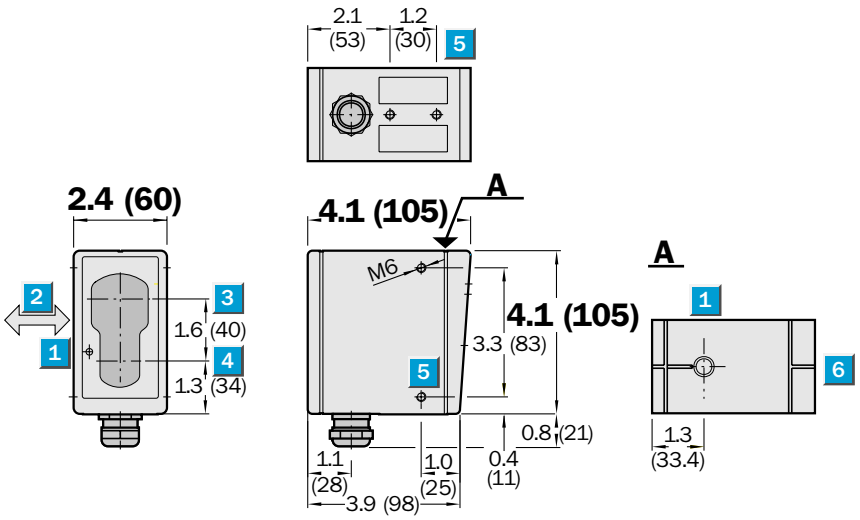
7.9...78.7 in (200...2000 mm)
sensing range

Highlights

- Robust metal housing
- Adjustable background suppression
- Adjustable sensing range
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available
- Selectable time delays
- Test input

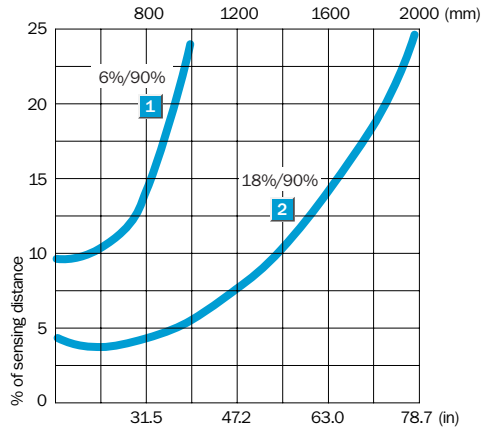
WT 45

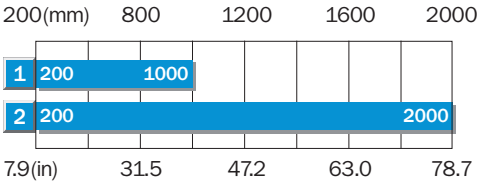
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

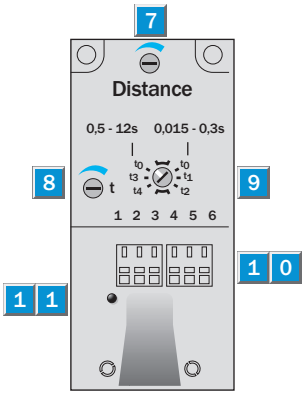




1	Sensing range on black, 6% remission
1	Sensing range on grey, 18% remission

Adjustments

All types



1	LED signal strength indicator
2	Standard direction of the material being sensed
3	Center of optical axis, receiver
4	Center of optical axis, sender
5	Threaded mounting hole M6 – 8 mm deep
6	Alignment sight
7	Sensing range adjustment
8	Time adjustment
9	Time delay selector switch
10	Terminal strip
11	Status indicator

Switch-selectable Time Delay

0.5 – 12 s

- t_0 without time delay
- t_3 ON-delay when object enters detection zone
- t_4 OFF-delay when object leaves detection zone

0.015 – 0.3 s

- t_0 without time delay
- t_1 ON-delay when object enters detection zone
- t_2 OFF-delay when object leaves detection zone

Order Information

Type	Part no.
WT 45-250	1 009 117
WT 45-P260	1 009 108
WT 45-N250	1 009 116
WT 45-N260	1 009 109
WT 45-P960	1 010 554
WT 45-P950	1 010 553
WT 45-N960	1 010 552
WT 45-N950	1 010 551

Accessories

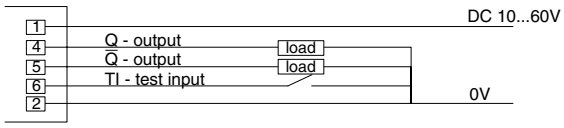
Accessories	page
Mounting brackets	935
Cooling plates	958
Dust shield	955
Weather hood	955

Technical Data	WT 45-	P250	P260	N250	N260	P950	P960	N950	N960
Sensing range, adjustable	7.9...78.7 in (200...2000 mm)	■	■	■	■	■	■	■	■
Background suppression	15.7...78.7 in (400...2000 mm)	■	■	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■	■	■	■	■
Light source[1], light type	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	1.4 in at 78.7 in (35 mm at 2000 mm)	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 1°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...60 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	$< 5\ V_{SS}$	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA		■		■		■		■
	≤ 250 mA, front lens heating	■		■		■		■	
Switching outputs	PNP, Q and $\overline{Q}$	■	■			■	■		
	NPN, Q and $\overline{Q}$			■	■			■	■
Output current I_A max.	200 mA	■	■	■	■	■	■	■	■
Response time[5]	6 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	50 Hz	■	■	■	■	■	■	■	■
Test input "TE"		■	■	■	■	■	■	■	■
Sender OFF	PNP: Test input to 0 V	■	■			■	■		
	NPN: Test input to V_S			■	■			■	■
Connection type	PG13.5 terminal chamber	■	■	■	■				
	1/2" NPSM terminal chamber					■	■	■	■
VDE protection class	⏚	■	■	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A[8]	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Approximate weight	28.2 oz (800 g)	■	■	■	■	■	■	■	■
Front lens heating		■		■		■		■	
Housing material	Die cast zinc	■	■	■	■	■	■	■	■

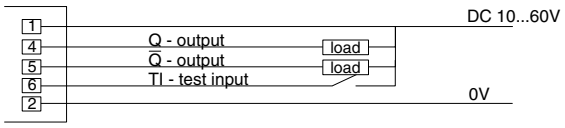
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) A = V_S connections reverse-polarity protected
B = Output Q_N and Q_P short-circuit protected
C = Interference pulse suppression
8) Up to 140°C with cooling plates (see Accessories)

Connection Diagram

PNP Models



NPN Models



VT 12T-2

Proximity/Diffuse Sensors-Energetic

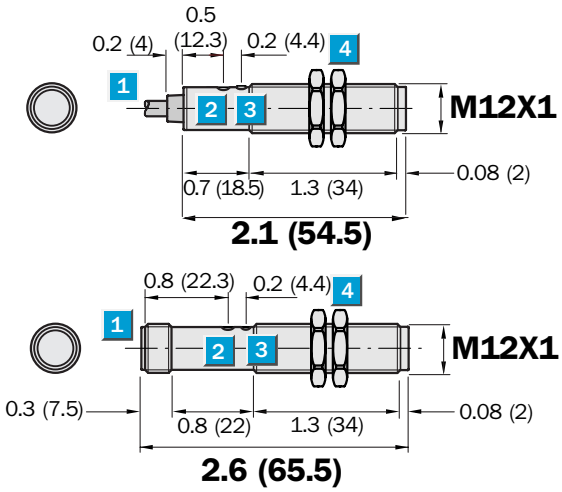
0...4.5 in (0...115 mm)
sensing range

Highlights

- Rugged metal housing
- Sensitivity can be set via Teach-in
- Reverse polarity and short circuit protection
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

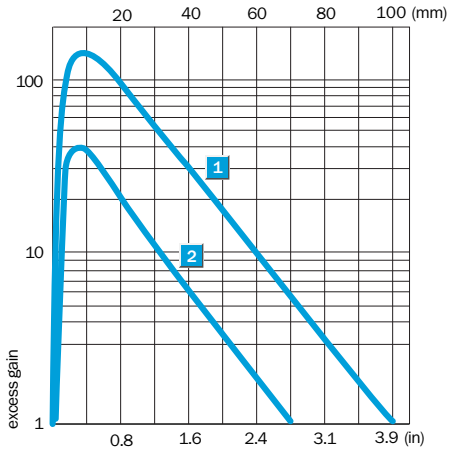
VT 12T-2

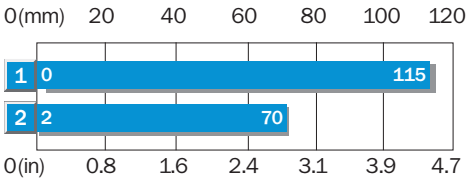
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

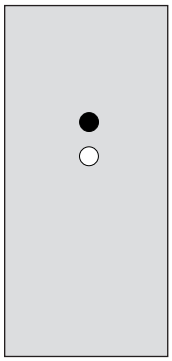




1	Sensing range on white, 90% remission
1	Sensing range on grey, 18% remission

Adjustments

All types



1	Cable or plug, M12 4-pin
2	Sensitivity adjustment (Teach-in button)
3	Yellow LED indicator: -lights continuously: reception signal > reserve factor 2 -blinks: reception signal < reserve factor 2 but > switching threshold 1
4	Mounting nuts (2x), SW 17, metal

Order Information

Type	Part no.
VT 12T-2P112	6 026 211
VT 12T-2P410	6 026 212
VT 12T-2N112	6 026 209
VT 12T-2N410	6 026 210

Accessories

	page
Cables and connectors	909
Mounting brackets	925

Technical Data	VT 12T-2-	P112	P410	N112	N410
Sensing range, adjustable	0...4.5 in (0...115 mm)[1]	■	■	■	■
Sensitivity setting	Manual, per Teach-in button	■	■	■	■
	Electronic, per control input C (0 V)[2]	■	■	■	■
Light source[3], light type	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 0.8 in at 3.9 in (20 mm at 100 mm)	■	■	■	■
Angle of divergence	Approx. 11.4° (SD = max.)	■	■	■	■
	Approx. 22.6° (SD = 1/2 max.)	■	■	■	■
Supply voltage V_S	10...30 V DC[4]	■	■	■	■
Ripple[5]	± 10%	■	■	■	■
Current consumption[6]	≤ 20 mA	■	■	■	■
Switching outputs	Q: PNP	■	■		
	Q: NPN			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching selectable[2]	■	■	■	■
Response time[7]	≤ 1.25 ms	■	■	■	■
Max. switching frequency[8]	400 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 4 x 0.14 mm², Ø 3.75 mm	■		■	
	Plug, M 12 4-pin		■		■
VDE protection class[10]	⧈	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
		■	■	■	■
Ambient temperature T_A	Operation -13...158°F (-25...70°C)	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■
Approximate weight	1.9 oz (54 g)	■		■	
	0.6 oz (18 g)		■		■
Housing material	Nickel-coated brass housing/ PA	■	■	■	■

1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Control input C
- L.ON/L.ON and - External Teach-in
C = open: light switching L.ON
C = V_S: dark switching D.ON
C = 0 V: Sensitivity setting per "external Teach-in" active
3) Average service life 100,000 h at T_A = 25°C
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Sensitivity Setting per Teach-in Function

Programming optionally
– manually per Teach-in button or
– electronically per control input C
Very simple programming:
Always position the scanning object at the target position in the light path.
Press the Teach-in button 1 x or activate control input C (0 V) 1 x:
Sensitivity setting has been completed.
Feedback: yellow LED indicator
Permanent storage of the "taught-in switching threshold and hysteresis",
even if power is interrupted for longer times.
Two programming types for your sensitivity adjustment.
Two easy-to-operate Teach-in modes are available to let you adjust sensitivity optimally.

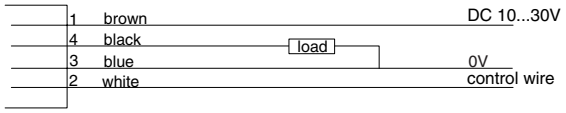
Sensitivity setting
Always position the scanning object at the target position in the light path.

1. Sensitivity setting 1, applications: substantial operating reserve
For all standard applications:
– Large operating reserve, factor > 2 above switching threshold:
Short "Teach-in time" > 2 s ... < 7 s.
Press the Teach-in button 1 x or activate control input C (0 V) = > 2 s ... < 7 s.
Yellow LED indicator → goes off → lights after > 2 s again → deactivate Teach-in signal → **sensitivity setting completed!** → Check application.
Yellow LED indicator lights after Teach-in process has been completed.

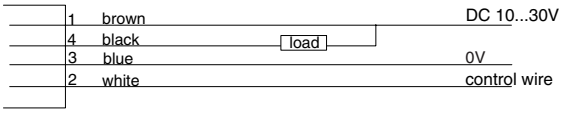
2. Sensitivity setting 2, applications: precise switching point
For slight differences between scanning object and background
For positioning tasks
For simple contrast detection:
– Small switching hysteresis, smaller operating reserve, factor > 1 < 2 above switching threshold:
Long "Teach-in time" > 8 s
Press the Teach-in button 1 x or activate control input C (0 V) = > 8 s
Yellow LED indicator → goes off → lights after > 2 s again → Blinks after > 8 s → deactivate Teach-in signal → **sensitivity setting completed!** → Check application.
Yellow LED indicator blinks permanently after Teach-in process has been completed.

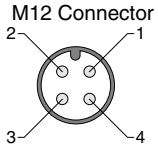
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included with quick disconnect models

SICK

VT 12T-2

Proximity/Diffuse Sensors-Energetic

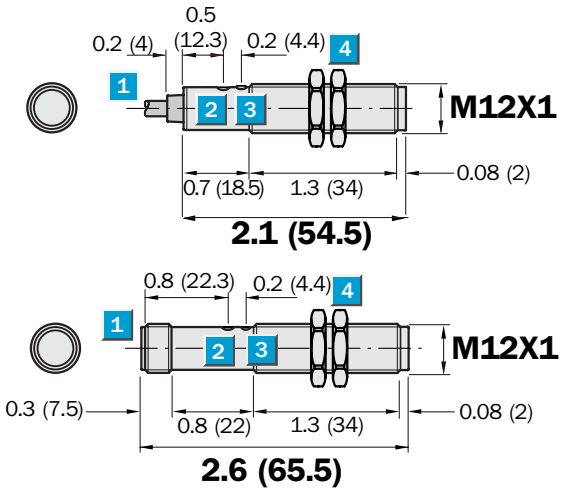
0...13.4 in (0...340 mm)
sensing range

Highlights

- Rugged metal housing
- Sensitivity can be set via Teach-in
- Reverse polarity and short circuit protection
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

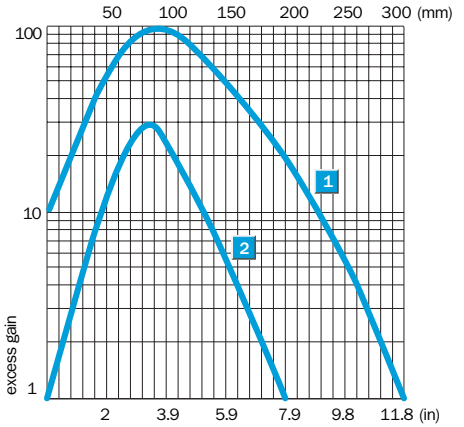
VT 12T-2

Dimensional Drawing



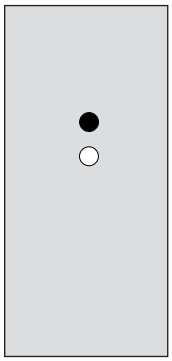
dimensions in inches (mm)

Excess Gain

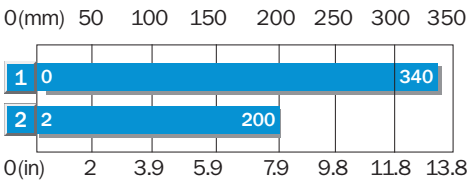


Adjustments

All types



1 Cable or plug, M12 4-pin
2 Sensitivity adjustment (Teach-in button)
3 Yellow LED indicator:
-lights continuously: reception signal > reserve factor 2
-blinks: reception signal < reserve factor 2
but > switching threshold 1
4 Mounting nuts (2x), SW 17, metal



1 Sensing range on white, 90% remission
1 Sensing range on grey, 18% remission

Order Information

Type	Part no.
VT 12T-2P132	6 026 215
VT 12T-2P430	6 026 216
VT 12T-2N132	6 026 213
VT 12T-2N430	6 026 214

Accessories

	page
Cables and connectors	909
Mounting brackets	925

Technical Data	VT 12T-2-	P132	P430	N132	N430					
Sensing range, adjustable	0...13.4 in (0...340 mm)[1]	■	■	■	■					
Sensitivity setting	Manual, per Teach-in button	■	■	■	■					
	Electronic, per control input C (0 V)[2]	■	■	■	■					
Light source[3], light type	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 1.1 in at 11.8 in (28 mm at 300 mm)	■	■	■	■					
Angle of divergence	Approx. 5.3° (SD = max.)	■	■	■	■					
	Approx. 11.2° (SD = 1/2 max.)	■	■	■	■					
Supply voltage V_S	10...30 V DC[4]	■	■	■	■					
Ripple[5]	± 10%	■	■	■	■					
Current consumption[6]	≤ 20 mA	■	■	■	■					
Switching outputs	Q: PNP	■	■							
	Q: NPN			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light/dark switching selectable[2]	■	■	■	■					
Response time[7]	≤ 1.25 ms	■	■	■	■					
Max. switching frequency[8]	400 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[9]; 4 x 0.14 mm², Ø 3.75 mm	■		■						
	Plug, M12 4-pin		■		■					
VDE protection class[10]	⧈	■	■	■	■					
Circuit protection[11]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
		■	■	■	■					
Ambient temperature T_A	Operation -13...158°F (-25...70°C)	■	■	■	■					
	Storage -13...158°F (-25...70°C)	■	■	■	■					
Approximate weight	1.9 oz (54 g)	■		■						
	0.6 oz (18 g)		■		■					
Housing material	Nickel-coated brass housing/PA	■	■	■	■					

1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Control input C
- L.ON/L.ON and - External Teach-in
C = open: light switching L.ON
C = V_S: dark switching D.ON
C = 0 V: Sensitivity setting per "external Teach-in" active
3) Average service life 100,000 h at T_A = 25°C
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Sensitivity Setting per Teach-in Function

Programming optionally
– manually per Teach-in button or
– electronically per control input C
Very simple programming:
Always position the scanning object at the target position in the light path.
Press the Teach-in button 1 x or activate control input C (0 V) 1 x:
Sensitivity setting has been completed.
Feedback: yellow LED indicator
Permanent storage of the "taught-in switching threshold and hysteresis",
even if power is interrupted for longer times.
Two programming types for your sensitivity adjustment.
Two easy-to-operate Teach-in modes are available to let you adjust sensitivity optimally.

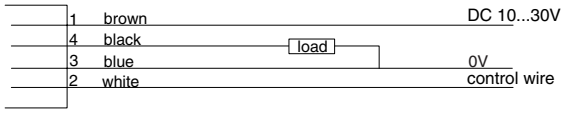
Sensitivity setting
Always position the scanning object at the target position in the light path.

1. Sensitivity setting 1, applications: substantial operating reserve
For all standard applications:
– Large operating reserve, factor > 2 above switching threshold:
Short "Teach-in time" > 2 s ... < 7 s.
Press the Teach-in button 1 x or activate control input C (0 V) = > 2 s ... < 7 s.
Yellow LED indicator → goes off → lights after > 2 s again → deactivate Teach-in signal → **sensitivity setting completed!** → Check application.
Yellow LED indicator lights after Teach-in process has been completed.

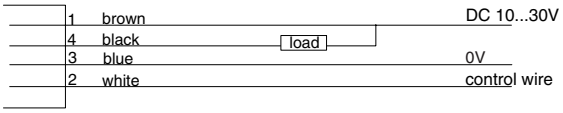
2. Sensitivity setting 2, applications: precise switching point
For slight differences between scanning object and background
For positioning tasks
For simple contrast detection:
– Small switching hysteresis, smaller operating reserve, factor > 1 < 2 above switching threshold:
Long "Teach-in time" > 8 s
Press the Teach-in button 1 x or activate control input C (0 V) = > 8 s
Yellow LED indicator → goes off → lights after > 2 s again → Blinks after > 8 s → deactivate Teach-in signal → **sensitivity setting completed!** → Check application.
Yellow LED indicator blinks permanently after Teach-in process has been completed.

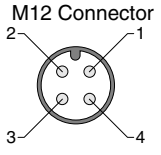
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included with quick disconnect models

SICK

VT 18-2

Proximity/Diffuse Sensors-Background Suppression

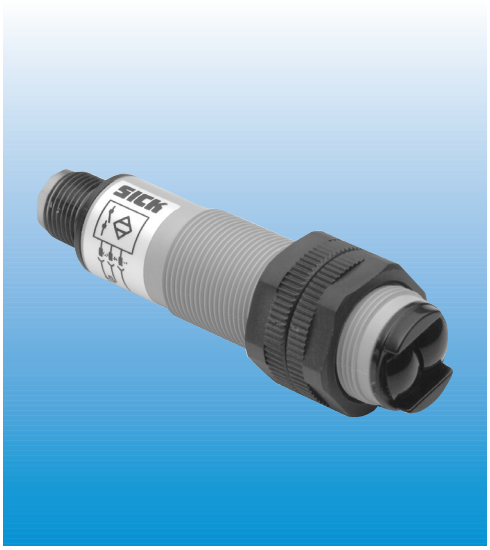
0...4.1 in (0...105 mm)

sensing range

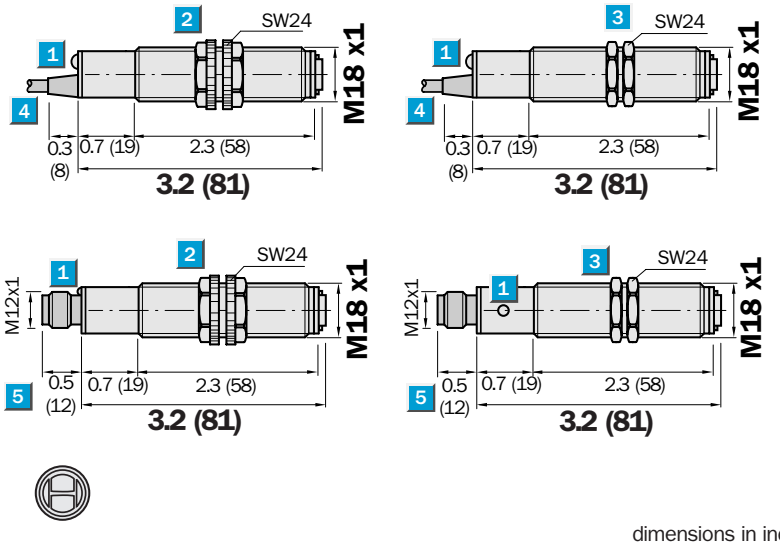
Highlights

- Rugged plastic housing
- Fixed background suppression provides much better performance than fixed focus sensors
- PNP/NPN and light or dark switching
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

VT 18-2



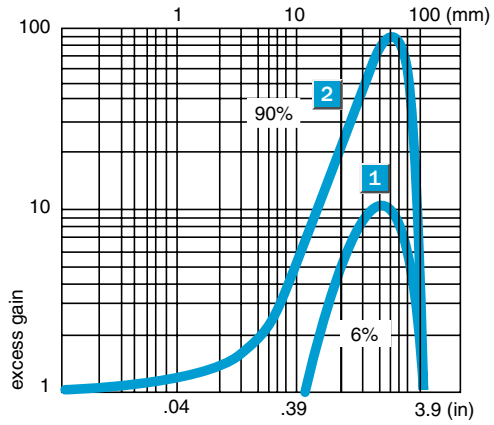
Dimensional Drawing

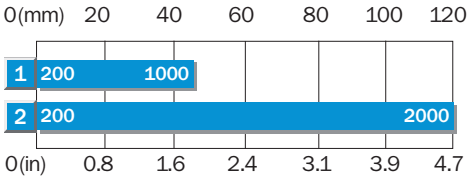


dimensions in inches (mm)

1 Red LED signal strength indicator
2 Locking nut, plastic (SW 24) included
3 Locking nut, metal (SW 24) included
4 Connecting cable
5 Plug, M12 4-pin

Excess Gain





1 Sensing range on black, 6% remission
1 Sensing range on white, 90% remission

Order Information

Type	Part no.
VT 18-204172	6 012 018
VT 18-204470	6 012 019
VT 18-204172 S01	6 012 020
VT 18-204470 S01	6 012 021

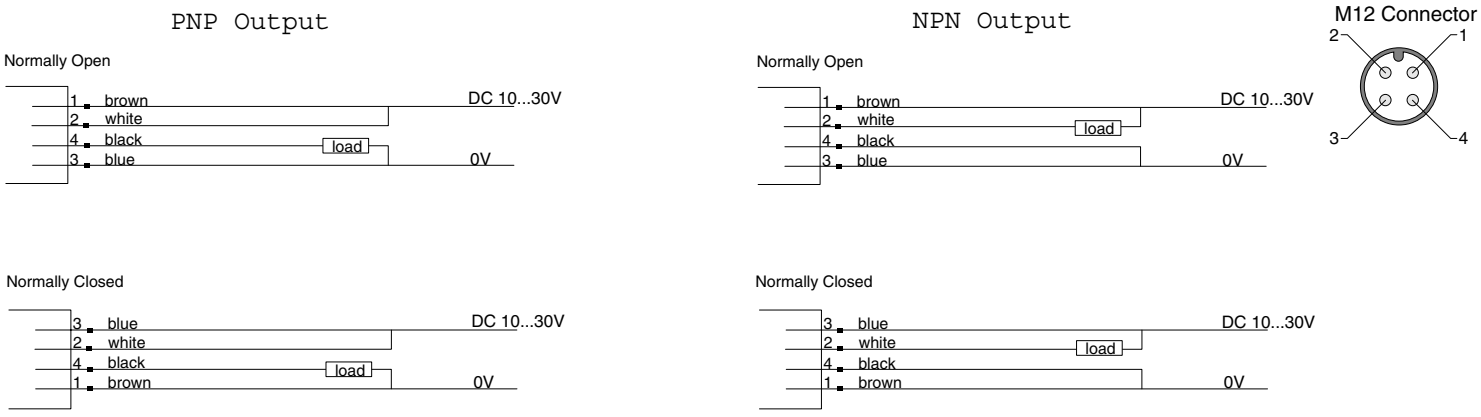
Accessories

	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data	VT 18-2-	04172	04172 S01	04470	04470 S01					
Housing	M18, straight									
Sensing range, typ. max. [1]	0...4.1 in (0...105 mm)									
Background suppression[1]	starting from 4.5 in (115 mm)									
Light source[1], **light type**	LED, infrared light, 880 nm									
Light spot diameter	0.2 in at 2 in (4 mm at 50 mm)/0.3 in at 3.9 in (8 mm at 100 mm)									
Angle of divergence	Approx. 4.5°									
Supply voltage V_S	10...30 V DC[3]									
Ripple[4]	±10%									
Current consumption[5]	≤ 40 mA									
Switching outputs	PNP, NPN									
programmable via	Q, dark switching									
control wire	Q, light switching									
Output current I_A max.	100 mA									
Response time[6]	≤ 6.25 ms									
Max. switching frequency[7]	≥ 80/s									
Connection type	Cable[8], PVC, 4 x 0.34 mm², Ø 4.7 mm									
	Plug, M12 4-pin									
VDE protection class[9]	□									
Circuit protection[10]	A, B, C, D									
Enclosure rating	IP 67/NEMA 6									
Ambient temperature T_A[8]	Operation -13...158°F (-25...70°C)									
	Storage -13...167°F (-25...75°C)									
Approximate weight	5.3 oz (150 g)									
	3.5 oz (100 g)									
Housing material	Metal housing: nickel plated brass									
	Plastic housing: polyamide									
	Optics: PMMA									

1) Object with 90% reflectance (referred to standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend cable below 0°C
9) Withstand voltage of 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short circuit protected

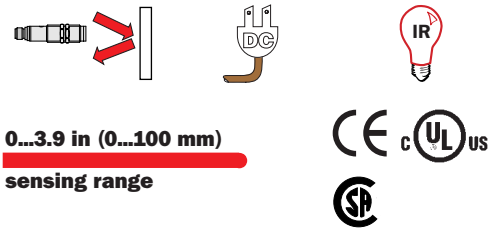
Connection Diagram



SICK

VTF 18

Proximity/Diffuse Sensors-Fixed Focus

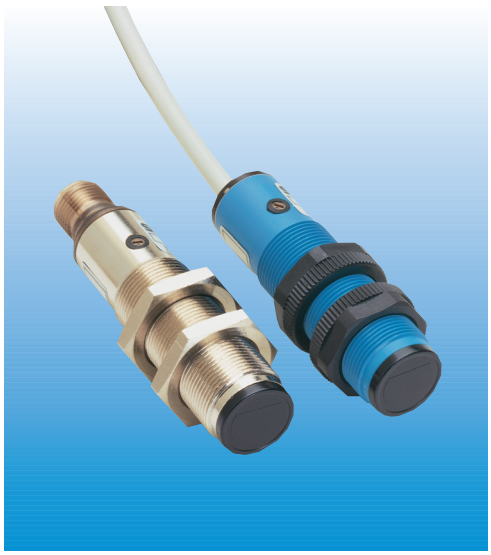


0...3.9 in (0...100 mm)
sensing range

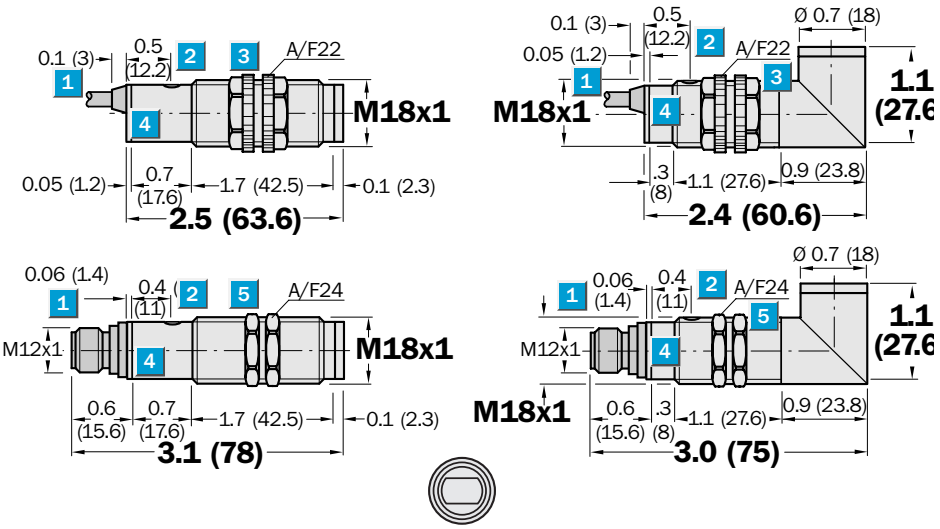
Highlights

- 2 sensing range options: 50 mm or 100 mm
- Signal strength indicator
- Crosstalk immunity
- Rugged plastic or metal housing
- Cable or M12 quick disconnects available
- Easy mounting with included nuts

VTF 18



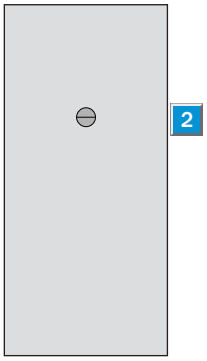
Dimensional Drawing



dimensions in inches (mm)

Adjustments

See selection table on page 896



1 Connecting cable or plug
2 Sensitivity control
3 Fastening nut, width across 22 mm, made of plastic for equipment with plastic housing
4 Signal strength indicator, LED, yellow
5 Fastening nut, width across 24 mm, made of metal for equipment with metal housing

Order Information

See selection table on page 896

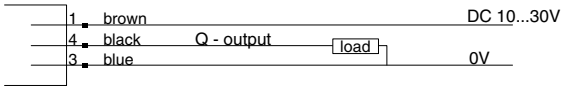
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data	VTF 18-	3_5...	4_5...	3_1...	4_1...
Housing	Straight	■	■	■	■
	Angled, 90°	■	■	■	■
VTF 18 2.0 in (50 mm)					
Sensing range[1]	0...2.0 in (0...50 mm)	■	■		
Light spot diameter	Approx. 0.1 in at 1.0 in (3 mm at 25 mm)	■	■		
Angle of divergence	Focused, focus 1.0 in (25 mm)	■	■		
Sensitivity, adjustable (optional)	Potentiometer 270°	■	■		
VTF 18 3.9 in (100 mm)					
Sensing range[1]	0.1...3.9 in (3...100 mm)			■	■
Light spot diameter	Approx. 0.1 in at 2.0 in (3 mm at 50 mm)			■	■
Angle of divergence	Focused, focus 2.0 in (50 mm)			■	■
Sensitivity, adjustable (optional)	Potentiometer 270°			■	■
Light source[2], light type	LED, infrared light	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Ripple[4]	± 10%	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■
Switching outputs (optional)	PNP/NPN	■	■	■	■
Operation mode	Q, dark switching	■		■	
	Q, light switching	■		■	
via control wire[6]	Q, light/dark switching		■		■
	+ V_S = light switching		■		■
	0 V = dark switching		■		■
Output current I_A max.	100 mA	■	■	■	■
Response time[7]	≤ 2 ms	■	■	■	■
Max. switching frequency[8]	250 Hz	■	■	■	■
Connection types	Cable, 2 m[9], PVC, 3 x 0.14 mm², Ø 3.1 mm	■		■	
	Cable, 2 m[9], PVC, 4 x 0.14 mm², Ø 5 mm		■		■
	Plug, M12 4-pin	■	■	■	■
VDE protection class[10]	□	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A	-13...158°F (-25...70°C)	■	■	■	■
Approximate weight	Metal housing: 4.2 oz (120 g)	■	■	■	■
	Plastic housing: 3.5 oz (100 g)	■	■	■	■
Housing material	Nickel-plated brass, PBT/PC	■	■	■	■
	Plastic housing, PBT/PC	■	■	■	■

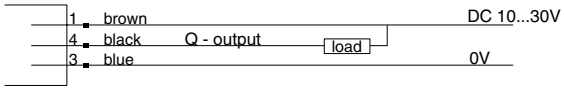
1) Object with 90% reflectance (referred to standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Control wire open:
NPN: light-switching
PNP: dark-switching.
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_s connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

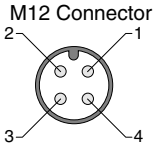
PNP Models



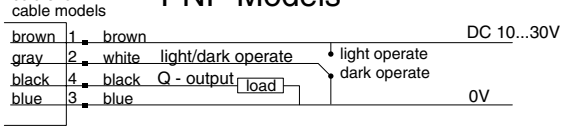
NPN Models



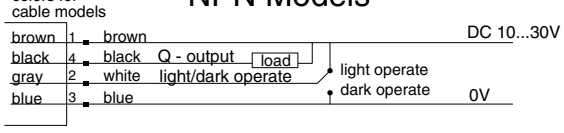
M12 Connector



PNP Models



NPN Models



wire colors refer to standard cable, not included with quick disconnect models

SICK

VTE 18

Proximity/Diffuse Sensors-Energetic

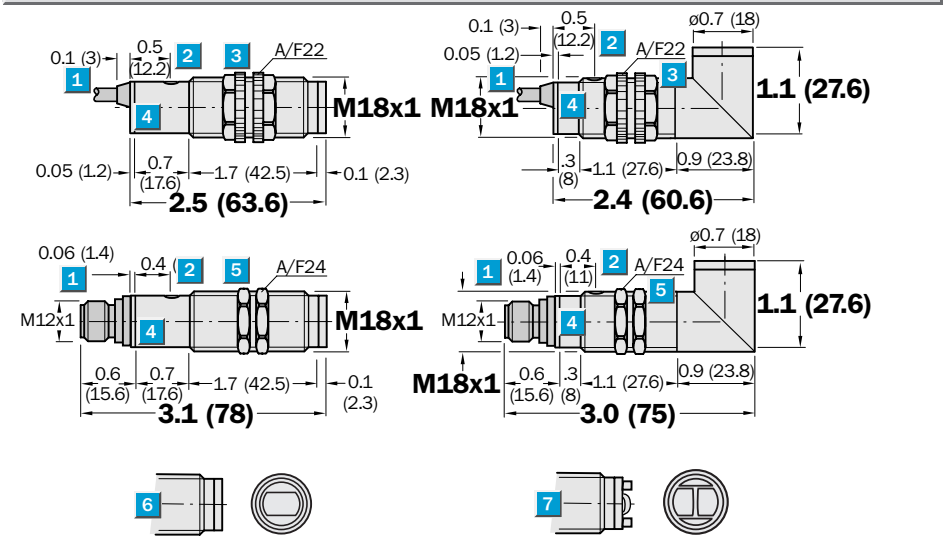
0.1...31.5 in (3...800 mm)
sensing range

Highlights

- Rugged plastic or metal housing
- Light or dark switching available
- 3 sensing range options:
  SD 1 = 7.9 in (200 mm)
  SD 2 = 15.7 in (400 mm)
  SD 3 = 31.5 in (800 mm)
- Standard 18 mm diameter
- Easy mounting with included nuts

VT 18

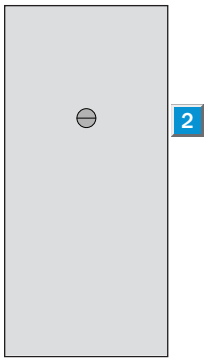
Dimensional Drawing



dimensions in inches (mm)

Adjustments

See selection table on page 896



1 Connecting cable or M12 plug
2 Sensitivity control
3 Fastening nut, width across 22 mm, made of plastic for equipment with plastic housing
4 Signal strength indicator, LED, yellow
5 Fastening nut, width across 24 mm, made of metal for equipment with metal housing
6 Sensors with a range of 200 mm to 400 mm
7 Sensors with a range of 800 mm

Order Information

See selection table on page 896

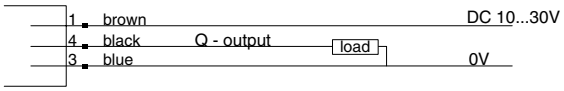
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data		VTE 18-	3_2...	4_2...	3_4...	4_4...	3_8...	4_8...
Housing	Straight		■	■	■	■	■	■
	Angled, 90°		■	■	■	■	■	■
VTE 18 Sensing range 7.9 in (200 mm)								
Sensing range[1]	0.1...7.9 in (3...200 mm)		■	■				
Light spot diameter	Approx. 0.4 in at 7.9 in (10 mm at 200 mm)		■	■				
VTE 18 Sensing range 15.7 in (400 mm)								
Sensing range[1]	0.2...15.7 in (5...400 mm)				■	■		
Light spot diameter	Approx. 0.8 in at 15.7 in (20 mm at 400 mm)				■	■		
VTE 18 Sensing range 31.5 in (800 mm)								
Sensing range[1]	0.4...31.5 in (10...800 mm)						■	■
Light spot diameter	Approx. 1.6 in at 31.5 in (40 mm at 800 mm)						■	■
Sensitivity adjustable (optional)	Potentiometer 270°		■	■	■	■	■	■
Light source[2], **light type**	LED, infrared light		■	■	■	■	■	■
Angle of divergence	Approx. 2.8°		■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[3]		■	■	■	■	■	■
Ripple[4]	± 10%		■	■	■	■	■	■
Current consumption[5]	≤ 30 mA		■	■	■	■	■	■
Switching outputs (optional)	PNP/NPN; open collector: Q		■	■	■	■	■	■
Operation mode	Q, light/dark switching		■		■		■	
	Q, light switching		■		■		■	
	Q, light/dark switching via control wire L/D[6]			■		■		■
	+ V_S = light switching			■		■		■
	0 V = dark switching			■		■		■
Output current I_A max.	100 mA		■	■	■	■	■	■
Response time[7]	≤ 2 ms		■	■	■	■	■	■
Max. switching frequency[8]	250 Hz		■	■	■	■	■	■
Connection types	Cable, 2 m,[9] PVC, 3 x 0.14 mm², Ø 3.1 mm		■		■		■	
	Cable, 2 m,[9] PVC, 4 x 0.14 mm², Ø 5 mm			■		■		■
	Plug, M12 4-pin		■	■	■	■	■	■
VDE protection class[10]	□		■	■	■	■	■	■
Circuit protection[11]	A, B, C, D		■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6		■	■	■	■	■	■
Ambient temperature T_A	-13...158°F (-25...70°C)		■	■	■	■	■	■
Approximate weight	Metal housing: 4.2 oz (120 g)		■	■	■	■	■	■
	Plastic housing: 3.5 oz (100 g)		■	■	■	■	■	■
Housing material	Nickel-plated brass, PBT/PC		■	■	■	■	■	■
	Plastic housing, PBT/PC		■	■	■	■	■	■

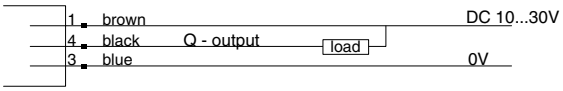
1) Object with 90% reflectance (referred to standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Control wire open:
NPN: light-switching
PNP: dark-switching
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

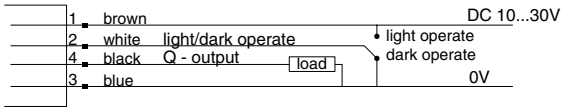


NPN Models

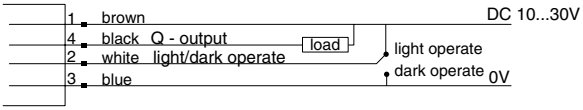


wire colors refer to standard cable, not included with quick disconnect models.

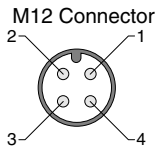
PNP Models



NPN Models



M12 Connector



SICK

VTE 18 L

Proximity/Diffuse Sensors-Energetic

0...15.7 in (0...400 mm)
0.08...9.8 in (2...250 mm)

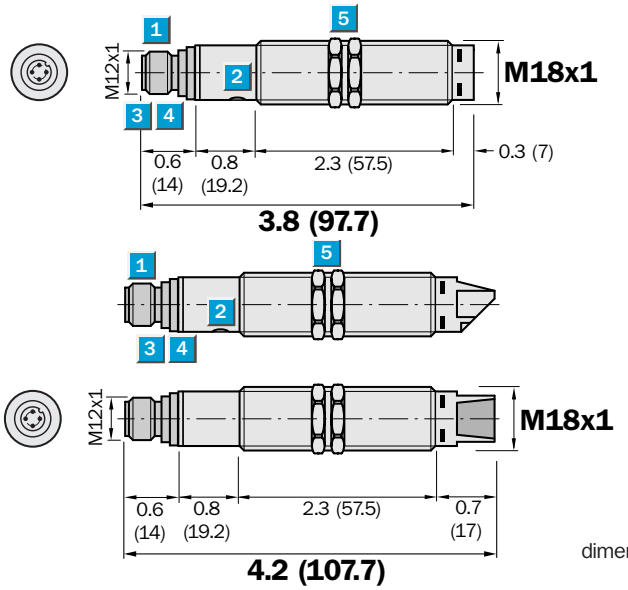
sensing range

Highlights

- Detects small parts precisely thanks to the small laser light spot
- Laser Class I
- Adjustable sensitivity

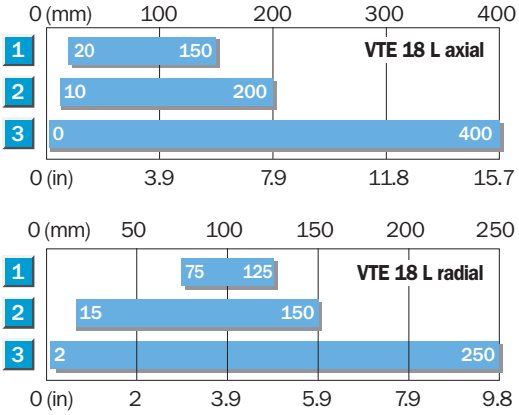
VTE 18 L

Dimensional Drawing



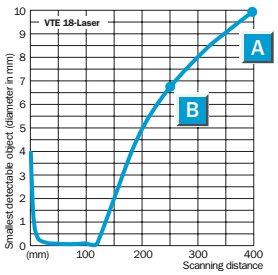
dimensions in inches (mm)

Excess Gain



Sensing range, max. typ.

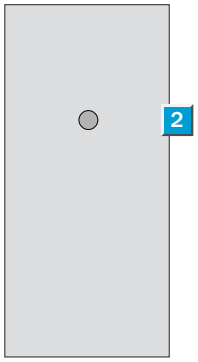
1. Sensing range on black, 6% remission
2. Sensing range on grey, 18% remission
3. Sensing range on white, 90% remission



A Axial optics
B Radial optics

Adjustments

All types



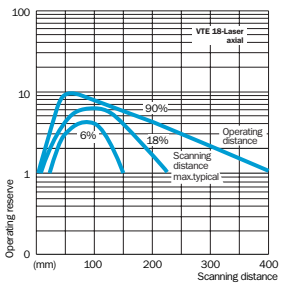
1. Plug M12, 4-pin
2. Sensitivity adjustment (Teach-in button)
3. Green LED indicator: V_S supply voltage feed
4. Yellow LED indicator:
   - lights continuously: reception signal > reserve factor 2
   - blinks: Reception signal < reserve factor 2 but > switching threshold 1
5. Mounting nuts (2x), SW 24, metal (included with delivery)

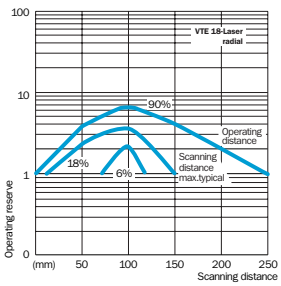
Order Information

Type	Part no.
VTE 18 L-4P324	6 027 418
VTE 18 L-4N324	6 027 420
VTE 18 L-4P344	6 027 422
VTE 18 L-4N344	6 027 424

Accessories

	page
Cables and connectors	909
Mounting brackets	925, 926

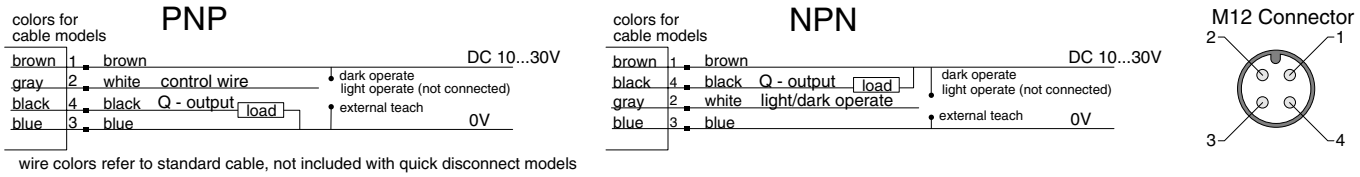




Technical Data	VTE 18 L-	4P324	4P344	4N324	4N344
Sensing range, max. typical [1]	0...15.7 in (0...400 mm)	■		■	
	0.08...9.8 in (2...250 mm)		■		■
Minimum object diameter[1]	= Light spot diameter	■	■	■	■
Light spot diameter	Approx. 0.004 in at 3.9 in (0.1 mm in 100 mm) (= Focus)	■	■	■	■
	Approx. 0.2 in at 7.9 in (5.0 mm in 200 mm)	■	■	■	■
	Approx. 0.3 in at 11.8 in (8.0 mm in 300 mm) (only axial)	■		■	
Angle of divergence	Focused, focus at 3.9 in (100 mm)	■	■	■	■
Light source[2], Light type	Red laser LED, 650 nm	■	■	■	■
Laser class	Laser class 1 (IEC 60825-1)	■	■	■	■
Laser sender output capacity	Max. 0.4 mW	■	■	■	■
Housing	Axial optics	■		■	
	Radial optics		■		■
Sensitivity setting	Manual, per Teach-in button	■	■	■	■
	Electronic, per control input C (0 V)[3]	■	■	■	■
Status indicators	Yellow LED: switching output active, reserve	■	■	■	■
	LED green: supply voltage V_S = ON	■	■	■	■
Supply voltage V_S	10...30 V DC [4]	■	■	■	■
Ripple[5]	≤ 10 %	■	■	■	■
Current consumption[6]	≤ 30 mA	■	■	■	■
Switching outputs	Q: PNP	■	■		
	Q: NPN			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■
Switching mode	Light/dark switching selectable[3]	■	■	■	■
Response time[7]	≤ 0.625 ms	■	■	■	■
Switching frequency max.[8]	800/s	■	■	■	■
Connection types	Plug, M12 4-pin	■	■	■	■
VDE protection class[9]	□	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Ambient temperature	Operation 5....131°F (-15...55°C)	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■
Approximate weight	With plug 2.1 oz (60 g)	■	■	■	■
Housing material	Housing: Nickel-coated brass/PC	■	■	■	■
	Optics: PC with protective glass pane	■	■	■	■

1) Object to be detected with 90% emission (elating to standard white in acc. with DIN 5033); 100 x 100 mm
2) Average service life 100,000 h at T_A = +25 °C
3) Control input C
   – L.ON/D.ON and
   – external Teach-in
   C = open: light switching L.ON
   C = + V_S: dark switching D.ON
   C = 0 V: Sensitivity setting per "external Teach-in"
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = V_S connections reverse-polarity protected
    B = Inputs and outputs reverse-polarity protected
    C = Interference pulse suppression
    D = Outputs overload and short-circuit protected

Connection Diagram

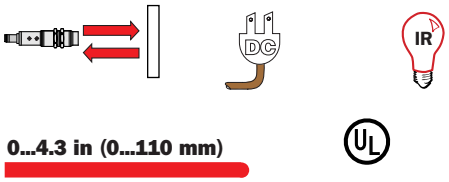


wire colors refer to standard cable, not included with quick disconnect models

SICK

VT 180

Proximity/Diffuse Sensors-Energetic



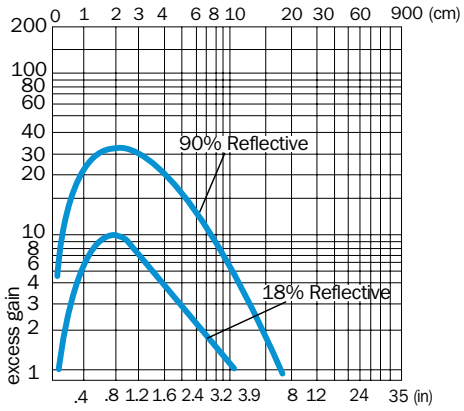
0...4.3 in (0...110 mm)
sensing range

Highlights

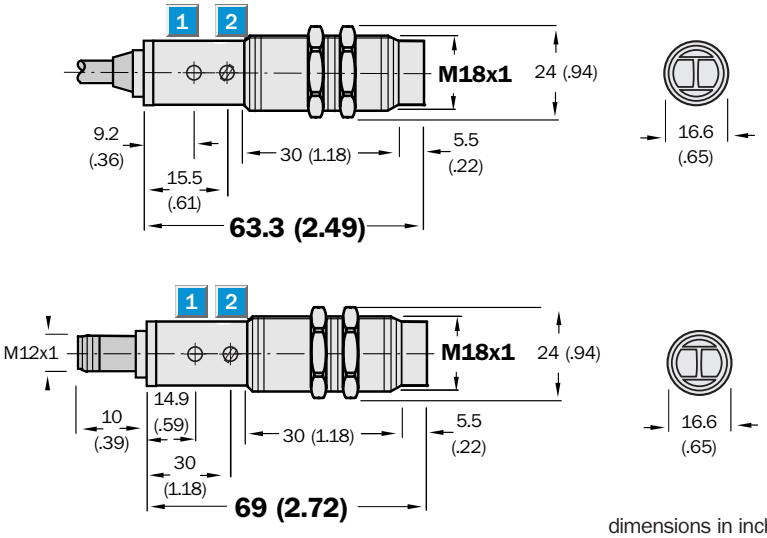
- Rugged metal housing
- LED status indicator
- Standard 18 mm size
- Adjustable sensitivity
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

VT 180

Excess Gain



Dimensional Drawing



dimensions in inches (mm)

1 Output indicator
2 Sensitivity adjustment

Order Information

Type	Part no.
VT 180-P112	6 008 787
VT 180-N112	6 008 788
VT 180-P410	6 008 789
VT 180-N410	6 008 790

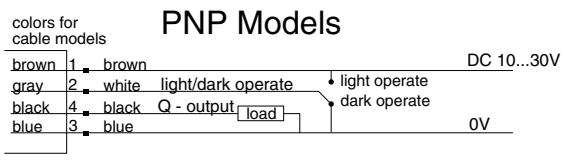
Accessories

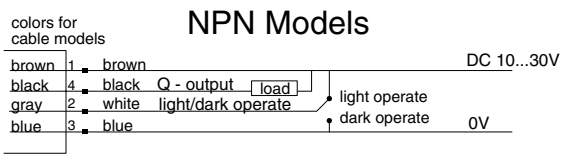
	page
Cables and connectors	909
Mounting brackets	925, 926

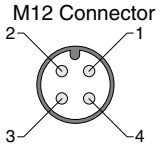
Technical Data	VT 180-	P112	N112	P410	N410
Sensing range, adjustable	0...4.3 in (0...110 mm)/PL 80 A	■	■	■	■
Light source[2], light type	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 2.6 in at 4.3 in (65 mm at 110 mm)	■	■	■	■
Angle of divergence	Approx. 33°	■	■	■	■
Supply voltage V_S	10...30 V DC[4]	■	■	■	■
Ripple[5]	≤ 5 V	■	■	■	■
Current consumption[6]	≤ 30 mA	■	■	■	■
Switching outputs	PNP	■		■	
	NPN		■		■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light or dark switching selectable via wire	■	■	■	■
Response time[7]	≤ 1.5 ms	■	■	■	■
Max. switching frequency[8]	333 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 3 x 0.14 mm², Ø 3.1 mm	■	■		
	Plug, M12 4-pin			■	■
VDE protection class[10]	□	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 66/NEMA 4	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	4.4 oz (125 g)	■	■		
	2.3 oz (65 g)			■	■
Housing material	Nickel-plated brass housing	■	■	■	■

1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Object to be detected with 90% remission 100 x 100 mm
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







wire colors refer to standard cable, not included with quick disconnect models

SICK

VT 180 Long range

Proximity/Diffuse Sensors-Energetic

0...15.8 in (0...400 mm)

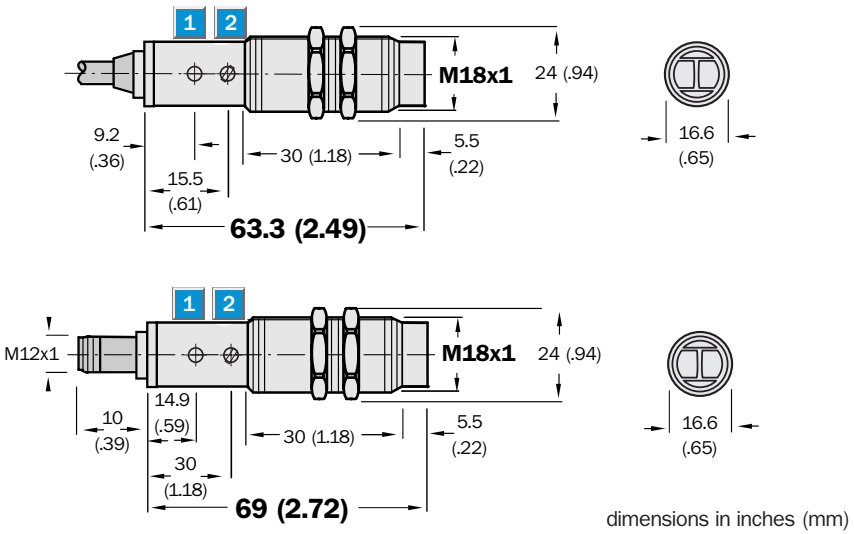
sensing range

Highlights

- Rugged metal housing
- LED status indicator
- Standard 18 mm size
- Adjustable sensitivity
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

VT 180

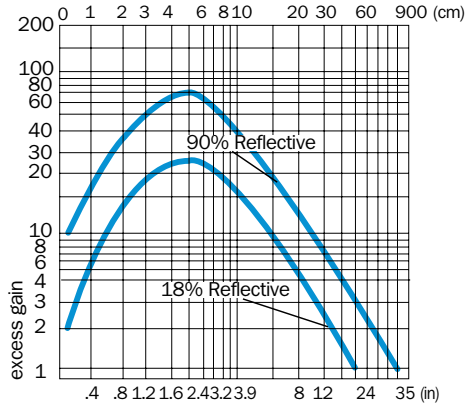
Dimensional Drawing



dimensions in inches (mm)

1 Output indicator
2 Sensitivity adjustment

Excess Gain



Order Information

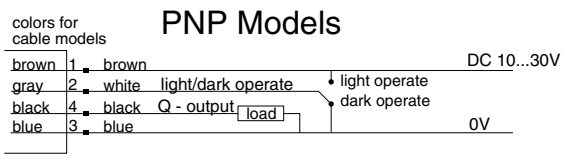
Type	Part no.
VT 180-P142	6 008 791
VT 180-N142	6 008 792
VT 180-P440	6 008 793
VT 180-N440	6 008 794

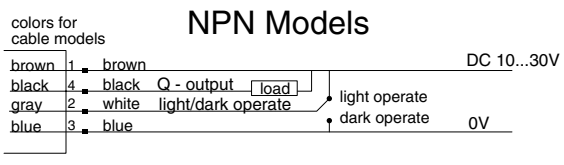
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

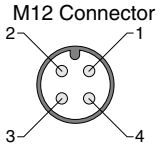
Technical Data	VT 180-	P142	N142	P440	N440					
Sensing range, adjustable	0...15.8 in (0...400 mm)/PL 80 A	■	■	■	■					
Light source[2], light type	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 1.2 in at 15.7 in (30 mm at 400 mm)	■	■	■	■					
Angle of divergence	Approx. 4°	■	■	■	■					
Supply voltage V_S	10...30 V DC[4]	■	■	■	■					
Ripple[5]	≤ 5 V	■	■	■	■					
Current consumption[6]	≤ 30 mA	■	■	■	■					
Switching outputs	PNP	■		■						
	NPN		■		■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light or dark switching selectable via wire	■	■	■	■					
Response time[7]	≤ 1.5 ms	■	■	■	■					
Max. switching frequency[8]	333 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[9]; 3 x 0.14 mm², Ø 3.1 mm	■	■							
	Plug, M12 4-pin			■	■					
VDE protection class[10]	□	■	■	■	■					
Circuit protection[11]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 66/NEMA 4	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	4.4 oz (125 g)	■	■							
	2.3 oz (65 g)			■	■					
Housing material	Nickel-plated brass housing	■	■	■	■					

1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Object to be detected with 90% remission 100 x 100 mm
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







wire colors refer to standard cable, not included with quick disconnect models

SICK

DS 60

Proximity/Diffuse Sensors - Background Suppression

3.1...177.2 in (200...6000 mm)

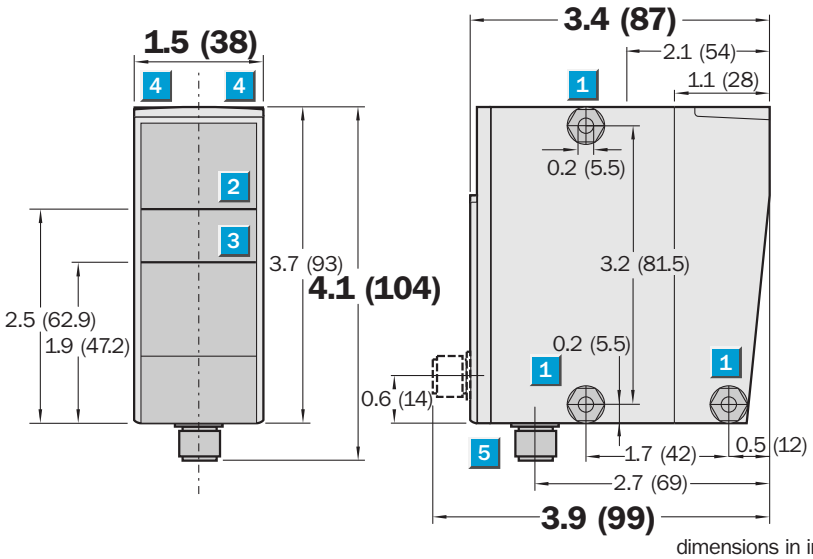
sensing range

Highlights

- Rugged plastic housing
- Background suppression up to 100 mm (against shiny objects)
- Works with objects from dull black to very shiny
- Two-function LED
- Red light alignment aid for easy setup
- Outputs set with one touch of a button
- Class 2 laser with time-of-flight technology for distance sensing

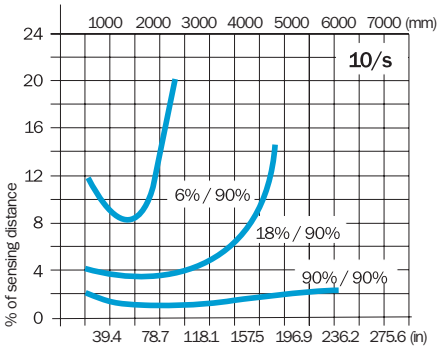
DS 60

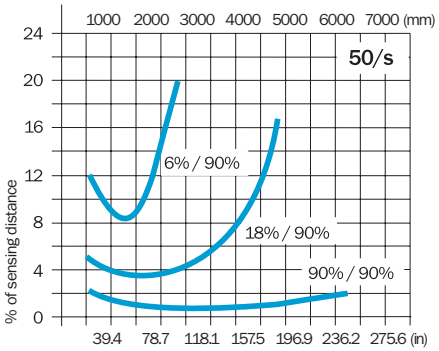
Dimensional Drawing



dimensions in inches (mm)

Background Suppression





Adjustments

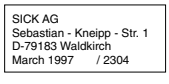
All types

1 Mounting holes Ø 5.2 mm
2 Center of optical axis – sender
3 Center of optical axis – receiver
4 Function indicator
5 Plug, M12 5-pin
6 Control panel

Order Information

Type	Part no.
DS 60-P21211	1 016 396
DS 60-N21211	1 016 491
DS 60-P41211	1 016 691
DS 60-N41211	1 016 692

Accessories	page
Cables and connectors	909
Mounting brackets	928



Technical Data	DS 60-	P 21211	N 21211	P 41211	N 41211
Sensing range, adjustable	7.9...236.2 in (200...6000 mm)	■	■	■	■
Object with 3% remission	3.1...55.1 in (80...1400 mm)	■	■		
	3.1...62.9 in (80...1600 mm)			■	■
Object with 6% remission	3.1...94.5 in (80...2400 mm)	■	■		
	3.1...102.4 in (80...2600 mm)			■	■
Object with 18% remission	3.1...181.1 in (80...4600 mm)	■	■		
	3.1...196.9 in (80...5000 mm)			■	■
Object with 90% remission[1]	3.1...236.2 in (80...6000 mm)	■	■	■	■
Light source[2]	Laser diode, red light (670 nm)	■	■	■	■
Light spot at 19.7 ft (6 m)	Ø 0.5 in (12 mm)	■	■	■	■
Laser protection class	II (21 CFR 1040-10)	■	■	■	■
Supply voltage V_S[3]	18...30 V DC	■	■	■	■
Power consumption[4]	< 3 W	■	■	■	■
Ripple[5]	≤ 5 V_{SS}	■	■	■	■
Switching outputs (invertible)	Q_1, Q_2	■	■	■	■
DS 60-P: PNP	HIGH = V_S – (< 2 V)/LOW = 0 V	■		■	
DS 60-N: NPN	HIGH = V_S/ LOW ≤ 2 V		■		■
Output current I_A[6]	100 mA	■	■	■	■
Response time/frequency	10 ms/50 Hz	■	■		
	50 ms/10 Hz			■	■
Switching threshold Q_1/Q_2	Adjustable (teach-in 200 mm minimum)	■	■	■	■
Time delay	On request	■	■	■	■
Mulifunction MF	N.C./External Teach on request	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■
VDE protection class[7]	□	■	■	■	■
Laser protection class	1 (EN 60 825-1)	■	■	■	■
Enclosure rating	IP 67 / NEMA 6	■	■	■	■
Ambient temperature T_A[8]	Operation -13...122°F (-25...50°C)	■	■	■	■
	Storage -13...167°F (-25...75°C)	■	■	■	■
Approximate weight	7.2 oz (202 g)	■	■	■	■
Housing material	Body: glass fiber reinforced ABS	■	■	■	■
	Lens: PMMA	■	■	■	■

1) Also shiny
2) Average service life 50,000 h at T_A = 25°C
3) Limit values, reverse-polarity protected
4) Without load
5) May not exceed or fall short of V_S tolerances
6) Outputs Q_1 and Q_2 short-circuit protected
7) Reference voltage 50 V DC
8) Do not bend below 0°C

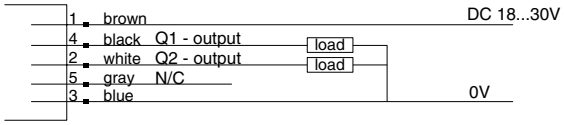
SICK AG
Sebastian - Kneipp - Str. 1
D-79183 Waldkirch
March 1997 / 2304

Emission Indicator
In order to meet the safety requirements for Class II laser products, a visible emission indicator must be located within 2 m (6.7 ft) of the sensor. We suggest using a switching amplifier with a power-ON indicator (the EN2 or EN3, for example) or a connector cable with a power-ON LED located on the connector.

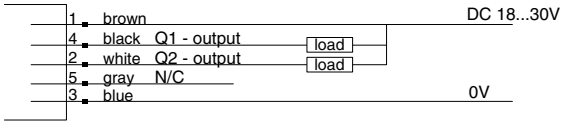
Beam Attenuator
The DS 60 sensor is equipped with an M12 style quick disconnect. The cable can be quickly and easily removed in the event that personnel require access to the area where the sensor is mounted.

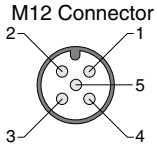
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included

SICK

DS 60 IR Laser

Proximity/Diffuse Sensors-Background Suppression

3.1...236.2 in (80...6000 mm)

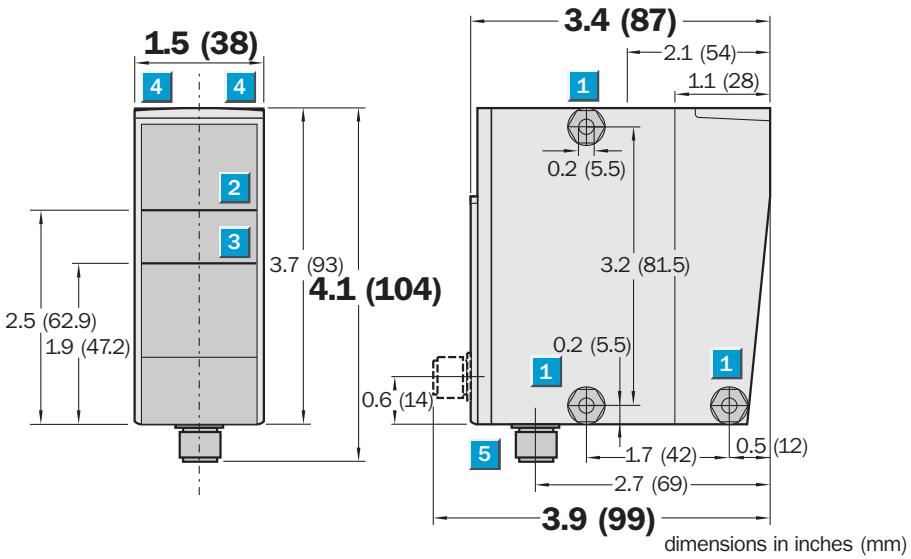
sensing range

Highlights

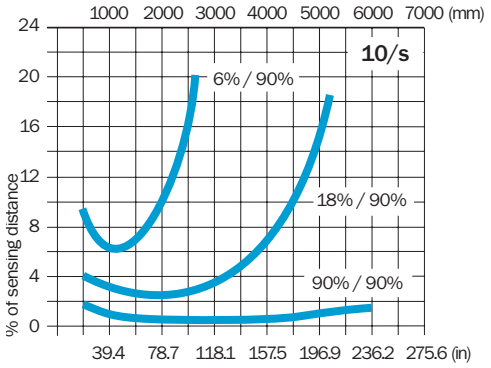
- Rugged plastic housing
- Background suppression sensor with two programmable outputs
- Reliably detects objects to 6 m
- Red light alignment aid for easy setup
- Outputs set with the push of a button
- Class I laser with time-of-flight technology for distance sensing
- Works with objects from dull black to very shiny

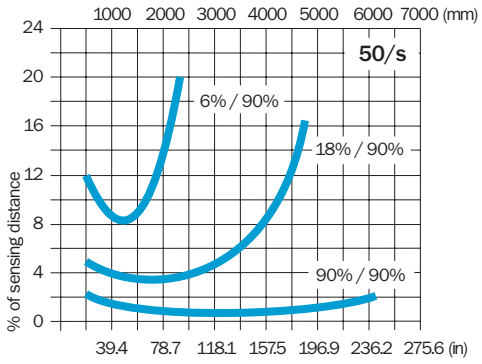
DS 60

Dimensional Drawing



Background Suppression





Adjustments

All types

1 Mounting holes Ø 5.2 mm
2 Center of optical axis – sender
3 Center of optical axis – receiver
4 Output indicator
5 Plug, M12 5-pin
6 Control panel

Order Information

Type	Part no.
DS 60-P21111	1 016 361
DS 60-P21311	1 016 393
DS 60-P41111	1 016 687
DS 60-P41311	1 016 689
DS 60-N21111	1 016 394
DS 60-N21311	1 016 686
DS 60-N41111	1 016 688
DS 60-N41311	1 016 690

Accessories

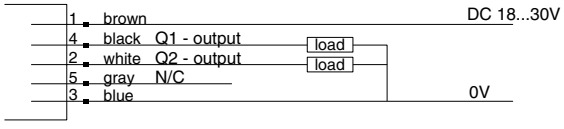
	page
Cables and connectors	909
Mounting brackets	928

Technical Data	DS 60-	P 21111	N 21111	P 21311	N 21311	P 41111	N 41111	P 41311	N 41311
Sensing range, adjustable	3.1...236.2 in (80 mm...6000 mm)	■	■	■	■	■	■	■	■
Object with 3% remission	3.1...55.1 in (80...1400 mm)	■	■	■	■				
	3.1...63.0 in (80...1600 mm)					■	■	■	■
Object with 6% remission	3.1...94.5 in (80...2400 mm)	■	■	■	■				
	3.1...102.4 in (80...2600 mm)					■	■	■	■
Object with 18% remission	3.1...181.1 in (80...4600 mm)	■	■	■	■				
	3.1...196.9 in (80...5000 mm)					■	■	■	■
Object with 90% remission[1]	3.1...236.2 in (80...6000 mm)	■	■	■	■	■	■	■	■
Light source[2], light type	Laser diode, infrared light	■	■	■	■	■	■	■	■
Light spot at 6 m	Ø 60 mm	■	■			■	■		
	Ø 12 mm			■	■			■	■
Supply voltage V_S[3]	18...30 V DC	■	■	■	■	■	■	■	■
Power consumption[4]	< 3 W	■	■	■	■	■	■	■	■
Ripple[5]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Switching outputs (invertible)	Q_1, Q_2	■	■	■	■	■	■	■	■
DS 60-P: PNP	HIGH = V_S – (< 2 V)/LOW = 0 V	■		■		■		■	
DS 60-N: NPN	HIGH = V_S/ LOW ≤ 2 V		■		■		■		■
Output current I_A[6]	100 mA	■	■	■	■	■	■	■	■
Response time/frequency	10 ms/50 Hz	■	■	■	■				
	50 ms/10 Hz					■	■	■	■
Switching threshold Q_1/Q_2	Adjustable (Teach-in 200 mm minimum)	■	■	■	■	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■	■	■	■
Laser protection class	1 (EN 60 825-1)	■	■	■	■	■	■	■	■
Enclosure rating	IP 67 /NEMA 6	■	■	■	■	■	■	■	■
		■	■	■	■	■	■	■	■
Ambient temperature T_A[8]	Operation -13...122°F (-25...50°C)								
	Storage -13...167°F (-25...75°C)	■	■	■	■	■	■	■	■
Approximate weight	7.2 oz (202 g)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

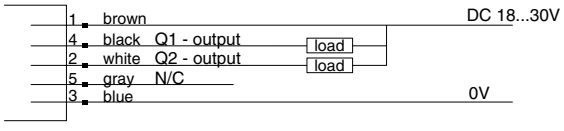
1) Also shiny
2) Average service life 100,000 h at T_A = 25°C
3) Limit values, reverse-polarity protected
4) Without load
5) May not exceed or fall short of V_S tolerances
6) Outputs Q_1 and Q_2 short-circuit protected
7) Reference voltage 50 V DC
8) Do not bend below 0°C

Connection Diagram

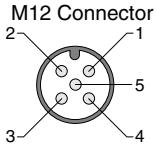
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

DS 60

Proximity/Diffuse Sensors-Foreground Suppression

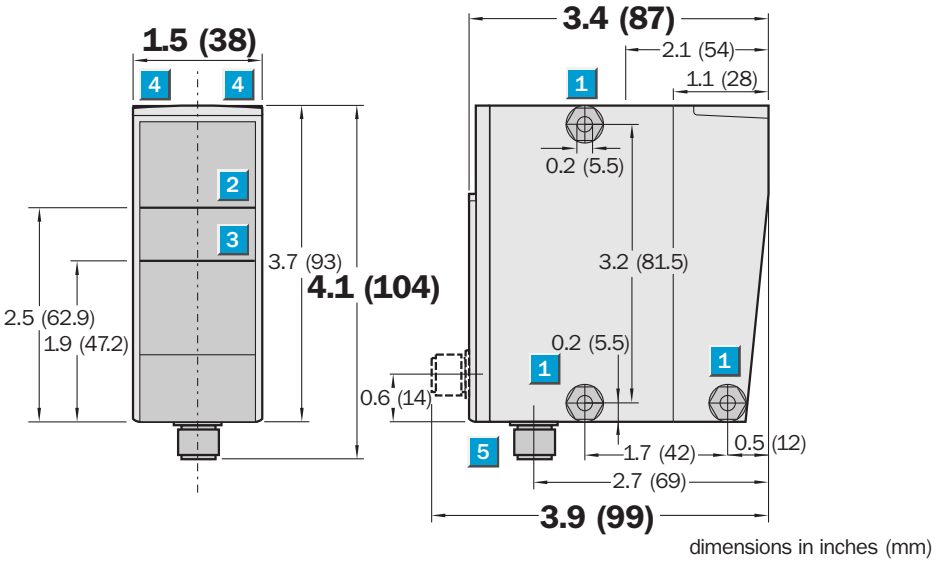
3.1...236.2 in (80...6000 mm)
sensing range

Highlights

- Rugged, lightweight plastic housing
- Foreground suppression sensor with two programmable outputs
- Works with objects from dull black to very shiny
- Two-function LED
- Red light alignment aid for easy setup
- Outputs set with the push of a button
- Class I laser with time-of-flight technology for distance sensing

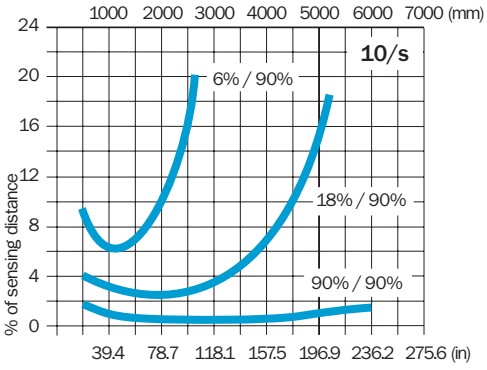
DS 60

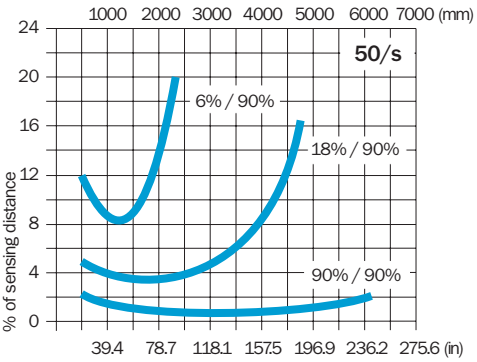
Dimensional Drawing



dimensions in inches (mm)

Foreground Suppression





Adjustments

All types

1 Mounting holes Ø 5.2 mm
2 Center of optical axis – sender
3 Center of optical axis – receiver
4 Output indicator
5 Plug, M12 5-pin
6 Control panel

Order Information

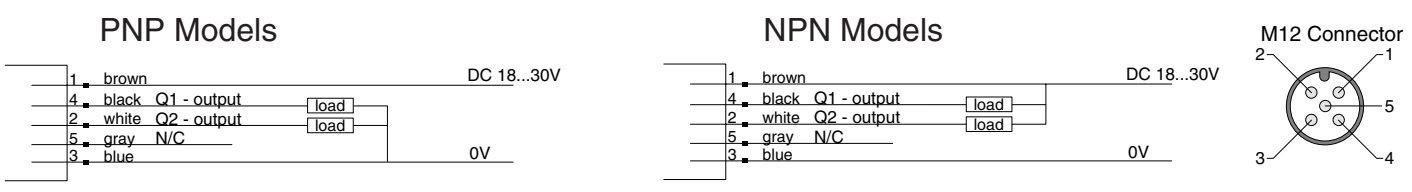
Type	Part no.
DS 60-P31111	1 016 493
DS 60-P31311	1 016 693
DS 60-P51111	1 016 695
DS 60-P51311	1 016 697
DS 60-N31111	1 016 494
DS 60-N31311	1 016 694
DS 60-N51111	1 016 696
DS 60-N51311	1 016 698

Accessories	page
Cables and connectors	909
Mounting brackets	928

Technical Data	DS 60-	P 31111	N 31111	P 31311	N 31311	P 51111	N 51111	P 51311	N 51311
Sensing range, adjustable	3.1...236.2 in (80...6000 mm)	■	■	■	■	■	■	■	■
Object with 3% remission	3.1...55.1 in (80...1400 mm))	■	■	■	■				
	3.1...63.0 in (80...1600 mm)					■	■	■	■
Object with 6% remission	3.1...94.5 in (80...2400 mm)	■	■	■	■				
	3.1...102.3 in (80...2600 mm)					■	■	■	■
Object with 18% remission	3.1...181.1 in (80...4600 mm)	■	■	■	■				
	3.1...196.8 in (80...5000 mm)					■	■	■	■
Object with 90% remission[1]	3.1...236.2 in (80...6000 mm)	■	■	■	■	■	■	■	■
Light source[2]	Laser diode, infrared	■	■	■	■	■	■	■	■
Light spot diameter	2.4 in at 19.7 ft (60 mm at 6 m)	■	■			■	■		
	0.5 in at 19.7 ft (12 mm at 6 m)			■	■			■	■
Supply voltage V_S[3]	18...30 V DC	■	■	■	■	■	■	■	■
Power consumption[4]	< 3 W	■	■	■	■	■	■	■	■
Ripple[5]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Switching outputs (invertible)	Q_1, Q_2	■	■	■	■	■	■	■	■
DS 60-P: PNP	HIGH = V_S – (< 2 V)/LOW = 0 V	■		■		■		■	
DS 60-N: NPN	HIGH = V_S/ LOW ≤ 2 V		■		■		■		■
Output current I_A[6]	100 mA	■	■	■	■	■	■	■	■
Response time/frequency	10 ms/50 Hz	■	■	■	■				
	50 ms/10 Hz					■	■	■	■
Switching threshold Q_1/Q_2	Adjustable (teach-in, 200 mm minimum)	■	■	■	■	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■	■	■	■
Laser protection class	1 (EN 60 825-1)	■	■	■	■	■	■	■	■
Enclosure rating	IP 67 / NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A[8]	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -13...167°F (-25...75°C)	■	■	■	■	■	■	■	■
Approximate weight	7.2 oz (202 g)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

1) Also shiny
2) Average service life 100,000 h at T_A = 25°C
3) Limit values, reverse-polarity protected
4) Without load
5) May not exceed or fall short of V_S tolerances
6) Outputs Q_1 and Q_2 short-circuit protected
7) Reference voltage 50 V DC
8) Do not bend below 0°C

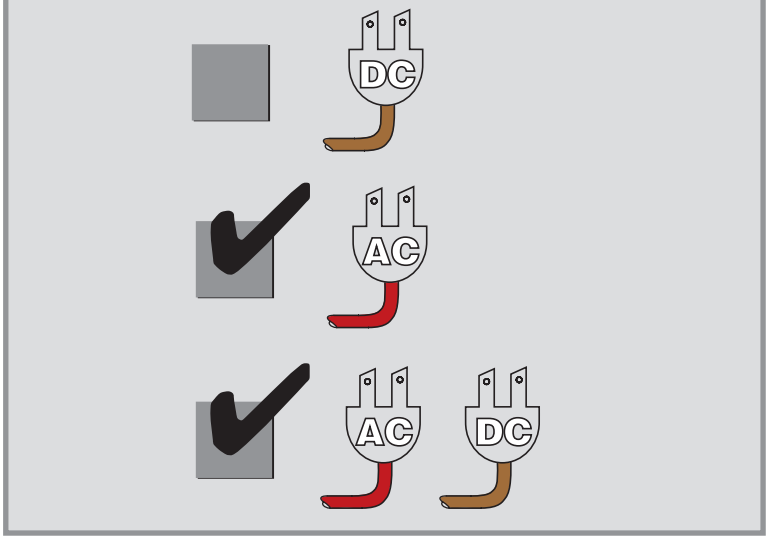
Connection Diagram



wire colors refer to standard cable, not included

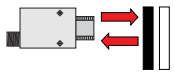
Proximity/Diffuse Sensors

Proximity/Diffuse Sensors



WT 1000 50 mm

Proximity/Diffuse Sensors-Background Suppression



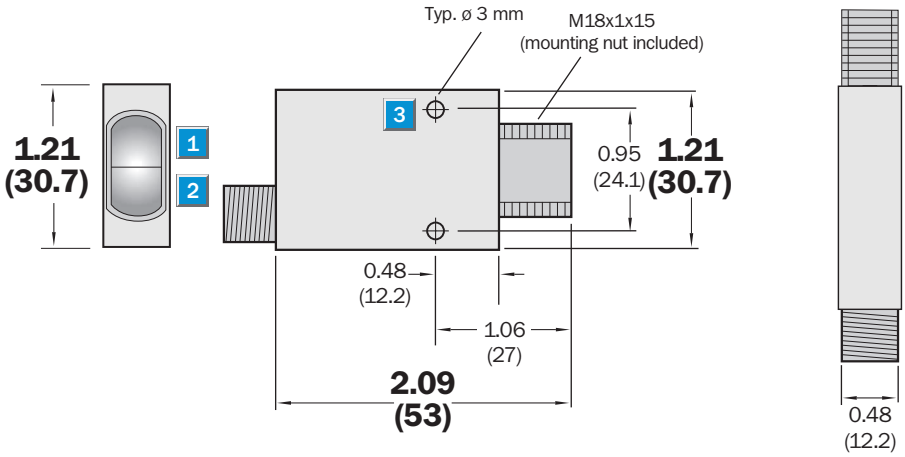
2.0 ±0.4 in (50 ±10 mm)
sensing range

Highlights

- Fixed background suppression provides superior performance to focused sensors
- Excels at sensing dark objects on light colored backgrounds
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

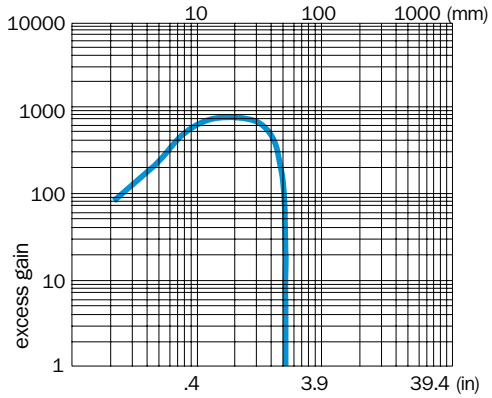
WT 1000 50

Dimensional Drawing



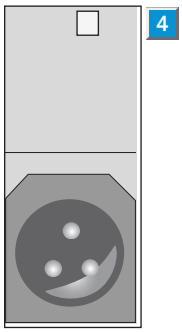
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Order Information

Type	Part no.
WT 1000-S152	7 025 947
WT 1000-S358	7 025 951
WT 1000-S351	7 025 952
WT 1000-T152	7 023 821
WT 1000-T350	7 023 822
WT 1000-T351	7 025 957

Accessories	page
Cables and connectors	910
Mounting brackets	925, 926

Technical Data	WT 1000-	S152	S350	S351	T152	T350	T351
Sensing range, fixed	2.0 ±0.39 in (50 ±10 mm)	■	■	■	■	■	■
Background suppression	6%/90%: ≤3% 0.06 in at 2 in (1.5 mm at 50 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 0.36 in at 2 in (9.2 mm at 50 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 10.5°	■	■	■	■	■	■
Supply voltage V_S	24...240 V AC	■	■	■	■	■	■
Leakage current, max.	1.7 mA (OFF state)	■	■	■	■	■	■
Switching outputs	Triac	■	■	■	■	■	■
Max. output current I_A	5...100 mA (5...300 mm at ≤50°C)	■	■	■	■	■	■
Switching mode	Light switching				■	■	■
	Dark switching	■	■	■			
Response time[2]	8.3 µs	■	■	■	■	■	■
Max. switching frequency[3]	60 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, micro 3-pin		■			■	
	Plug, micro 3-pin, with cable 150 mm			■			■
VDE protection class[4]	□	■	■	■	■	■	■
Circuit protection	Interference pulse suppression	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)		■			■	
	1.1 oz (30 g)	■		■	■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

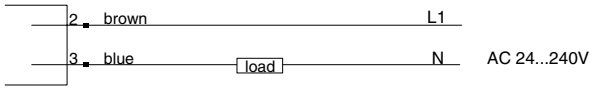
1) Average service life 50,000 h where $T_A = 25°C$

2) Signal transit time with resistive load

3) With light/dark ratio 1:1

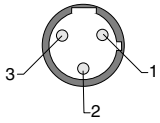
4) Reference voltage 250 V AC

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

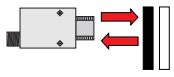
Micro Connector



SICK

WT 1000 100 mm

Proximity/Diffuse Sensors-Background Suppression



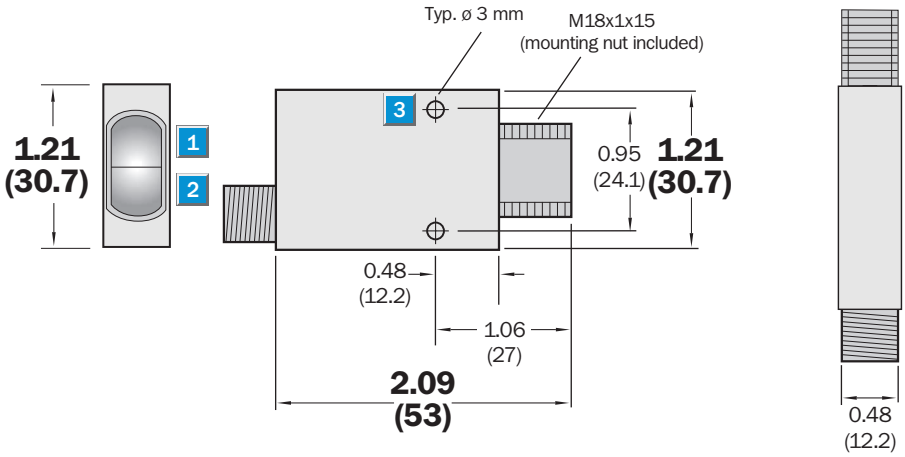
4.0 ±0.8 in (100 ±20 mm)
sensing range

Highlights

- Fixed background suppression provides superior performance to focused sensors
- Excels at sensing dark objects on light colored backgrounds
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

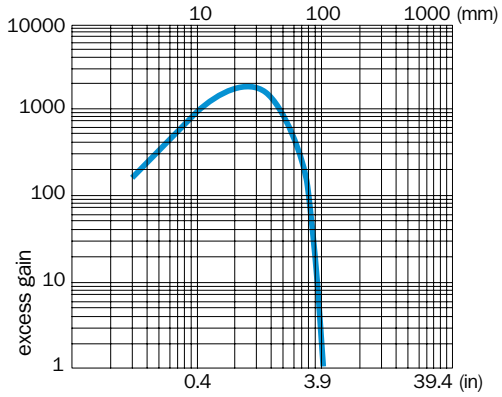
WT 1000 100

Dimensional Drawing



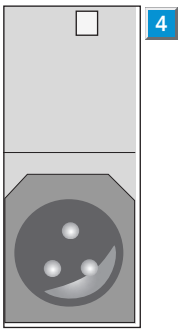
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Order Information

Type	Part no.
WT 1000-S162	7 025 949
WT 1000-S460	7 025 953
WT 1000-S361	7 025 954
WT 1000-T162	7 023 827
WT 1000-T360	7 023 828
WT 1000-T361	7 025 958

Accessories	page
Cables and connectors	910
Mounting brackets	925, 926

Technical Data	WT 1000-	S162	S360	S361	T162	T360	T361
Sensing range, fixed	4.0 ±0.8 in (100 ±20 mm)	■	■	■	■	■	■
Background suppression	6%/90%: ≤5% 0.2 in at 4 in (5 mm at 100 mm)	■	■	■	■	■	■
Background suppression capability	% of set sensing distance (see previous pg)	■	■	■	■	■	■
Light source[1], light type	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 0.7 in at 4 in (18.4 mm at 100 mm)	■	■	■	■	■	■
Angle of divergence	Approx. 10.5°	■	■	■	■	■	■
Supply voltage V_S	24...240 V AC	■	■	■	■	■	■
Leakage current, max.	1.7 mA (OFF state)	■	■	■	■	■	■
Switching outputs	Triac	■	■	■	■	■	■
Max. output current I_A	5...100 mA (5...300 mm at ≤50°C)	■	■	■	■	■	■
Switching mode	Light switching				■	■	■
	Dark switching	■	■	■			
Response time[2]	8.3 µs	■	■	■	■	■	■
Max. switching frequency[3]	60 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, micro, 3-pin		■			■	
	Plug, micro, 3-pin, with cable 150 mm			■			■
VDE protection class[4]	□	■	■	■	■	■	■
Circuit protection	Interference pulse suppression	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)		■			■	
	1.1 oz (30 g)	■		■	■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

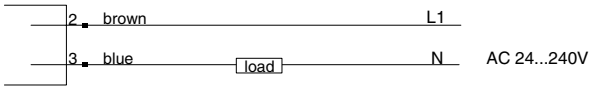
1) Average service life 50,000 h where $T_A = 25°C$

2) Signal transit time with resistive load

3) With light/dark ratio 1:1

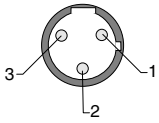
4) Reference voltage 250 V AC

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

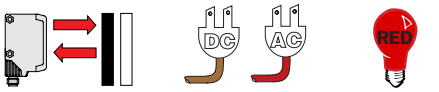
Micro Connector



SICK

WT 250

Proximity/Diffuse Sensors-Background Suppression



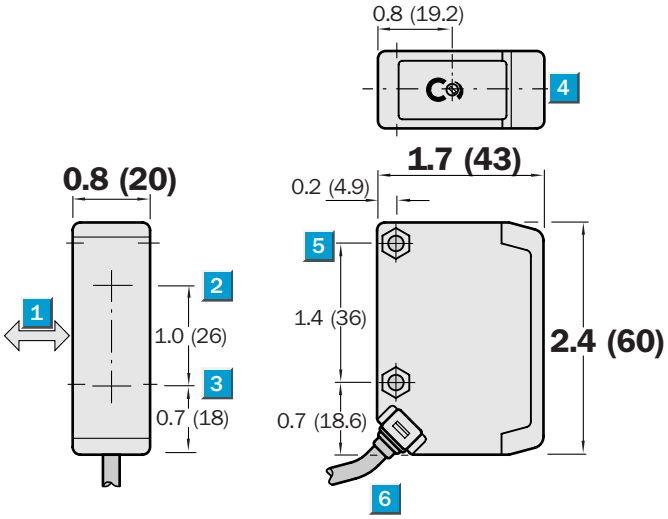
0.2...12.2 in (5...310 mm)
sensing range

Highlights

- Adjustable background suppression
- Adjustable sensing range
- Rugged plastic housing
- Universal current, relay switching output, SPDT
- Cable connections swivel 90° for easy installation
- Cable or M12 quick disconnect versions
- Easy mounting with included bracket

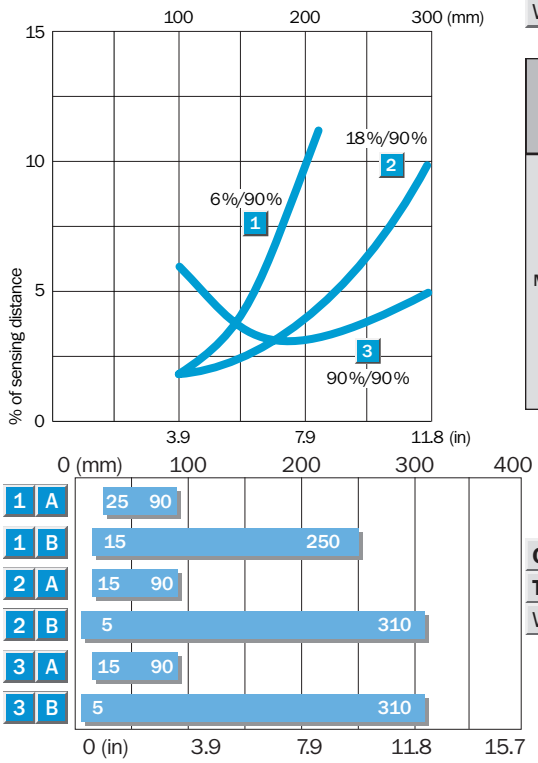
WT 250

Dimensional Drawing



dimensions in inches (mm)

Background Suppression

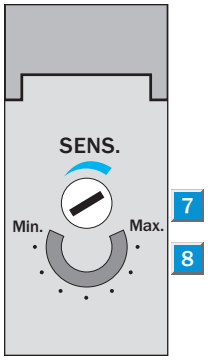


1	Sensing range on black[9], white background
2	Sensing range on gray[9], white background
3	Sensing range on white[9], white background
A	Sensing distance control set to MIN
B	Sensing distance control set to MAX

(see footnotes on next page)

Adjustments

WT 250-S142



1	Standard direction of the material to be sensed
2	Center of optical axis, sender
3	Center of optical axis, receiver
4	Red LED signal strength indicator
5	Through hole Ø 4.2 mm, for M4 hexagon nut on both sides
6	Connection cable
7	Sensing range adjustment (2 turns), over-turn protected
8	Position indicator for sensing range setting (270°)

Order Information

Type	Part no.
WT 250-S142	6 010 622

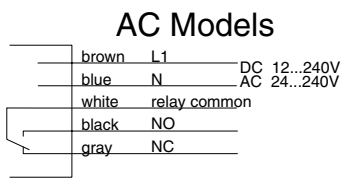
Accessories	page
Mounting brackets*	924, 935

* included with delivery

Technical Data	WT 250-	S142								
Sensing range, adjustable	0.2...12.2 in (5...310 mm)[1]									
Background suppression	3.5...12.2 in (90...310 mm)									
Background suppression capability	% of set sensing distance (see previous page)									
Sensitivity	Potentiometer, 2 turns, with position indicator									
Light source[2], light type	LED, visible red light									
Light spot diameter	Approx. 1.0 in at 11.8 in (25 mm at 300 mm)									
Angle of divergence	Approx. 3°									
Supply voltage V_S[3]	12...240 V DC									
	24...240 V AC									
Power consumption	≤ 2 VA									
Switching outputs	Relay, SPDT, electrically isolated									
Switching current I_A max.[4]	3 A/240 V AC; 3 A/30 V DC									
Operation mode	Light switching									
Response time	≤ 15 ms									
Max. switching frequency[5]	33/s									
Connection type	Cable PVC[6], 2 m 5 x 0.76 mm², Ø 6.3 mm									
VDE protection class[7]	⧈									
Circuit protection[8]	A, C									
Enclosure rating	IP 67/NEMA 6									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	5.3 oz (160 g)									
Housing material	Body: glass fiber reinforced ABS									
	Lens: polycarbonate									

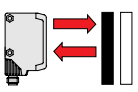
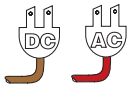
1) 90% remission of material sensed (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) ± 10%
4) Ensure spark extinguishing for inductive or capacitive load
5) With dark/light ratio 1:1
6) Do not bend below 0°C
7) Reference voltage 250 V UC
8) A = V_s connections reverse-polarity protected
C = Interference pulse suppression
9) Black = 6% remission
Gray = 18% remission
White = 90% remission

Connection Diagram



WT 250

Proximity/Diffuse Sensors-Background Suppression

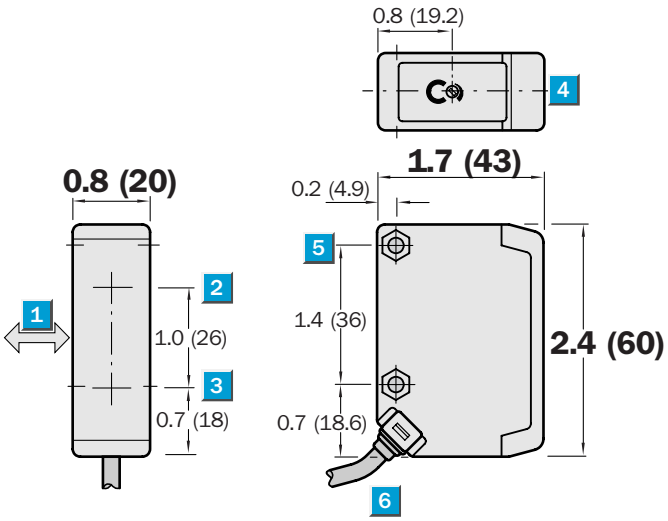
0.4...23.6 in (10...600 mm)
sensing range

Highlights

- Adjustable background suppression
- Rugged plastic housing
- Visible red light for easy alignment
- Wide range supply voltage
- Adjustable sensing range
- Easy mounting with included bracket

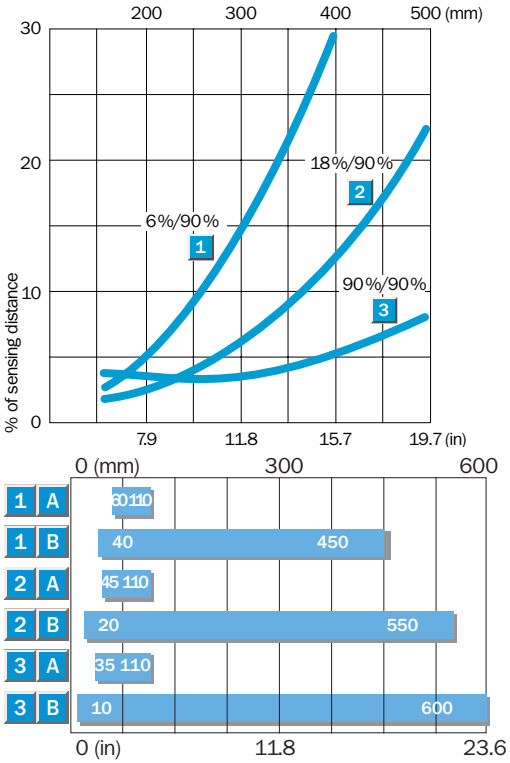
WT 250

Dimensional Drawing



dimensions in inches (mm)

Background Suppression

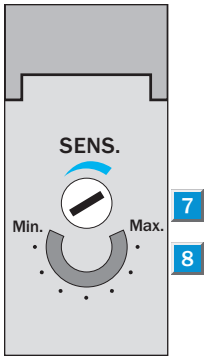


1	Sensing range on black[9], white background
2	Sensing range on gray[9], white background
3	Sensing range on white[9], white background
A	Sensing distance control set to MIN
B	Sensing distance control set to MAX

(see footnotes on next page)

Adjustments

WT 250-S162



1	Standard direction of the material to be sensed
2	Center of optical axis, sender
3	Center of optical axis, receiver
4	Red LED signal strength indicator
5	Through hole Ø 4.2 mm, for M4 hexagon nut on both sides
6	Connection cable
7	Sensing range adjustment (2 turns), over-turn protected
8	Position indicator for sensing range setting (270°)

Order Information

Type	Part no.
WT 250-S162	6 010 707

Accessories

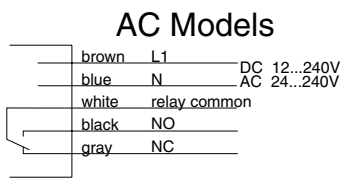
	page
Mounting brackets*	924, 935

* included with delivery

Technical Data	WT 250-	S162								
Sensing range, adjustable	0.4...23.6 in (10...600 mm)[1]									
Background suppression	3.9...23.6 in (100...600 mm)									
Background suppression capability	% of set sensing distance (see previous page)									
Sensitivity	Potentiometer, 2 turns, with position indicator									
Light source[2], light type	LED, visible red light									
Light spot diameter	Approx. 1.4 in at 19.7 in (35 mm at 500 mm)									
Angle of divergence	Approx. 3°									
Supply voltage V_S	10...240 V DC[3]									
	24...240 V AC									
Power consumption	≤ 2 VA									
Switching outputs	Relay, SPDT, electrically isolated									
Switching current I_A max.[4]	3 A/240 V AC; 3 A/30 V DC									
Operation mode	Light switching									
Response time	≤ 15 ms									
Max. switching frequency[5]	33/s									
Connection type	Cable PVC[6], 2 m 5 x 0.76 mm², Ø 6.3 mm									
VDE protection class[7]	□									
Circuit protection[8]	A, C									
Enclosure rating	IP 67 / NEMA 6									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	5.3 oz (160 g)									
Housing material	Body: glass fiber reinforced ABS									
	Lens: polycarbonate									

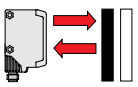
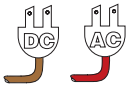
1) 90% remission of material sensed (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) ± 10%
4) Ensure spark extinguishing for inductive or capacitive load
5) With dark/light ratio 1:1
6) Do not bend below 0 °C
7) Reference voltage 250 V UC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
9) Black = 6% reflectance
Gray = 18% reflectance
White = 90% reflectance

Connection Diagram



WT 250

Proximity/Diffuse Sensors-Background Suppression

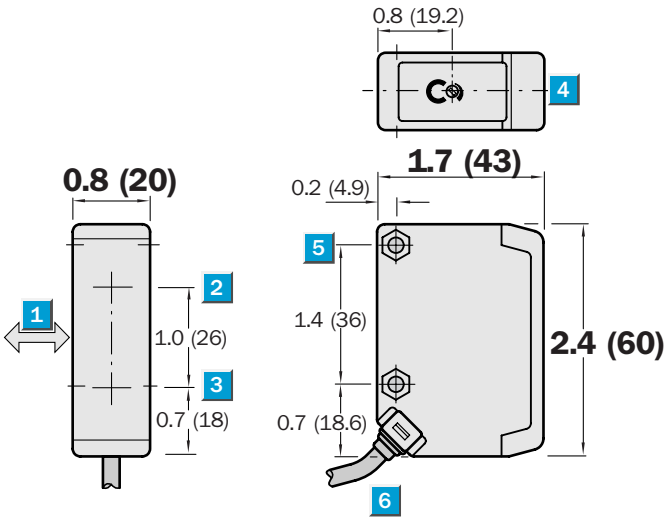
0.4...23.6 in (10...1100 mm)
sensing range

Highlights

- Adjustable background suppression
- Rugged plastic housing
- Visible red light for easy alignment
- Wide range supply voltage
- Adjustable sensing range
- Easy mounting with included bracket

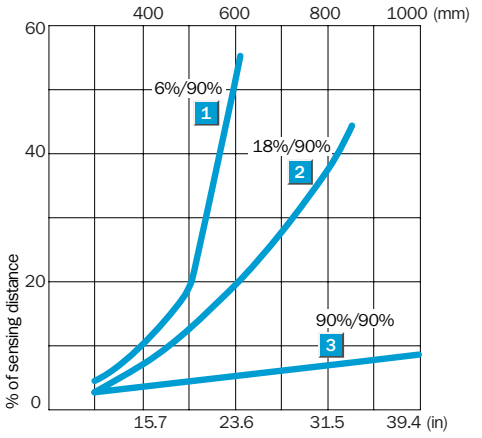
WT 250

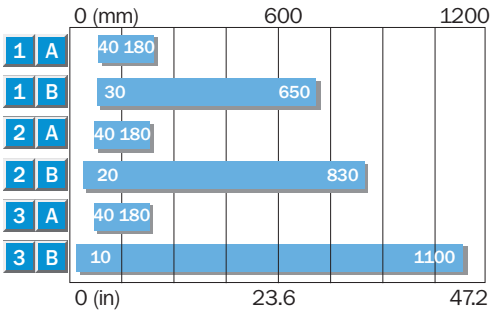
Dimensional Drawing



dimensions in inches (mm)

Background Suppression



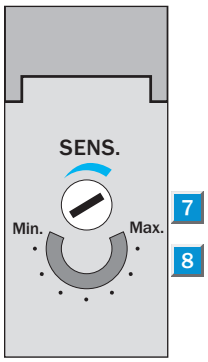


1	Sensing range on black[9], white background
2	Sensing range on gray[9], white background
3	Sensing range on white[9], white background
A	Sensing distance control set to MIN
B	Sensing distance control set to MAX

(see footnotes on next page)

Adjustments

WT 250-S172



1	Standard direction of the material to be sensed
2	Center of optical axis, sender
3	Center of optical axis, receiver
4	Red LED signal strength indicator
5	Through hole Ø 4.2 mm, for M4 hexagon nut on both sides
6	Connection cable
7	Sensing range adjustment (2 turns), over-turn protected
8	Position indicator for sensing range setting (270°)

Order Information

Type	Part no.
WT 250-S172	6 012 650

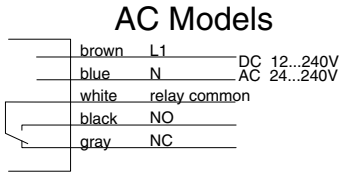
Accessories	page
Mounting brackets*	924, 935

* included with delivery

Technical Data	WT 250-	S172								
Sensing range, adjustable	0.4...43.3 in (10...1100 mm)[1]									
Background suppression	6.7...43.3 in (170...1100 mm)									
Background suppression capability	% of set sensing distance (see previous page)									
Sensitivity	Potentiometer, 2 turns, with position indicator									
Light source[2], light type	LED, visible red light									
Light spot diameter	Approx. 2.8 in at 39.4 in (70 mm at 1000 mm)									
Angle of divergence	Approx. 3°									
Supply voltage V_S	10...240 V DC[3]									
	24...240 V UC									
Power consumption	≤ 2 VA									
Switching outputs	Relay, SPDT, electrically isolated									
Switching current I_A max.[4]	3 A/240 V AC; 3 A/30 V DC									
Operation mode	Light switching									
Response time	≤ 15 ms									
Max. switching frequency[5]	33/s									
Connection type	Cable PVC[6], 2 m 5 x 0.76 mm², Ø 6.3 mm									
VDE protection class[7]	⊡									
Circuit protection[8]	A, C									
Enclosure rating	IP 67 / NEMA 6									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	5.3 oz (160 g)									
Housing material	Body: glass fiber reinforced ABS									
	Lens: polycarbonate									

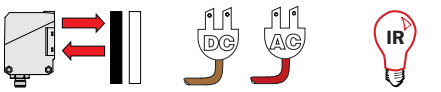
1) 90% remission of material sensed (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) ± 10%
4) Ensure spark extinguishing for inductive or capacitive load
5) With dark/light ratio 1:1
6) Do not bend below 0 °C
7) Reference voltage 250 V UC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
9) Black = 6% reflectance
Gray = 18% reflectance
White = 90% reflectance

Connection Diagram



WT 260

Proximity/Diffuse Sensors-Background Suppression

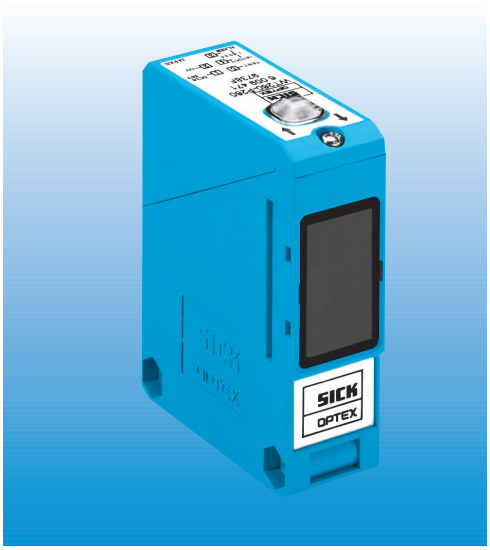


0...15.0 in (0...380 mm)
sensing range

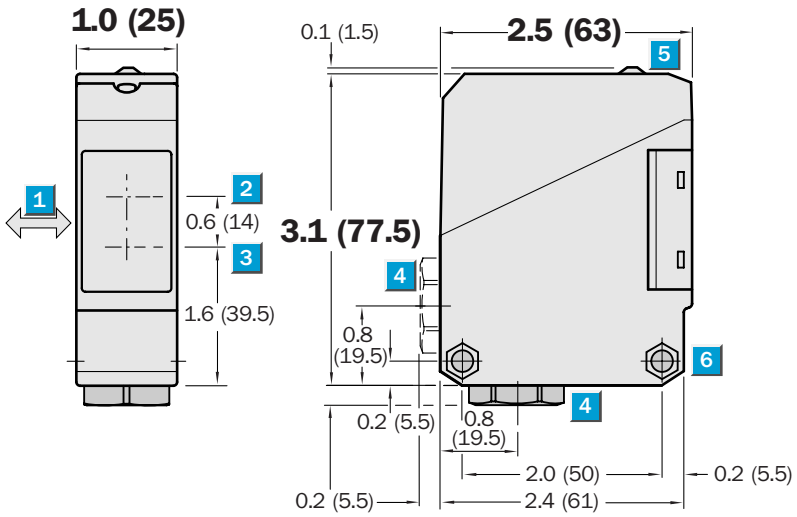
Highlights

- Rugged plastic housing
- Easy mounting with included bracket
- Terminal chamber for connection flexibility
- Universal current supply, relay output, SPST, timer optional
- Adjustable background suppression
- Sensitivity adjustment
- Selectable time delays
- Signal strength indicator

WT 260

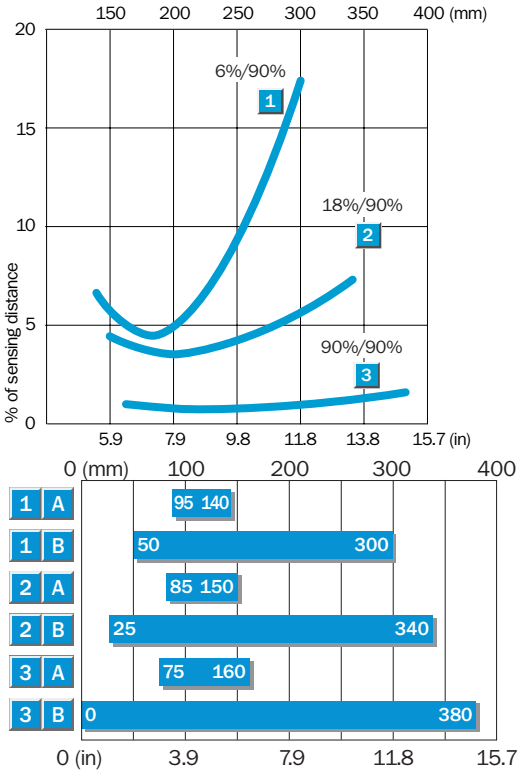


Dimensional Drawing



dimensions in inches (mm)

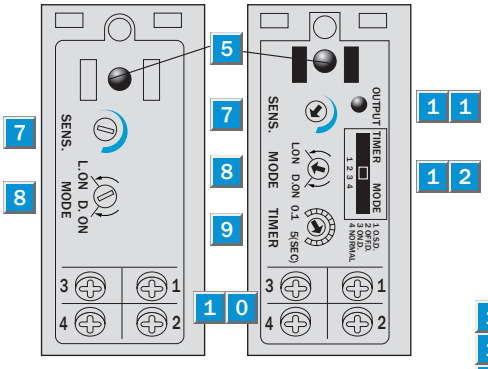
Background Suppression



1	Sensing range on black[8]/background white
2	Sensing range on grey[8]/background white
3	Sensing range on white[8]/background white
A	Sensing distance control set to MIN
B	Sensing distance control set to MAX

Adjustments

WT 260-S260 | WT 260-R260



1	Standard direction of material being sensed
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear
5	LED signal strength indicator, red
6	Through hole Ø 5.2 mm on both sides for M5 hex nut
7	Sensing range adjustment
8	Light/dark rotary switch (L.ON = light switching, D.ON = dark switching)
9	Time range control
10	Terminals
11	Red LED status indicator
12	Time delay selector switch

O.S.D. = One Shot OFF.D. = OFF delay
ON.D. = ON delay Normal = No delay

Order Information

Type	Part no.
WT 260-S260	6 009 473
WT 260-R260	6 009 472

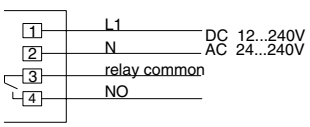
Accessories	page
Mounting brackets*	924, 935

* included with delivery

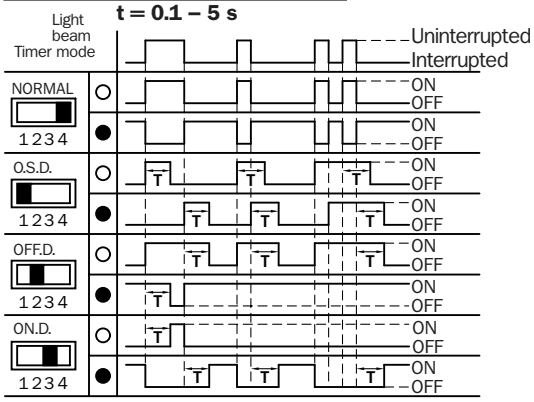
Technical Data		WT 260-	S260	R260
Sensing range, adjustable		0...15.0 in (0...380 mm)[1]		
Background suppression		3.0...15.0 in (75...380 mm)		
Background suppression capability		% of set sensing distance (see previous page)		
Sensitivity		Adjustable, potentiometer 270°		
Light source[2]**, light type**		LED, infrared light		
Light spot diameter		Approx. 0.7 in at 11.8 in (17 mm at 300 mm)		
Angle of divergence		Approx. 1.5°		
Supply voltage V_S[3]		12...240 V DC		
		24...240 V AC		
Power consumption		≤ 5 VA		
Switching outputs		Relay, SPST, electrically isolated		
Switching current I_A max.[4]		3 A/240 V AC; 3 A/30 V DC		
Operation mode		Light/dark switching by rotary switch		
Response time		≤ 20 ms		
Max. switching frequency[5]		25 Hz		
Time delay		With LED display: switching output active		
Switch position:	«1 O.S.D.»	«One shot»		
	«2 OFF.D.»	OFF delay		
	«3 ON.D.»	ON delay		
	«4 Normal»	No delay		
Delay		Adjustable, 0.1…5 s; potentiom. 270°		
Connection type		Terminal chamber		
VDE protection class[6]		⊡		
Circuit protection[7]		A, C		
Enclosure rating		IP 66/NEMA 4		
Ambient temperature T_A		Operation -13...131°F (-25...55°C)		
		Storage -40...158°F (-40...70°C)		
Approximate weight		4.2 oz (120 g)		
Housing material		Body: glass fiber reinforced ABS		
		Lens: polycarbonate		

1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Reference voltage 250 V UC
7) A = V_S connections reverse-polarity protected
C = Interference suppression
8) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



Time Delay

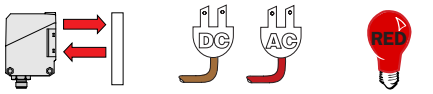


Setting mode: ○ light-switching
● dark-switching

SICK

WT 260

Proximity/Diffuse Sensors-Energetic

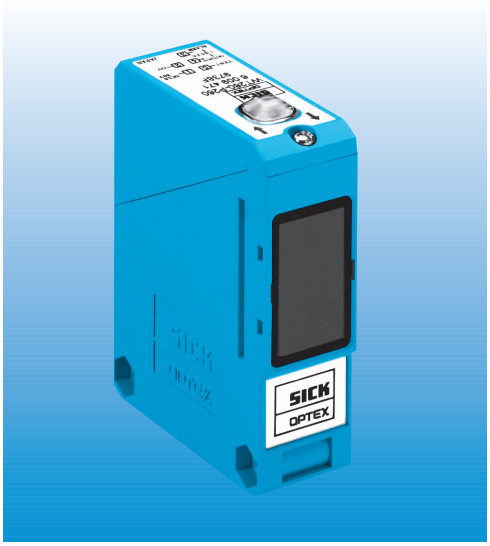


0.2...66.9 in (5...1700 mm)
sensing range

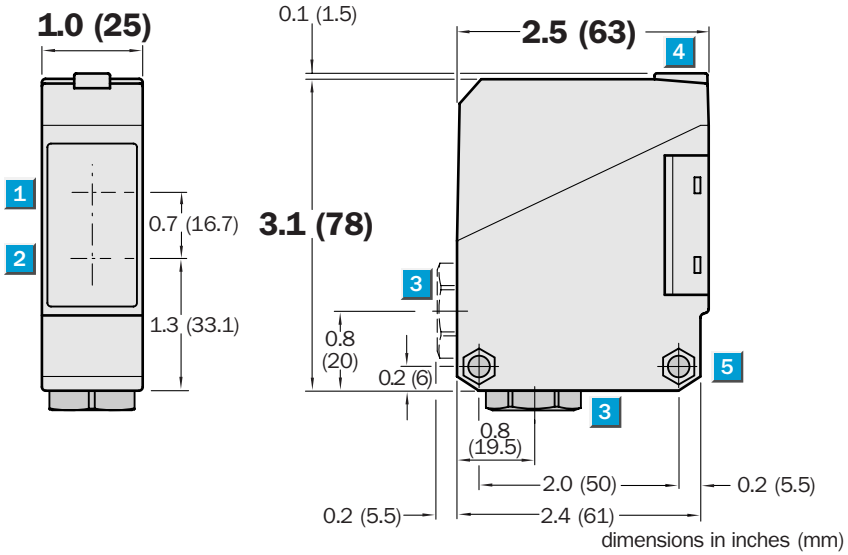
Highlights

- Rugged plastic housing
- Adjustable sensitivity
- Terminal chamber for connection flexibility
- Adjustable time delays
- Wide range supply voltage
- Signal strength indicator
- Easy mounting with included bracket

WT 260

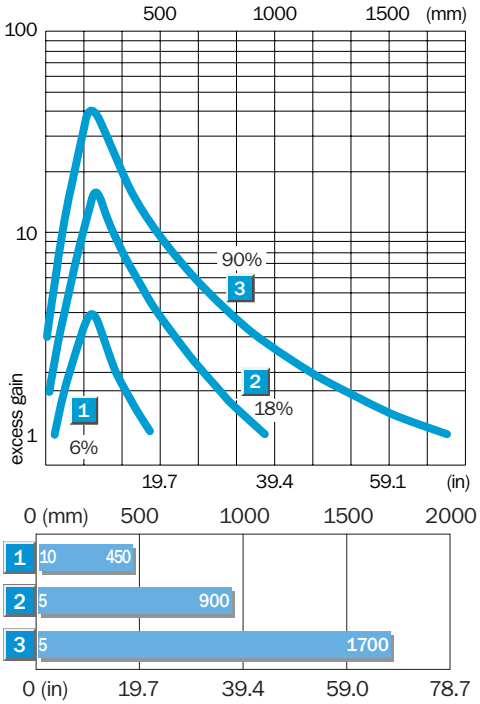


Dimensional Drawing



dimensions in inches (mm)

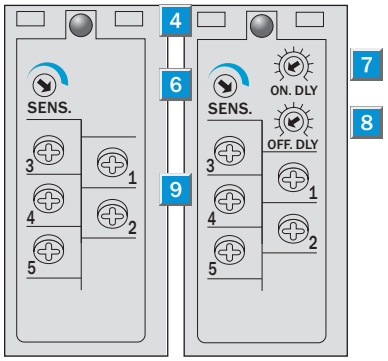
Excess Gain



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 260-S270	WT 260-R270



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear
4	LED signal strength indicator, red
5	Through hole Ø 5.2 mm on both sides for M 5 hex nut
6	Sensitivity adjustment
7	Time control ON-delay t_{ON}
8	Time control OFF-delay t_{OFF}
9	Terminals

Order Information

Type	Part no.
WT 260-S270	6 020 769
WT 260-R270	6 020 770

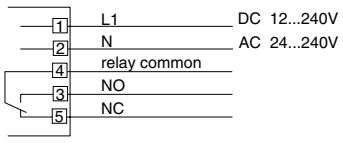
Accessories	page
Mounting brackets*	924, 935

* included with delivery

Technical Data	WT 260-	S270	R270
Sensing range, adjustable	0.2...66.9 in (5...1700 mm)[1]	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■
Light source[2], light type	LED, red light	■	■
Light spot diameter	Approx. 2.4 in at 51.2 in (60 mm at 1300 mm)	■	■
Angle of divergence	Approx. 1.8°	■	■
Supply voltage V_S[3]	12...240 V DC	■	■
	24...240 V AC	■	■
Power consumption	≤ 5 VA	■	■
Switching output	Relay, SPDT, electrically isolated	■	■
Switching current I max[4]	3 A/240 V AC; 3 A/30 V DC	■	■
Operation mode	Light switching	■	■
Response time	≤ 20 ms	■	■
Max. switching frequency[5]	25 Hz	■	■
Time delays			
ON-delay t_{ON}	0.1...10 s, can be connected separately		■
OFF-delay t_{OFF}	0.1...10 s, can be connected separately		■
Connection type	Terminal chamber	■	■
CE noise radiation	Level EN 50081-1	■	■
	("Residential standard")		
VDE protection class[6]	⧈	■	■
Circuit protection[7]	A, C	■	■
Enclosure rating	IP 67 / NEMA 6	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■
	Storage -40...158°F (-40...70°C)	■	■
Approximate weight	4.2 oz (120 g)	■	■
Housing material	Body: glass fiber reinforced ABS	■	■
	Lens: polycarbonate	■	■

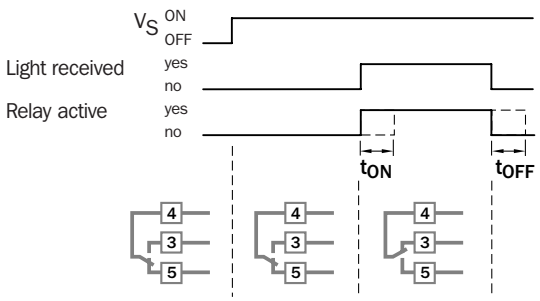
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Reference voltage 250 V UC
7) A = V_s connections reverse-polarity protected
C = Interference suppression

Connection Diagram



Time delay

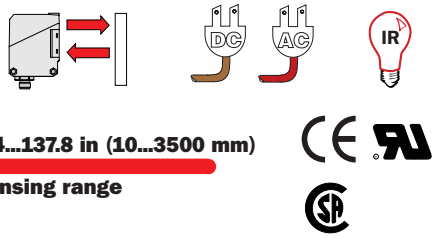
t = 0.1 – 10 s



SICK

WT 260

Proximity/Diffuse Sensors-Energetic

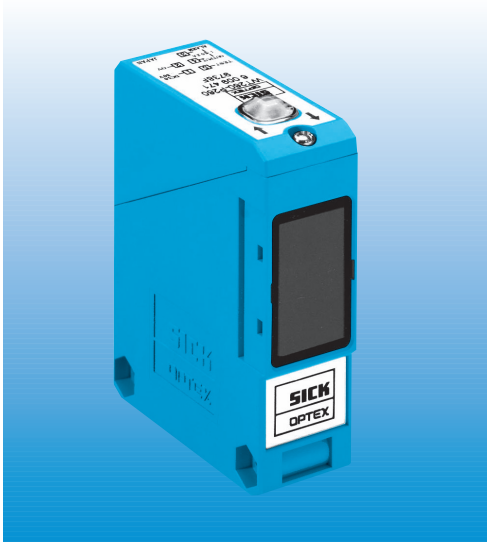


0.4...137.8 in (10...3500 mm)
sensing range

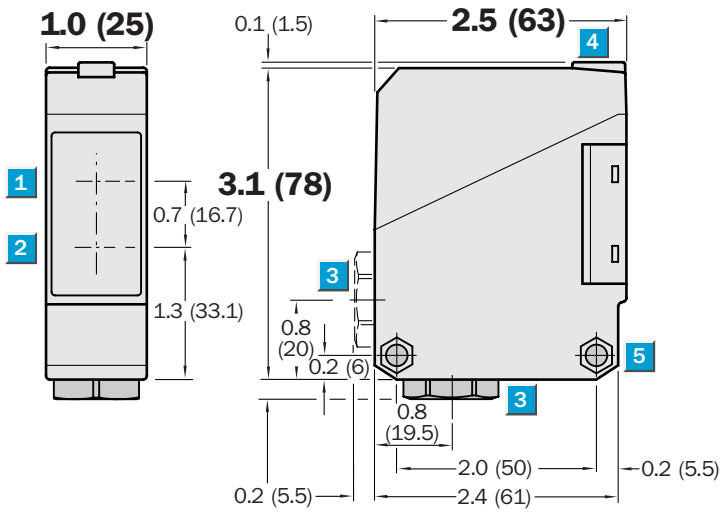
Highlights

- Rugged plastic housing
- Adjustable sensitivity
- Terminal chamber for connection flexibility
- Wide range supply voltage
- Adjustable time delays
- Signal strength indicator
- Easy mounting with included brackets

WT 260

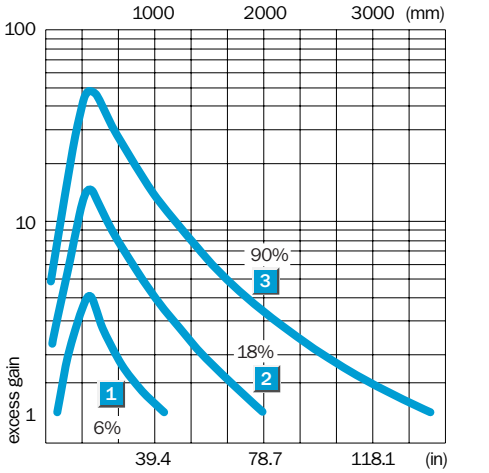


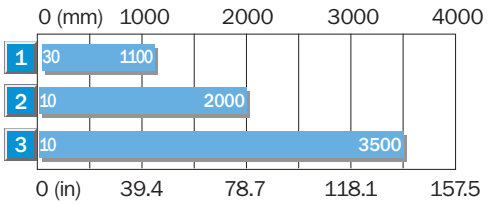
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

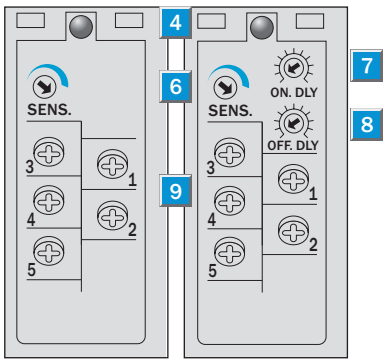




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 260-S280	WT 260-R280



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear
4	LED signal strength indicator, red
5	Through hole Ø 5.2 mm on both sides for M5 hex nut
6	Sensitivity adjustment
7	Time control ON-delay t_{ON}
8	Time control OFF-delay t_{OFF}
9	Terminals

Order Information

Type	Part no.
WT 260-S280	6 020 771
WT 260-R280	6 020 772

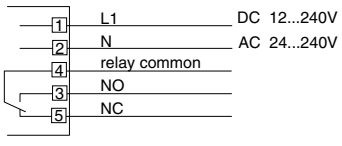
Accessories	page
Mounting brackets*	924, 935

* included with delivery

Technical Data	WT 260-	S280	R280
Sensing range, adjustable	0.4...137.8 in (10...3500 mm)[1]	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■
Light source[2], light type	LED, infrared light	■	■
Light spot diameter	Approx. 3.7 in at 118.1 in (95 mm at 3000 mm)	■	■
Angle of divergence	Approx. 1.7°	■	■
Supply voltage V_S[3]	12...240 V DC	■	■
	24...240 V AC	■	■
Power consumption	≤ 5 VA	■	■
Switching output	Relay, SPDT, electrically isolated	■	■
Switching current I max[4]	3 A/240 V AC; 3 A/30 V DC	■	■
Operation mode	Light switching	■	■
Response time	≤ 20 ms	■	■
Max. switching frequency[5]	25/s	■	■
Time delays			
ON delay t_{ON}	0.1...10 s, can be connected separately		■
OFF delay t_{OFF}	0.1...10 s, can be connected separately		■
Connection type	Terminal chamber	■	■
CE noise radiation	Level EN 50081-1	■	■
	("Residential standard")		
VDE protection class[6]	⧈	■	■
Circuit protection[7]	A, C	■	■
Enclosure rating	IP 67 / NEMA 6	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■
	Storage -40...158°F (-40...70°C)	■	■
Approximate weight	4.2 oz (120 g)	■	■
Housing material	Body: glass fiber reinforced ABS	■	■
	Lens: polycarbonate	■	■

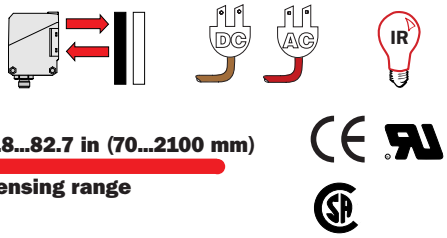
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Reference voltage 250 V UC
7) A = V_s connections reverse-polarity protected
C = Interference suppression

Connection Diagram



WT 260T

Proximity/Diffuse Sensors - Background Suppression



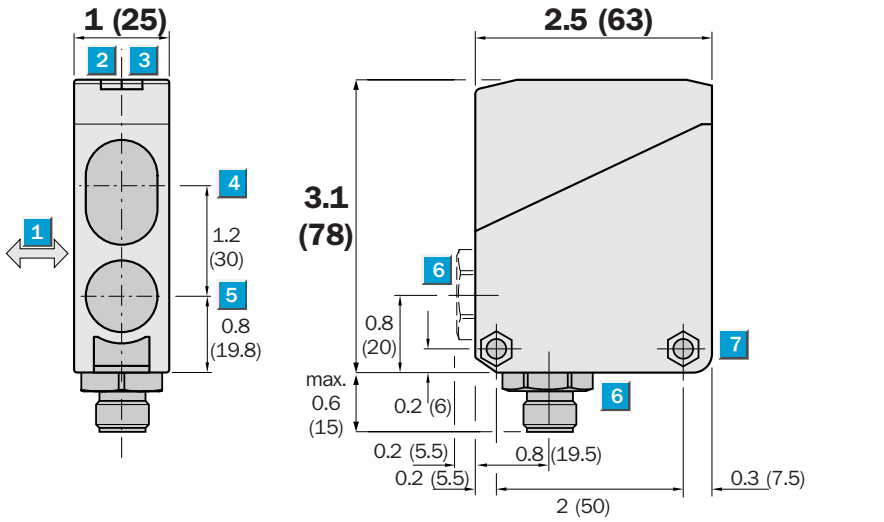
2.8...82.7 in (70...2100 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable sensitivity
- Test input
- Terminal chamber for connection flexibility
- Easy mounting with included bracket

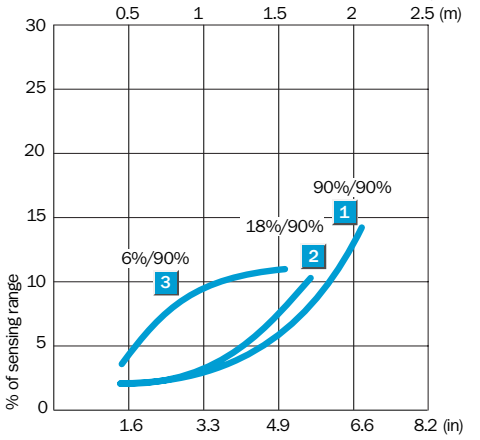
WT 260

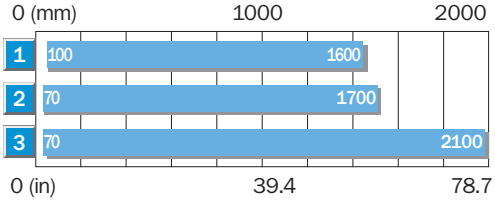
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

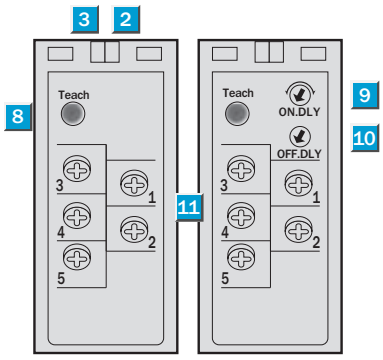




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 260T-S290	WT 260T-R290



1	Standard direction of material being sensed
2	LED signal indicator orange, switching output active
3	LED signal indicator green, operating reserve
4	Center of optical axis, receiver
5	Center of optical axis, sender
6	Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or M12 equipment plug, bottom (4-pin)
	LED signal strength indicator, yellow,
7	Through hole Ø 5.2 mm on both sides for M5 hex nut
8	Teach-in button (sensing range setting/ background suppression
9	Time control ON delay t_{ON}
10	Time control OFF delay t_{OFF}
11	Terminals

Order Information

Type	Part no.
WT 260T-S290	6 021 923
WT 260T-R290	6 021 924

Accessories	page
Mounting brackets*	924, 935

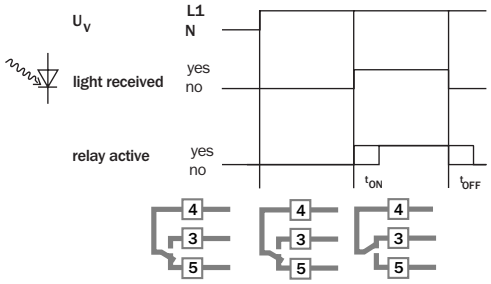
* included with delivery

Technical Data	WT 260T-	S290	R290							
Sensing range, adjustable	2.8...82.7 in (70...2100 mm)[1]									
Background suppression	3.9...78.7 in (100...2000 mm)									
Sensing range setting	Automatic, per Teach-in									
Light source[2], light type	LED, infrared light									
Light spot diameter	Approx. 7.9 in at 78.7 in (200 mm at 2000 mm)									
Angle of divergence	Approx. 6°									
Supply voltage V_S	10...30 V DC[3]									
	24...240 V UC									
Current consumption	≤ 5 VA									
Switching outputs	Relay, SPDT, electrically isolated									
Switching current I Max.[4]	3 a/240 V AC; 3 A/30 V DC									
Light receiver, switching mode	Light switching									
Response time[6]	≤ 20 ms; 25/s									
Max. switching frequency[7]	25/s									
Time delay										
ON delay t_{ON}	0.1...10 s, can be connected separately									
OFF delay t_{OFF}	0.1...10 s, can be connected separately									
Connection types	Terminal chamber									
VDE protection class[9]	⧈									
Circuit protection[10]	A, C									
Enclosure rating	IP 67									
Ambient temperature T_A	Operation -13...131°F (-25 ...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	4.2 oz (120 g)									
Housing material	Glass fiber reinforced ABS									

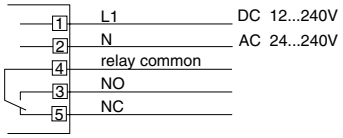
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Operating reserve < 50 %
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) Black = 6% remission
Grey = 18% remission
White = 90% remission

Time Delay

t = 0.1-10 s



Connection Diagram



SICK

WT 23

Proximity/Diffuse Sensors-Energetic

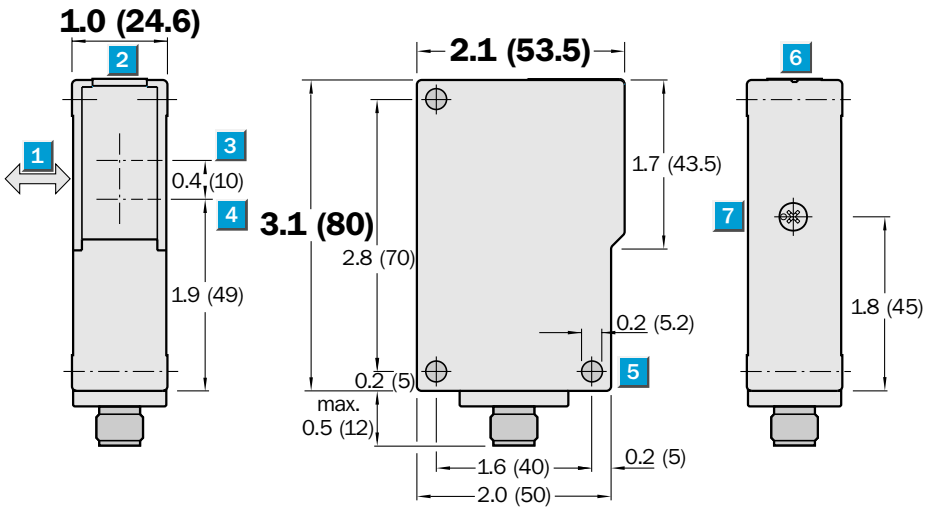
11.8...78.7 in (300...2000 mm)
sensing range

Highlights

- Infrared light
- Adjustable energetic photoelectric proximity sensor
- Low-cost sensor
- Cable or M12 quick disconnect versions

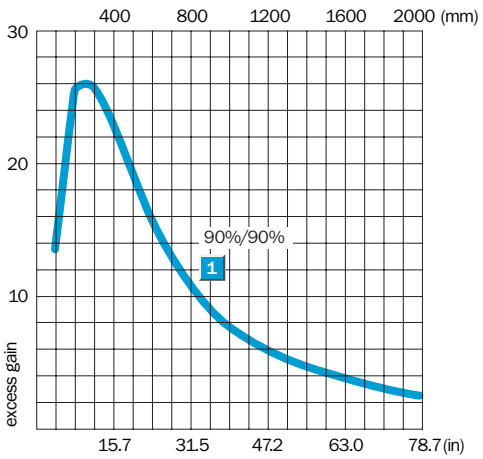
WT 23

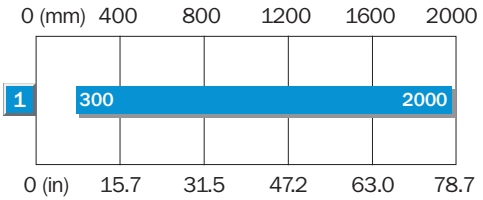
Dimensional Drawing



dimensions in inches (mm)

Excess Gain





Adjustments

WT 23-S112

1	Standard direction of the material being sensed
2	Output indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.2 mm
6	Alignment sight
7	Sensitivity adjustment

Order Information

Type	Part no.
WT 23-S112	1 016 249

Accessories

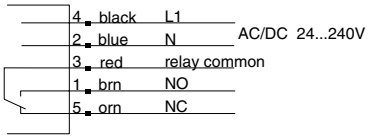
	page
Mounting brackets	923, 924

1 Sensing range on white, 90% remission

Technical Data	WT 23-	S112
Sensing range, adjustable	11.8...78.7 in (300...2000 mm)	
Light source[1], **light type**	LED, infrared light	
Light spot diameter	7.9 in at 78.7 in (200 mm at 2000 mm)	
Supply voltage V_S	90...265 V AC[2]	
Ripple[3]	≤ 5 V_{SS}	
Current consumption[4]	≤ 25 mA	
Power consumption	< 2 VA	
Switching outputs	PNP, Q and $\overline{Q}$	
	Relay SPDT[5]	
Output current I_A max.	100 mA	
Max. switching voltage	90...265 V AC	
Switching current	2.5 A	
Max. switching capacity	150 VA	
Response time[6]	6 ms	
Max. switching frequency[7]	10/s	
Connection types	Cable[8], 2 m	
VDE protection class[9]	⧈	
Circuit protection[10]	A, B, C	
Enclosure rating	IP 65	
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	
	Storage -40...158°F (-40...70°C)	
Approximate weight	6.3 oz (180 g)	
Housing material	Glass fiber reinforced ABS	

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Provide suitable spark suppression for inductive or capacitive loads
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC, 250 V AC
10) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



WT 27-2

Proximity/Diffuse Sensors-Background Suppression

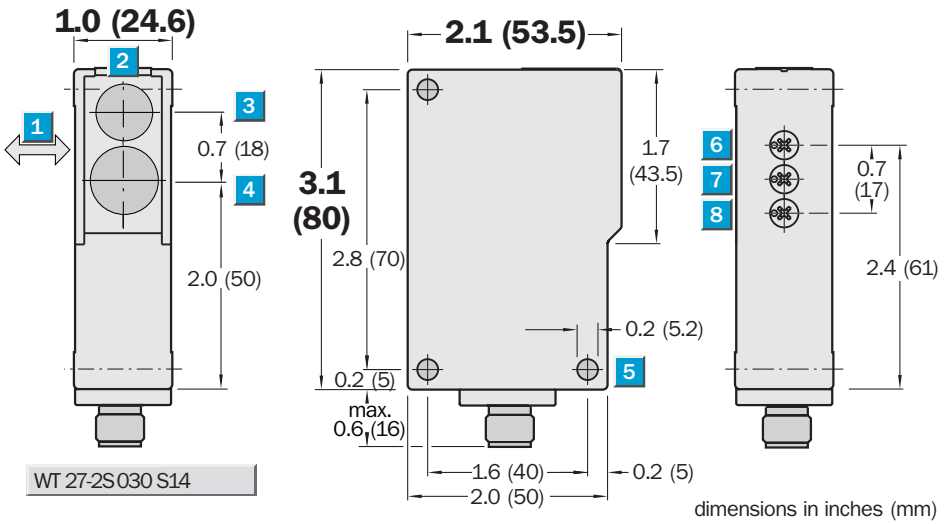
1.2...39.4 in (30...1000 mm)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Adjustable background suppression
- Selectable time delays
- Signal strength indicator
- Cable or quick disconnect versions
- Wide range supply voltage

WT 27-2

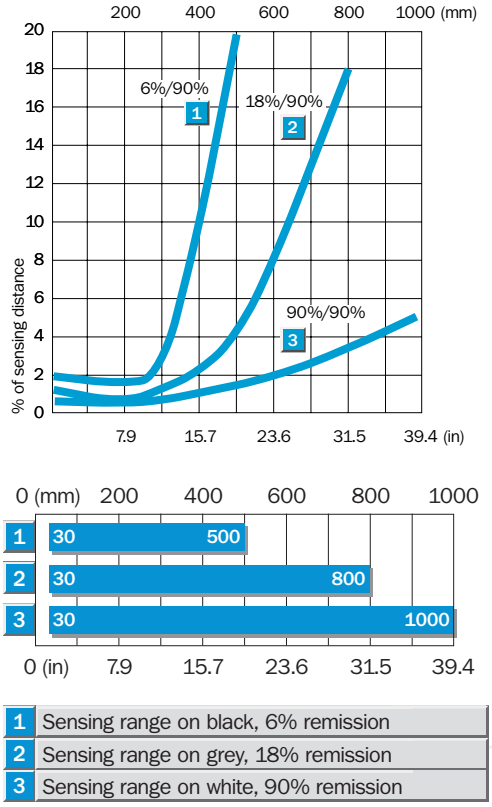
Dimensional Drawing



WT 27-2S030 S14

dimensions in inches (mm)

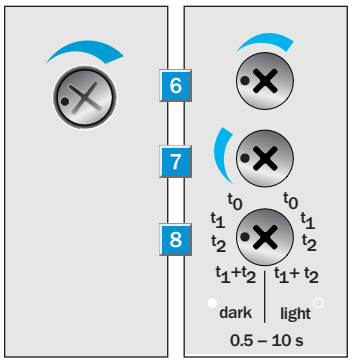
Background Suppression



1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 27-2S132	WT 27-2R630
WT 27-2S730	WT 27-2R830
WT 27-2S030 S14	



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.2 mm
6	Sensitivity adjustment
7	Time control
8	Time delay selector switch
X	Light switching
●	Dark switching

Switch-selectable Time Delay

0.5 – 10 s

t_0	Without time delay
t_1	OFF-delay from trailing edge of object
t_2	ON-delay from leading edge of object
$t_1 + t_2$	OFF- and ON-delay

Order Information

Type	Part no.
WT 27-2S132	1 015 960
WT 27-2R630	1 015 092
WT 27-2S730	1 015 097
WT 27-2R830	1 016 074
WT 27-2S 030S14	1 015 709

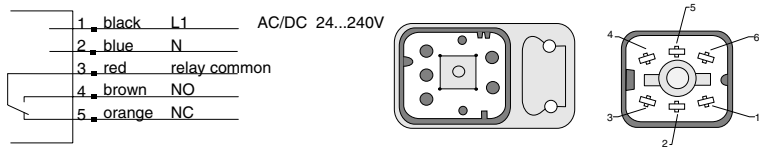
Accessories

	page
Cables & connectors	911, 914, 915
Mounting brackets	923, 924, 935

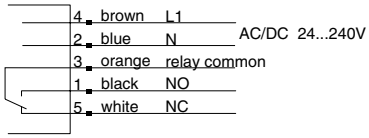
Technical data		WT 27-2-	S132	R630	S730	S030 S14[7]	R830				
Sensing range, adjustable	1.2...39.4 in (30...1000 mm)		■	■	■	■	■				
Background suppression	3.9...39.4 in (100...1000 mm)		■	■	■	■	■				
Background suppression capability	% of set sensing distance (see previous page)		■	■	■	■	■				
Light source[1], light type	LED, red light		■	■	■	■	■				
Light spot diameter	Approx. 0.5 in at 19.7 in (15 mm at 500 mm)		■	■	■	■	■				
Angle of divergence	Approx. 1.8°		■	■	■	■	■				
Supply voltage V_S	24...240 V UC (+ 10%, – 20%)		■	■	■	■	■				
Current consumption	< 2 VA		■	■	■	■	■				
Switching outputs	Relay, SPDT, isolated[2]		■	■	■	■	■				
Max. switching voltage	250 V AC / 120 V DC		■	■	■	■	■				
Max. switching current	4 A / 240 V AC or 24 V DC		■	■	■	■	■				
Max. switching capacity	AC 1000 V A / DC 100 W		■	■	■	■	■				
Response time	< 6 ms		■	■	■	■	■				
Max. switching frequency[3]	10 Hz		■	■	■	■	■				
Time delay	0.5...10 s			■			■				
Connection types	Plug, mini 5-pin					■	■				
	Cable[4], 2 m		■								
	Plug, square 6-pin			■							
	Plug, square 7-pin				■						
VDE protection class[5]	⧈		■		■	■	■				
Circuit protection[6]	A, C		■	■	■	■	■				
Enclosure rating	IP 67/NEMA 6		■		■	■	■				
	IP 65			■							
Ambient temperature T_A	Operation	-40...140°F (-40...60°C)	■	■	■	■	■				
	Storage	-40...167°F (-40...75°C)	■	■	■	■	■				
Approximate weight	3.5 oz (100 g)		■	■	■	■	■				
Housing material	Glass fiber reinforced ABS		■	■	■	■	■				

1) Average service life 100,000 h at $T_A = 25°C$
2) Provide suitable spark suppression for inductive and capacitive loads
3) With light/dark ratio 1:1
4) Do not bend below 0°C
5) Reference voltage 250 V AC
6) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
7) Wet contact

Connection Diagram

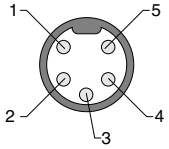


WT 27-2R830



WT 27-2S030S14

Mini Connector



SICK

WT 27-2

Proximity/Diffuse Sensors-Background Suppression

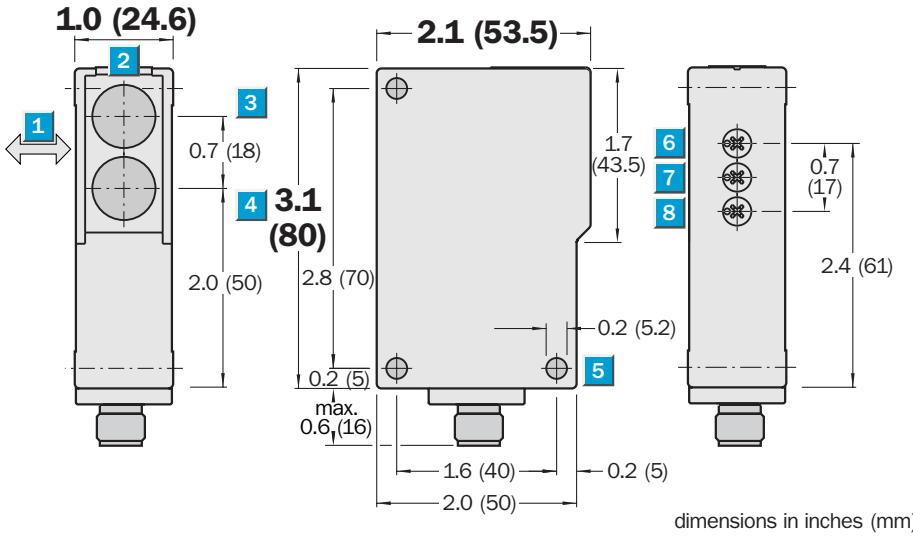
1.2...59.1 in (30...1500 mm)
sensing range

Highlights

- Rugged plastic housing
- Infrared light
- Adjustable background suppression
- Selectable time delays
- Signal strength indicator
- Adjustable sensing range
- Crosstalk immunity
- Wide range supply voltage
- Cable or mini quick disconnect versions

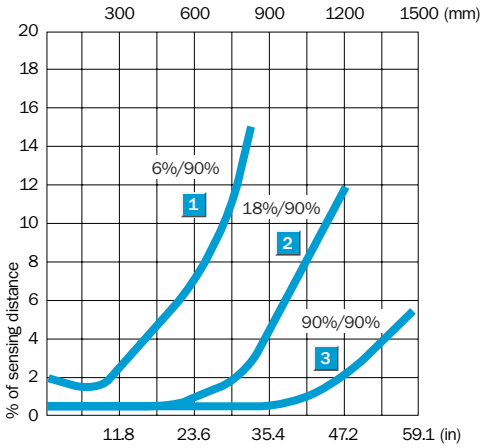
WT 27-2

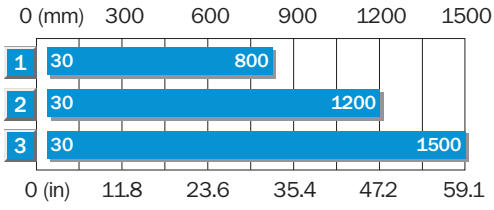
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

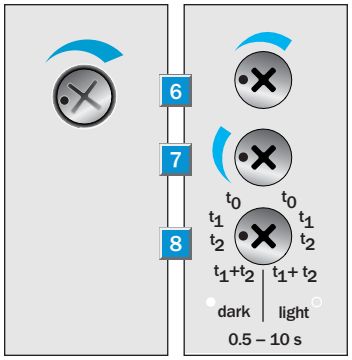




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

WT 27-2S112	WT 27-2R610
WT 27-2S710	WT 27-2R810



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.2 mm
6	Sensitivity adjustment
7	Time control
8	Time delay selector switch
X	Light switching
●	Dark switching

Switch-selectable Time Delay

0.5 – 10 s

t_0	Without time delay
t_1	OFF-delay from trailing edge of object
t_2	ON-delay from leading edge of object
$t_1 + t_2$	OFF- and ON-delay

Order Information

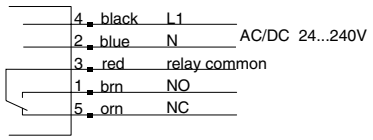
Type	Part no.
WT 27-2S112	1 015 093
WT 27-2R610	1 015 091
WT 27-2S710	1 015 096
WT 27-2R810	1 016 073

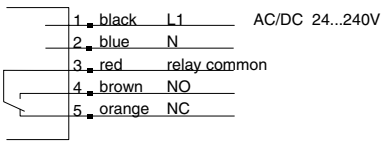
Accessories	page
Cables & connectors	911, 914, 915
Mounting brackets	923, 924, 935

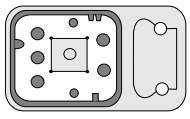
Technical Data	WT 27-2-	S112	R610	S710	R810
Sensing range, adjustable	1.2...59.1 in (30...1500 mm)	■	■	■	■
Background suppression	3.9...59.1 in (100...1500 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 1.0 in at 31.5 in (25 mm at 800 mm)	■	■	■	■
Angle of divergence	Approx. 1.8°	■	■	■	■
Supply voltage V_S	24...240 V UC (+ 10%, – 20%)	■	■	■	■
Current consumption	< 2 VA	■	■	■	■
Switching outputs	Relay, SPDT, isolated[2]	■	■	■	■
Max. switching voltage	250 V AC / DC 120 V	■	■	■	■
Max. switching current	4 A / 240 V AC or 24 V DC	■	■	■	■
Max. switching capacity	AC 1000 V A / DC 100 W	■	■	■	■
Response time	< 6 ms	■	■	■	■
Max. switching frequency[3]	10 Hz	■	■	■	■
Delay range	0.5...10 s		■		■
Connection types	Cable[4], 2 m	■			
	Plug, 6-pin square		■		
	Plug, 7-pin square			■	
	Plug, mini 5-pin				■
VDE protection class[5]	⧈	■	■		■
Circuit protection[6]	A, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■		■	■
	IP 65		■		
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

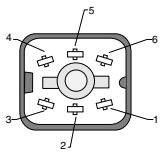
1) Average service life 100,000 h at T_A = 25°C
2) Provide suitable spark suppression for inductive and capacitive loads
3) With light/dark ratio 1:1
4) Do not bend below 0°C
5) Reference voltage 250 V AC
6) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

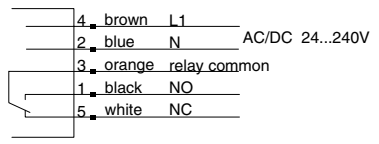
Connection Diagram

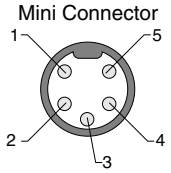










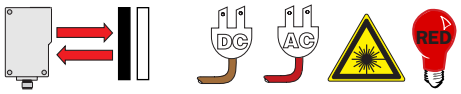


wire colors refer to standard cable,
not included with quick disconnect models

SICK

WT 27L-2

Proximity/Diffuse Sensors-Background Suppression



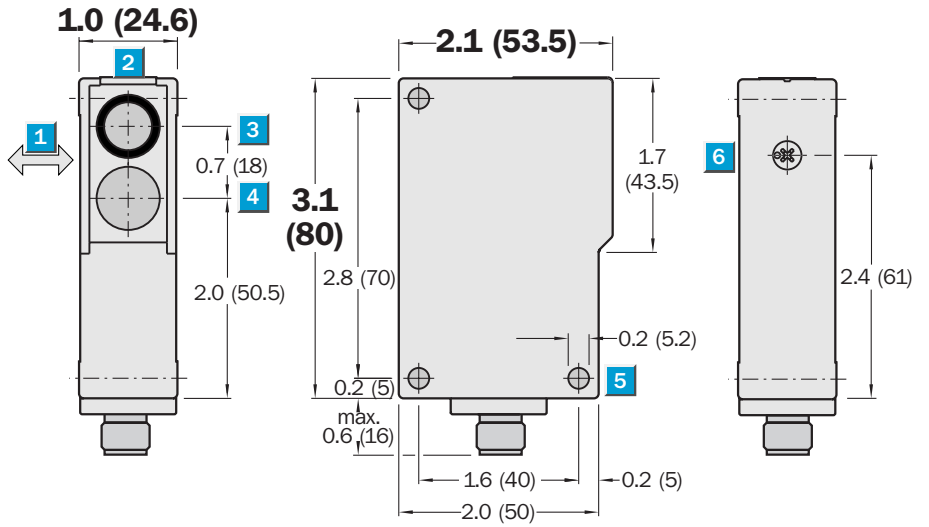
1.1...31.5 in (30...800 mm)
sensing range

Highlights

- Adjustable background suppression
- Rugged plastic housing
- Crosstalk immunity
- Visible red light for easy alignment
- Wide range supply voltage
- Signal strength indicator
- Class II laser provides a very small light spot

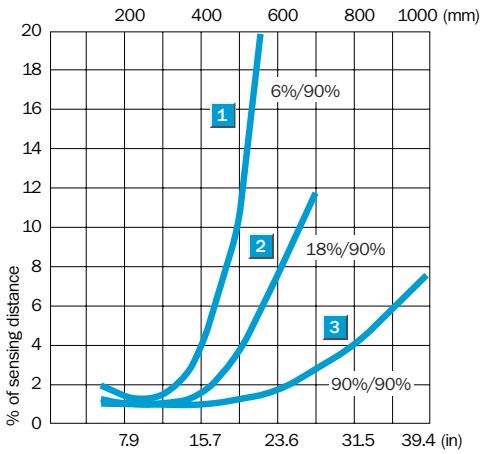
WT 27L-2

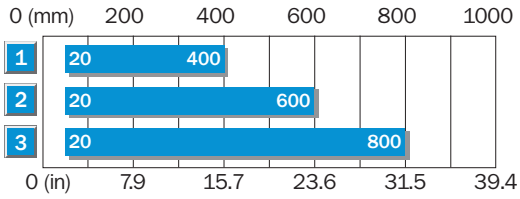
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

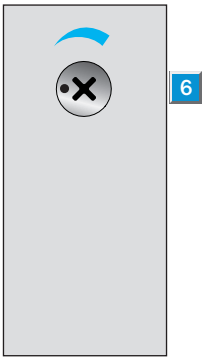




1	Sensing range on black, 6 % remission
2	Sensing range on grey, 18 % remission
3	Sensing range on white, 90 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optic axis, receiver
5	Mounting hole ø 5.2 mm
6	Sensitivity adjustment

Order Information

Type	Part no.
WT 27L-2S830A	1 016 359
WT 27L-2S830A01	1 016 360
WT 27L-2S930A01	1 017 933

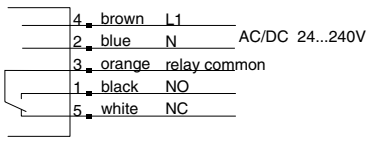
Accessories	page
Cables and connectors	911
Mounting brackets	923, 924, 935

Technical Data	WT 27L-2	S83 0A	S830 A01	S930 A01						
Sensing range, adjustable	1.1...31.5 in (30...800 mm)									
Background suppression	3.9...31.5 in (100...800 mm)									
Background suppression capability	% of set sensing distance (see previous pg)									
Light source[2], **light type**	LED, laser, red light									
Light spot diameter	Approx. 0.07 in at 15.7 in (2 mm at 400 mm)									
Angle of divergence	Approx. 3°									
Supply voltage V_S	24...240 V UC[3] -10% - 20%									
Current consumption[5]	≤ 2 mA									
Switching outputs	Relay, SPDT									
Max. switching voltage	250 V AC/120 V DC									
Max. switching current I_A	4 A/240 V AC or 24 V DC									
Max. switching capacity[6]	AC 1000 VA/DC 100 W									
Response time[7]	≤ 6 ms									
Max. switching frequency[8]	10 Hz									
Connection types	Plug, mini 5-pin									
	Plug, micro 5-pin									
VDE protection class[10]	□									
Circuit protection[11]	A, B, C									
Enclosure rating	IP 67/NEMA 6									
Ambient temperature T_A	Operation -14...140°F (-10...60°C)									
	Storage -13...167°F (-25...75°C)									
Approximate weight	3.5 oz (100 g)									
Housing material	Glass fiber reinforced ABS									

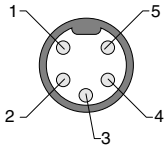
1) 90% remission of material scanned (based on standard white according to DIN 5033)
2) Average service life T_A = 25°C; LED, red light 100,000 h
3) ± 10%
4) Ensure spark extinguishing for inductive or capacitive load
5) With dark/light ratio 1:1
6) Do not bend below 0 °C
7) Reference voltage 250 V UC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
9) Black = 6% reflectance
Gray = 18% reflectance
White = 90% reflectance

Connection Diagram

WT 27L-2S830A

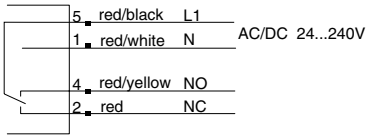


Mini Connector

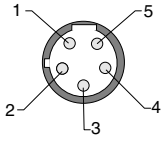


WT27L-2S830A01

WT 27L-2S930A01



Micro Connector



SICK

WT 24-2

Proximity/Diffuse Sensors-Background Suppression

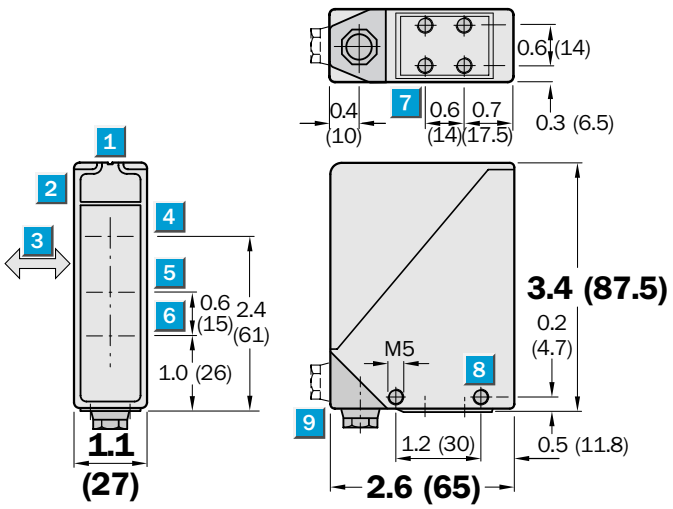
2.0...47.2 in (50...1200 mm)
sensing range

Highlights

- Robust metal housing
- Adjustable background suppression
- Crosstalk immunity
- Signal strength indicator
- Selectable time delays
- Cable connections swivel 90° for easy installation
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

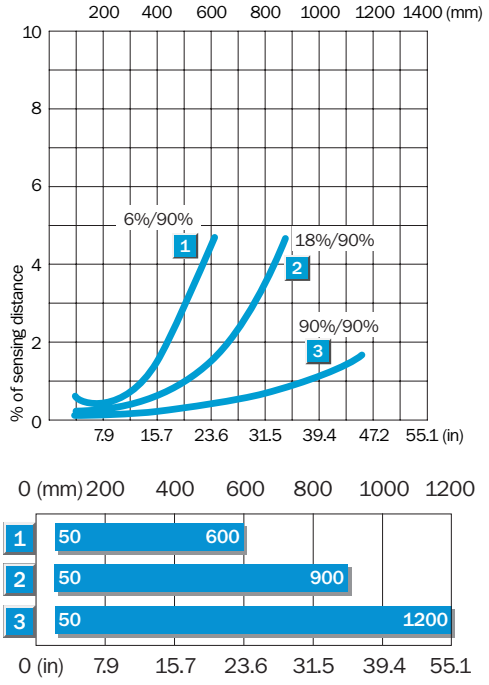
WT 24-2

Dimensional Drawing



dimensions in inches (mm)

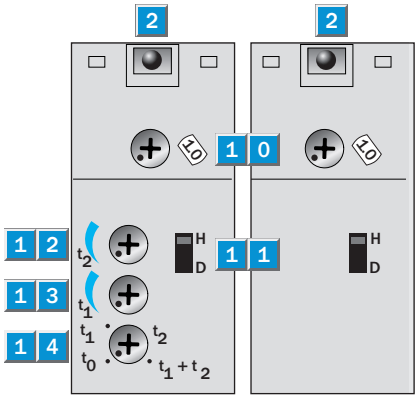
Background Suppression



1	Sensing range on black[8)]
2	Sensing range on gray[8)]
3	Sensing range on white[8)]

Adjustments

WT 24-2R250 | WT 24-2R240



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of the material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver (close range)
6	Center of optical axis, receiver (far range)
7	M5 threaded mounting hole, 6 mm deep
8	M5 threaded mounting hole, through-hole
9	PG screw fixing rotatable by 90°
10	Sensing range adjustment
11	Light/dark selector
12	Time control t_2 = OFF-delay
13	Time control t_1 = ON-delay
14	Time delay selector switch

Order Information

Type	Part no.	
WT 24-2R240	1 017 854	
WT 24-2R250	1 016 820	
WT 24-2R548	1 018 318	*
WT 24-2R549	1 018 316	*

* wet contact

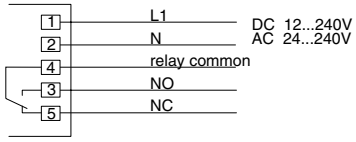
Accessories	page
Cables and connectors	911
Mounting brackets	923, 935
Special Accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

(see footnotes on next page)

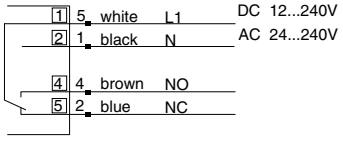
Technical Data		WT 24-2-	R240	R250	R548*	R549*
Sensing range, adjustable	2.0...47.2 in (50...1200 mm)		■	■	■	■
Background suppression	3.9...47.2 in (100...1200 mm)		■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)		■	■	■	■
Light source[1], **light type**	LED, red light		■	■	■	■
Light spot diameter	Approx. 1.6 in at 47.2 in (40 mm at 1200 mm)		■	■	■	■
Angle of divergence	Approx. 1.8°		■	■	■	■
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]		■	■	■	■
Power consumption without heating	< 2 VA		■			
Power consumption with heating	< 3 VA			■		
Switching output	Relay, SPDT, isolated[4]		■	■	■	■
Max. switching voltage	250 V AC/120 V DC		■	■	■	■
Max. switching current	4 A/240 V AC, 4 A/24 V DC		■	■	■	■
Max. switching capacity	AC: 1000 VA/DC: 100 W		■	■	■	■
Response time	≤ 10 ms		■	■	■	■
Max. switching frequency[5]	10 Hz		■	■	■	■
Time delay	Adjustable, 0.5...10 sec			■		
Connection types	PG 9 terminal chamber					■
	Plug, micro 5-pin		■	■		■
	Plug, mini 5-pin				■	
VDE protection class[6]	⧈		■	■	■	■
Circuit protection[7]	A, C		■	■	■	■
Enclosure rating	IP 67/NEMA 6		■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)		■	■	■	■
	Storage -40...167°F (-40...75°C)		■	■	■	■
Approximate weight	11.6 oz (330 g)		■	■	■	■
Front lens heating				■		
Housing material	Die cast zinc		■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Reference voltage 250 V AC/DC
7) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
8) Black = 6% remission
Grey = 18% remission
White = 90% remission
* wet contact

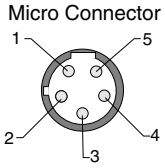
Connection Diagram



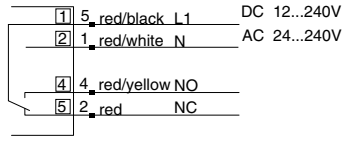
WT 24-2R548



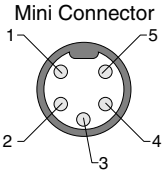
Micro Connector



WT 24-2R549



Mini Connector



wire colors refer to standard cable, not included

SICK

WT 24-2

Proximity/Diffuse Sensors-Background Suppression

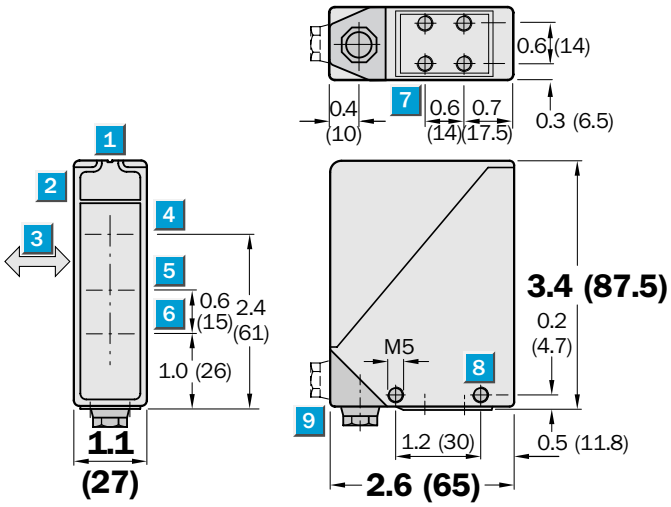
1.2...98.4 in (30...2500 mm)
sensing range

Highlights

- Robust metal housing
- Adjustable background suppression and selectable time delays
- Cable connections swivel 90° for easy installation
- Signal strength indicator
- Wide range supply voltage
- Crosstalk immunity
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

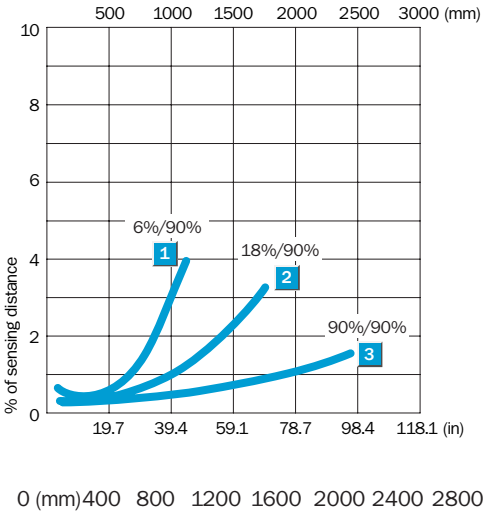
WT 24-2

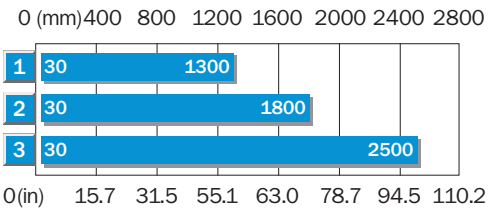
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

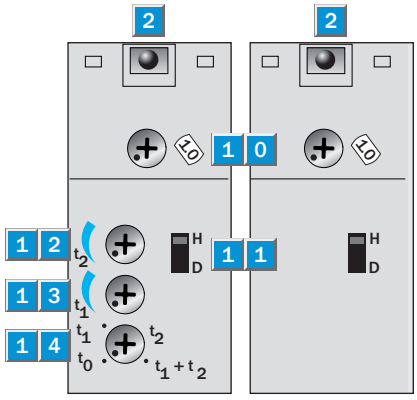




1	Sensing range on black[8)]
2	Sensing range on gray[8)]
3	Sensing range on white[8)]

Adjustments

WT 24-2R220	WT 24-2R210
	WT 24-2R518
	WT 24-2R519



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of the material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver (close range)
6	Center of optical axis, receiver (far range)
7	M5 threaded mounting hole, 6 mm deep
8	M5 threaded mounting hole, through-hole
9	PG 9 screw fixing rotatable by 90°
10	Sensing range adjustment
11	Light/dark selector
12	Time control t_2 = OFF-delay
13	Time control t_1 = ON-delay
14	Time delay selector switch

Order Information

Type	Part no.
WT 24-2R210	1 016 932
WT 24-2R220	1 016 854
WT 24-2R518	1 018 317
WT 24-2R519	1 018 315

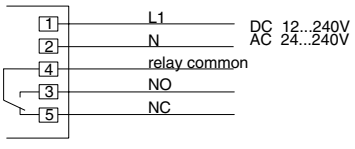
Accessories	page
Cables and connectors	911
Mounting brackets	923, 935
Special Accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

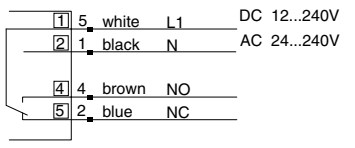
(see footnotes on next page)

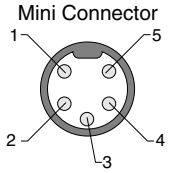
Technical Data	WT 24-2-	R210	R220	R518	R519
Sensing range, adjustable	1.2...98.4 in (30...2500 mm)	■	■	■	■
Background suppression	3.9...98.4 in (100...2500 mm)	■	■	■	■
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 3.2 in at 98.4 in (80 mm at 2500 mm)	■	■	■	■
Angle of divergence	Approx. 1.8°	■	■	■	■
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]	■	■	■	■
Power consumption without heating	< 2 VA	■		■	■
Power consumption with heating	< 3 VA		■		
Switching output	Relay, SPDT, isolated[4]	■	■	■	■
Max. switching voltage	250 V AC/120 V DC	■	■	■	■
Max. switching current	4 A/240 V AC, 4 A/24 V DC	■	■	■	■
Max. switching capacity	AC: 1000 VA/DC: 100 W	■	■	■	■
Response time	≤ 10 ms	■	■	■	■
Max. switching frequency[5]	10 Hz	■	■	■	■
Time delay	Adjustable, 0.5...10 sec		■		
Connection types	Plug, micro 5-pin				■
	PG 9 terminal chamber	■	■		
	Plug, mini 5-pin			■	
VDE protection class[6]	⧈	■	■	■	■
Circuit protection[7]	A, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■	■
Front lens heating			■		
Housing material	Die cast zinc	■	■	■	■

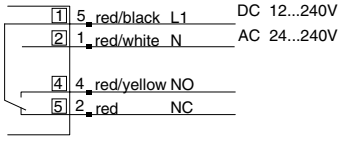
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) ± %
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Reference voltage 250 V AC/DC
7) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
8) Black = 6% remission
Grey = 18% remission
White = 90% remission

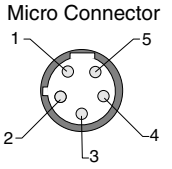
Connection Diagram











wire colors refer to standard cable, not included

SICK

WT 34 Red

Proximity/Diffuse Sensors - Background Suppression

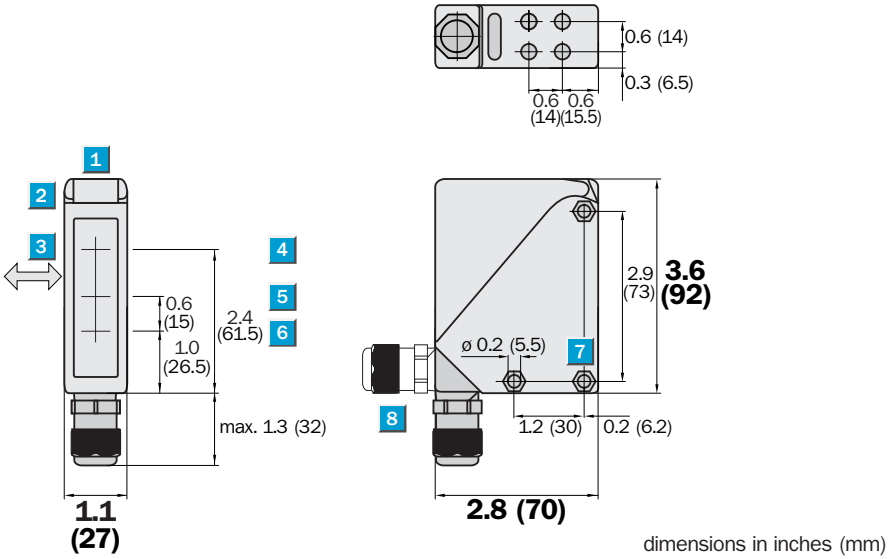
2.0...47.2 in (50...1200 mm)
sensing range

Highlights

- Sturdy plastic housing
- Red light for easy alignment
- Adjustable background suppression
- Selectable time delays
- Cable connections swivel 90° for easy installation
- Terminal chamber for connection flexibility

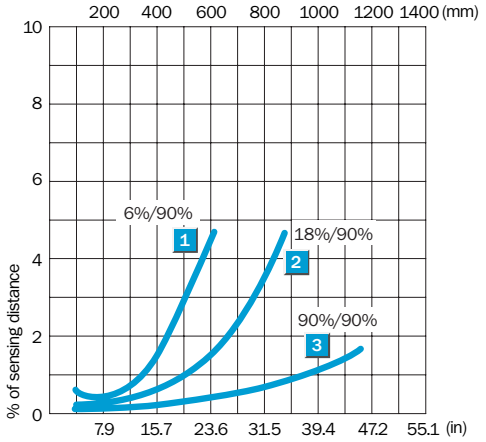
WT 34

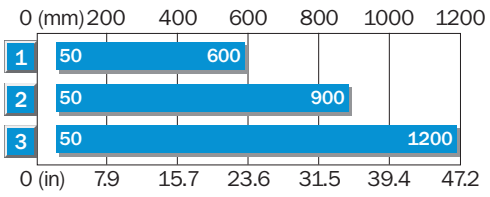
Dimensional Drawing



dimensions in inches (mm)

Background Suppression



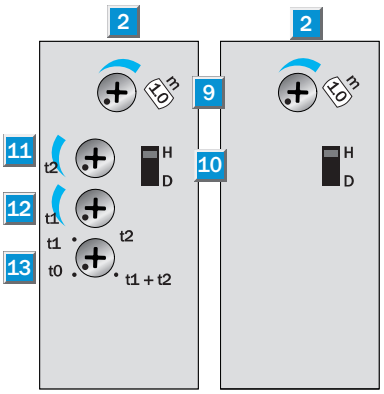


1 Sensing range on black[9)]
2 Sensing range on gray[9)]
3 Sensing range on white[9)]

(see footnotes on next page)

Adjustments

WT 34-R250	WT 34-R240



1 Alignment sight
2 LED signal strength indicator
3 Standard direction of the material being sensed
4 Center of optical axis, sender
5 Center of optical axis, receiver at close range
6 Center of optical axis, receiver at long range
7 Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
8 M16 screw fixing rotatable by 90°
9 Sensing range adjustment
10 Light/dark selector
11 Time control t_2 = OFF-delay
12 Time control t_1 = ON-delay
13 Time delay selector switch

Order Information

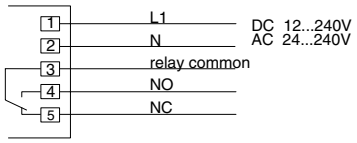
Type	Part no.
WT 34-R240	1 019 239
WT 34-R250	1 019 240

Accessories	page
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

Technical Data	WT 34-	R240	R250								
Sensing range, adjustable	2.0...47.2 in (50...1200 mm)	■	■								
Background suppression	3.9...47.2 in (100...1200 mm)	■	■								
Background suppression capability	% of set sensing distance (see previous page)	■	■								
Light source[1], light type	LED, red light	■	■								
Light spot diameter	Approx. 1.6 in at 47.2 in (40 mm at 1200 mm)	■	■								
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]	■	■								
Power consumption	< 2 VA	■	■								
Switching output	Relay, SPDT, isolated[4]	■	■								
Max. switching voltage	250 V AC/120 V DC	■	■								
Max. switching current	4 A/240 V AC, 4 A/24 V DC	■	■								
Max. switching capacity	1000 VA AC/100 W DC	■	■								
Response time	≤ 10 ms	■	■								
Max. switching frequency[5]	10 Hz	■	■								
Time delay	Adjustable, 0.5 to 10 s		■								
Connection type	M16 terminal chamber	■	■								
VDE protection class[6]	□	■	■								
Circuit protection[7]	A, C	■	■								
Enclosure rating	IP 67	■	■								
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■								
	Storage -40...167°f (-40...75°C)	■	■								
Approximate weight	4.9 oz (140 g)	■	■								
Housing material	Glass fiber reinforced ABS	■	■								

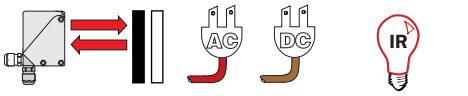
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Withstand voltage 250 V AC/DC
7) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
8) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



WT 34 IR

Proximity/Diffuse Sensors - Background Suppression



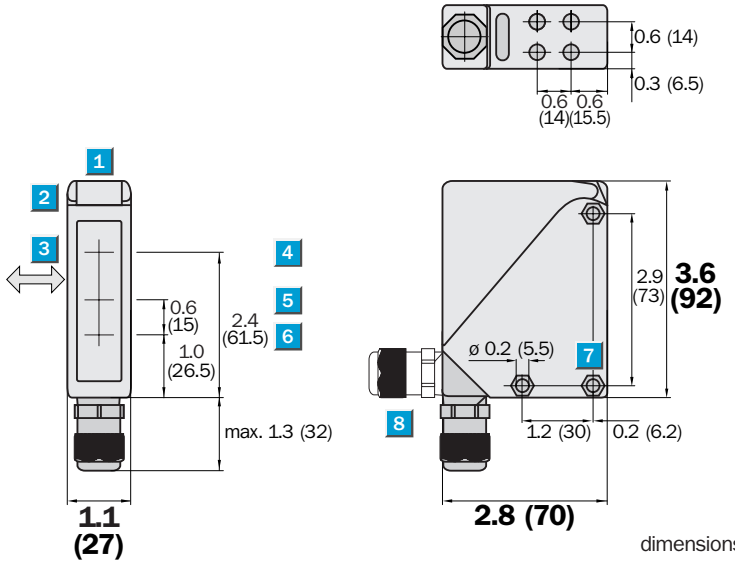
1.2...98.4 in (30...2500 mm)
sensing range

Highlights

- Sturdy plastic housing
- Infrared light
- Adjustable background suppression
- Signal strength indicator
- Selectable time delays
- Wide range supply voltage
- Terminal chamber for connection flexibility

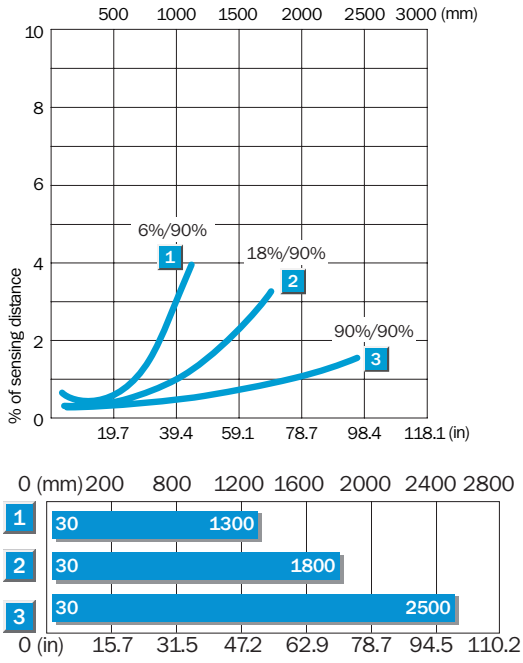
WT 34

Dimensional Drawing



dimensions in inches (mm)

Background Suppression

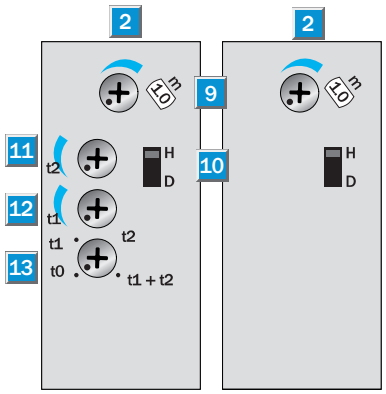


1	Sensing range on black[9]
2	Sensing range on gray[9]
3	Sensing range on white[9]

(see footnotes on next page)

Adjustments

WT 34-R220 | WT 34-R210



1	Alignment sight
2	LED signal strength indicator
3	Standard direction of the material being sensed
4	Center of optical axis, sender
5	Center of optical axis, receiver at close range
6	Center of optical axis, receiver at long range
7	Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
8	M16 screw fixing rotatable by 90°
9	Sensing range adjustment
10	Light/dark selector
11	Time control t_2 = OFF-delay
12	Time control t_1 = ON-delay
13	Time delay selector switch

Order Information

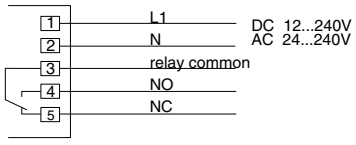
Type	Part no.
WT 34-R210	1 019 232
WT 34-R220	1 019 223

Accessories	page
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

Technical Data	WT 34-	R210	R220								
Sensing range, adjustable	1.2...98.4 in (30...2500 mm)	■	■								
Background suppression	3.9...98.4 in (100...2500 mm)	■	■								
Background suppression capability	% of set sensing distance	■	■								
Light source[1], light type	LED, infrared light	■	■								
Light spot diameter	Approx. 3.2 in at 98.4 in (80 mm at 2500 mm)	■	■								
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]	■	■								
Power consumption	< 2 VA	■	■								
Switching output	Relay, SPDT, isolated[4]	■	■								
Max. switching voltage	250 V AC/120 V DC	■	■								
Max. switching current	4 A/240 V AC, 4 A/24 V DC	■	■								
Max. switching capacity	1000 VA AC/100 W DC	■	■								
Response time	≤ 10 ms	■	■								
Max. switching frequency[5]	10 Hz	■	■								
Time delay	Adjustable, 0.5 to 10 s		■								
Connection type	M16 terminal chamber	■	■								
VDE protection class[6]	□	■	■								
Circuit protection[7]	A, C	■	■								
Enclosure rating	IP 67	■	■								
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■								
	Storage -40...167°F (-40...75°C)	■	■								
Approximate weight	4.9 oz (140 g)	■	■								
Housing material	Glass fiber reinforced ABS	■	■								

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Withstand voltage 250 V AC/DC
7) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
8) Black = 6% remission
Grey = 18% remission
White = 90% remission

Connection Diagram



WT 2000

Proximity/Diffuse Sensors-Energetic

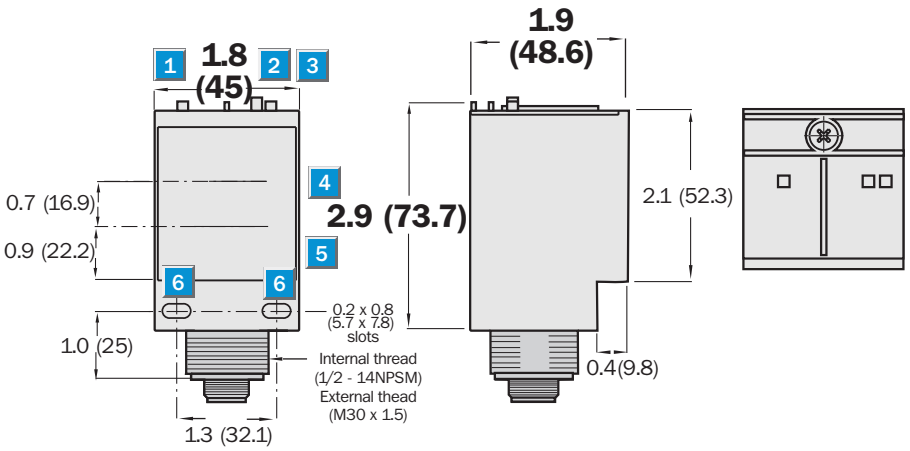
0...11.5 ft (0...3.5 m)
sensing range

Highlights

- Rugged plastic housing
- Signal strength indicator
- Adjustable sensing range
- Selectable time delays
- Crosstalk immunity
- Adjustable scanning range
- Cable or mini quick disconnect versions

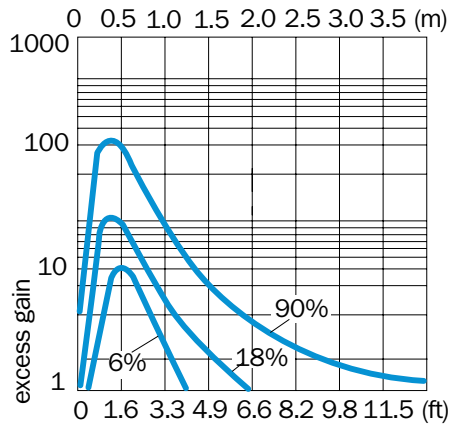
WT 2000

Dimensional Drawing



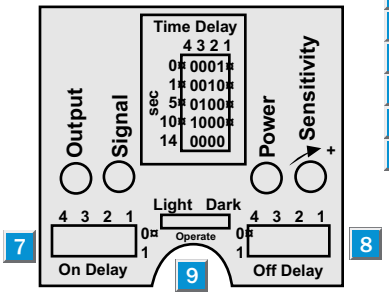
dimensions in inches (mm)

Excess Gain

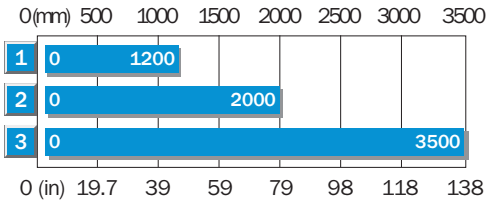


Adjustments

All types



1 LED power indicator (green)
2 LED signal strength indicator (red)
3 LED output indicator (yellow)
4 Center of optical axis, sender
5 Center of optical axis, receiver
6 Mounting through-hole Ø 0.2 x 0.8 mm,
7 ON delay selector
8 OFF delay selector
9 Light/dark switching selector



1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

Order Information

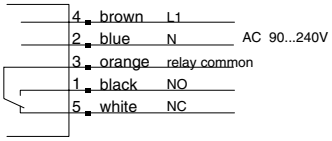
Type	Part no.
WT 2000-R1102	7 023 062
WT 2000-R1112	7 023 063
WT 2000-R1122	7 023 064
WT 2000-R5100	7 023 065
WT 2000-R5110	7 023 066
WT 2000-R5120	7 023 067

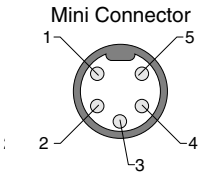
Accessories	page
Cables and connectors	911
Mounting brackets	927

Technical Data	WT 2000-	R1102	R1112	R1122	R5100	R5110	R5120
Sensing range, adjustable	0...11.5 ft (0...3.5 m)	■	■	■	■	■	■
Light source[1], light type	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 2.2 in at 8.2 ft (55 mm at 2.5 m)	■	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■	■
Supply voltage V_S	90...240 V AC	■	■	■	■	■	■
Current consumption[4]	≤ 6 W	■	■	■	■	■	■
Switching outputs	Relay, SPDT, isolated	■	■	■	■	■	■
Switching voltage (Max.)	265 V	■	■	■	■	■	■
Switching current (Max.)	3 A	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[5]	≤ 10 ms	■	■	■	■	■	■
Max. switching frequency[6]	10 Hz	■	■	■	■	■	■
Time delay settings	0, 1, 5, 10 or 14 s		■	■		■	■
OFF delay			■			■	
ON/OFF delay				■			■
Connection types	Cable, 2 m, PVC	■	■	■			
	Plug, mini 5-pin				■	■	■
VDE protection class[8]	□	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models

SICK

WT 2000

Proximity/Diffuse Sensors-Solid State-Energetic

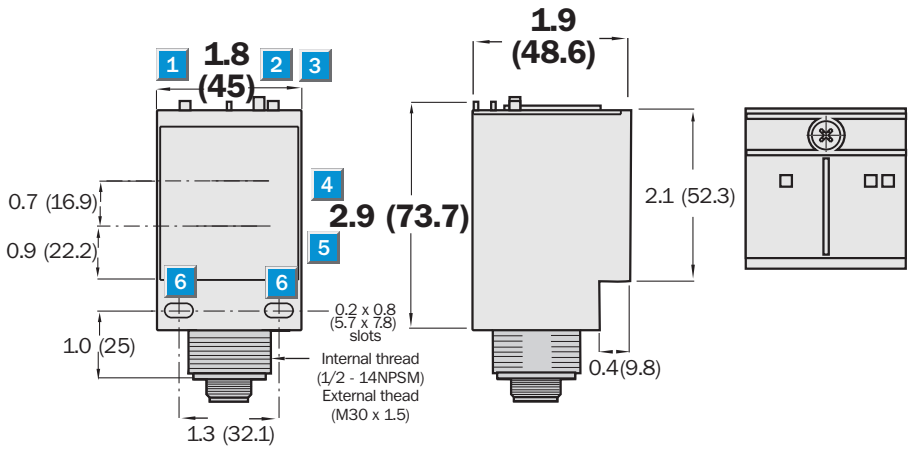
0...11.5 ft (0...3.5 m)
sensing range

Highlights

- Rugged plastic housing
- Signal strength indicator
- Adjustable sensing range
- Red light for easy alignment
- Crosstalk immunity
- Polarizing filters prevent false readings on reflective surfaces
- Cable or M12 quick disconnect versions

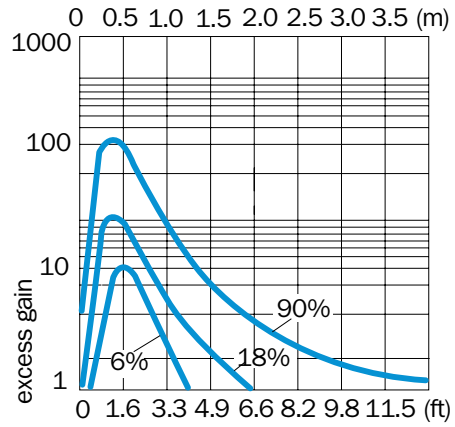
WT 2000

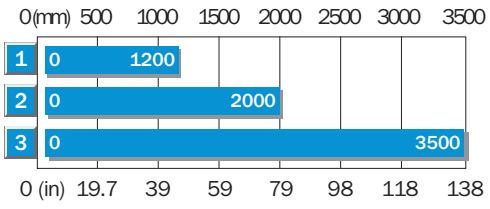
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

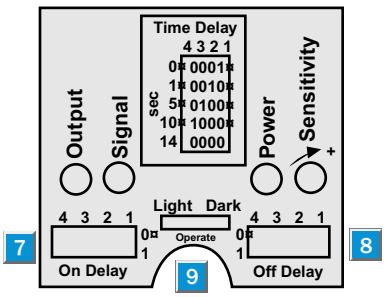




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Possible Adjustments

All types



1	LED power indicator (green)
2	LED signal strength indicator (red)
3	LED output indicator (yellow)
4	Center of optical axis, sender
5	Center of optical axis, receiver
6	Mounting through-hole Ø 0.2 x 0.8 mm,
7	ON delay selector
8	OFF delay selector
9	Light/dark switching selector

Order Information

Type	Part no.
WT 2000-M1102	7 023 432
WT 2000-M1112	7 023 431
WT 2000-M1122	7 023 430
WT 2000-M4100	7 023 441
WT 2000-M4110	7 023 440
WT 2000-M4120	7 023 439
WT 2000-M9100	7 023 444
WT 2000-M9110	7 023 443
WT 2000-M9120	7 023 443

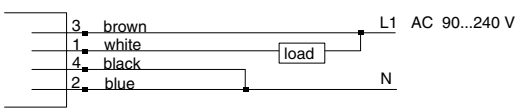
Accessories	page
Cables and connectors	911
Mounting brackets	927

Technical Data	WT 2000-	M1102	M1112	M1122	M4100	M4110	M4120	M9100	M9110	M9120
Sensing range, adjustable	0...11.5 ft (0...3.5 m)	■	■	■	■	■	■	■	■	■
Light source[1], light type	LED, infrared light, 880 nm	■	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 2.2 in at 8.2 ft (55 mm at 2.5 m)	■	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■	■	■	■	■
		■	■	■	■	■	■	■	■	■
Supply voltage V_S	90...240 V UC	■	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 6 W	■	■	■	■	■	■	■	■	■
Switching outputs	FET	■	■	■	■	■	■	■	■	■
Switching voltage (Max.)	240 V	■	■	■	■	■	■	■	■	■
Switching current (Max.)	150 mA	■	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■	■	■
Response time[5]	≤ 2 ms	■	■	■	■	■	■	■	■	■
Max. switching frequency[6]	250 Hz	■	■	■	■	■	■	■	■	■
Time delay settings	0, 1, 5, 10 or 14 s		■	■		■	■		■	■
OFF delay			■			■		■	■	
ON/OFF delay				■			■	■		■
Connection types	Cable, 2 m, PVC	■	■	■						
	Plug, mini 4-pin				■	■	■			
	Plug, micro 4-pin							■	■	■
VDE protection class[8]	□	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■	■	■	■

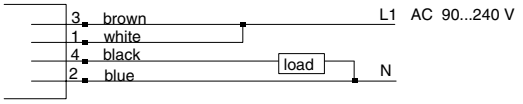
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

Mini / Cable Versions

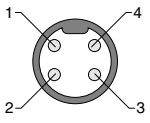


-OR-

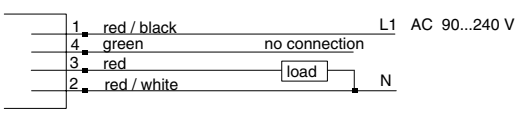


wire colors refer to standard cable, not included with quick disconnect mode

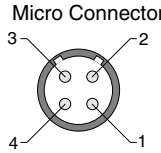
Mini Connector



Micro Versions



Micro Connector



SICK

WT 36

Proximity/Diffuse Sensors-Background Suppression

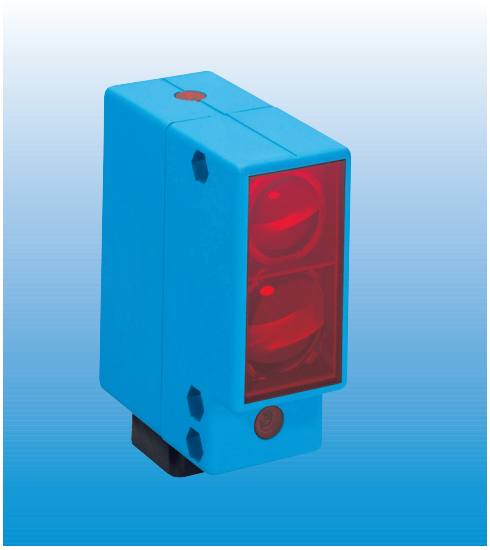
7.9...31.5 in (200...800 mm)
sensing range

CE

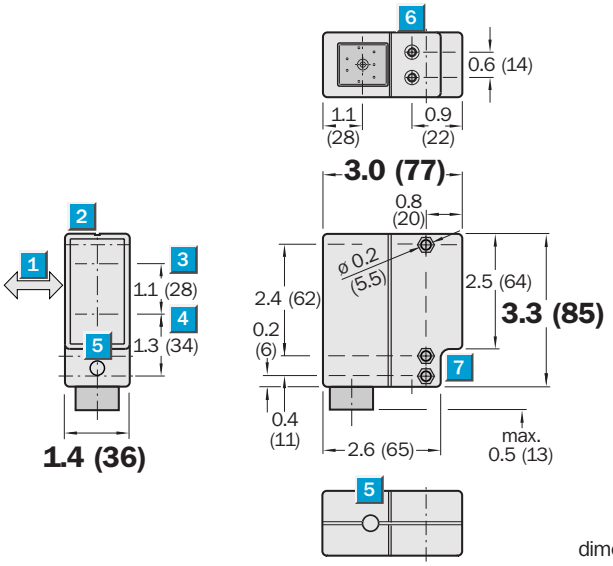
Highlights

- Rugged plastic housing
- Infrared light source
- Adjustable background suppression
- Selectable time delays

WT 36

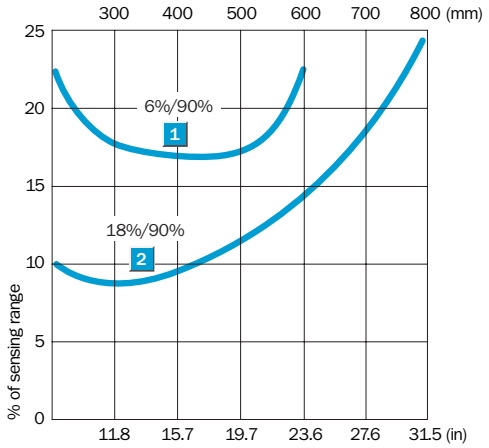


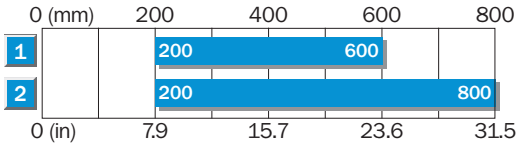
Dimensional Drawing



dimensions in inches (mm)

Background Suppression

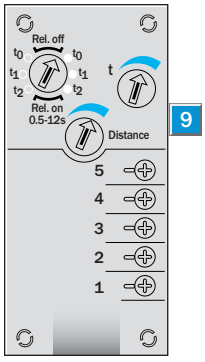




1	Sensing range on black, 6 % remission
2	Sensing range on grey, 18 % remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Alignment sight
3	Center of optical axis, receiver
4	Center of optical axis, sender
5	LED signal strength indicator
6	M5 threaded mounting hole – 5.5 mm deep
7	Mounting holes, recesses on both sides for M5 hex nuts
8	Time delay and light/dark switching selector switches with UC
X	Light switching
●	Dark switching
9	Time control
10	Sensing range adjustment

Order information

Type	Part no.
WT 36-R710	1 005 927
WT 36-R210	1 010 110
WT 36-R910	1 010 734

Accessories	page
Cables and connectors	915
Mounting brackets	924, 935

Technical Data	WT 36-	R710	R210	R910
Scanning distance, adjustable	7.9...31.5 in (200...800 mm)	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■
Light spot diameter	Approx. 0.6 in at 31.5 in (15 mm at 800 mm)	■	■	■
Supply voltage V_S	24...240 V UC (+10% / –25%)	■	■	■
Power consumption	< 2 VA	■	■	■
Switching outputs	Relay, SPDT, isolated[5]	■	■	■
Max. switching voltage	AC: 250 V / DC: 120 V	■	■	■
Switching current	4 A / 240 V AC or 24 V DC	■	■	■
Max. switching capacity	AC: 1000 VA / DC: 100 W	■	■	■
Response time[6]	6 ms	■	■	■
Max. switching frequency[7]	10/s	■	■	■
Connection types	Plug, square 7-pin AC	■		
	PG 11 terminal chamber		■	
	1/2" NPSM terminal chamber			■
VDE protection class[8]	⊡	■	■	■
Circuit protection[9]	A, C	■	■	■
Enclosure rating	IP 65	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■
	Storage -13...167°F (-25...75°C)	■	■	■
Approximate weight	7.1 oz (200 g)	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■

1) Average service life 100,000 h at $T_A = +25$ °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Provide suitable spark suppression for inductive or capacitive loads
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC, 250 V AC
9) A = V_S connections reverse-polarity protected
B = Output Q_N and Q_P short-circuit protected
C = Interference pulse suppression

Switch-selectable Time Delay

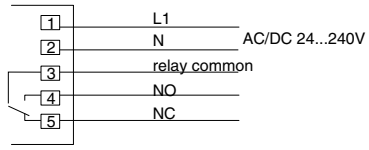
0.5 – 12 s with UC

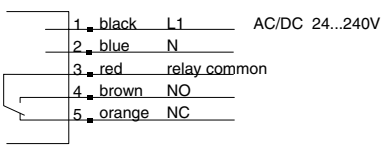
t_0 without time delay

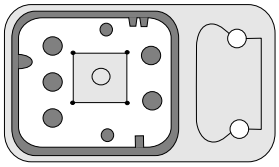
t_1 ON-delay

t_2 OFF-delay

Connection Diagram







SICK

WT 45

Proximity/Diffuse Sensors-Background Suppression

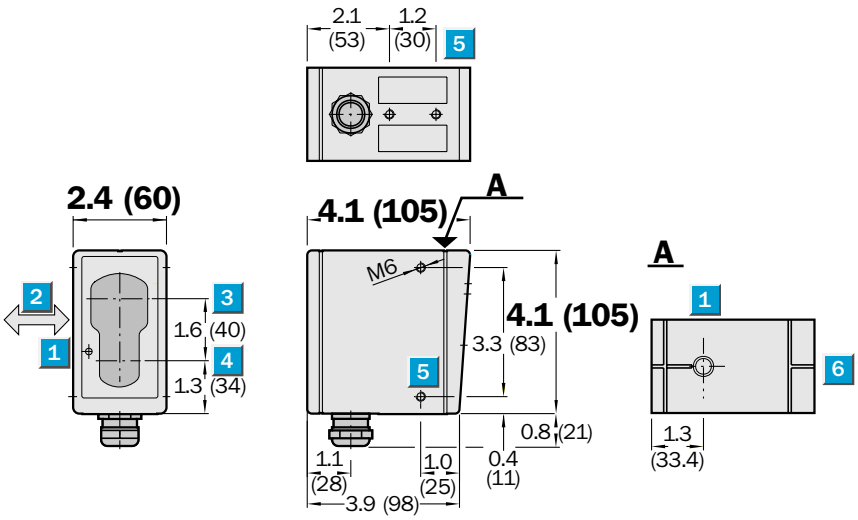
7.9...78.7 in (200...2000 mm)
sensing range

Highlights

- Robust metal housing
- Infrared light
- Adjustable background suppression
- Optional front lens heating
- Adjustable sensing range
- Selectable time delays
- Test input
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

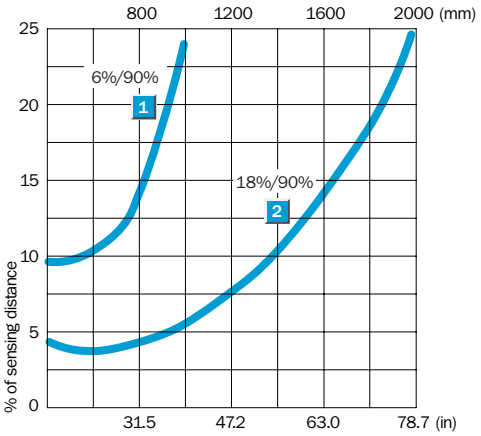
WT 45

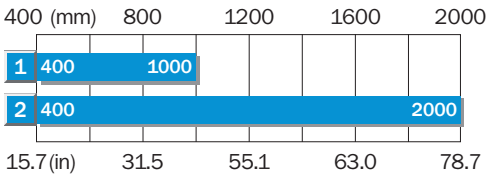
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

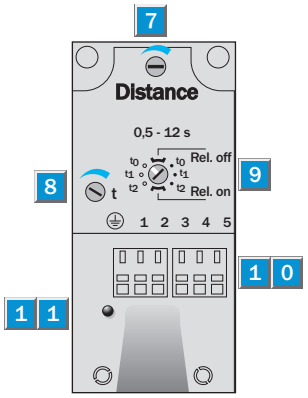




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission

Adjustments

All types



1	LED signal strength indicator
2	Standard direction of the material being sensed
3	Center of optical axis, receiver
4	Center of optical axis, sender
5	M6 threaded mounting hole – 8 mm deep
6	Alignment sight
7	Sensing range adjustment
8	Time adjustment
9	Time delay selector switch left: light switching, right: dark switching
10	Terminal strip
11	Status indicator

Switch-selectable Time Delay

0.5 – 12 s

t_0 without time delay

t_1 ON-delay when object enters detection zone

t_2 OFF-delay when object leaves detection zone

Order Information

Type	Part no.
WT 45-R250	1 009 118
WT 45-R260	1 009 107
WT 45-R950	1 010 555
WT 45-R960	1 010 556

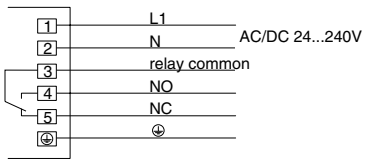
Accessories

	page
Mounting brackets	935
Cooling plates	958
Dust shield	955
Weather hood	955

Technical Data	WT 45-	R250	R260	R950	R960					
Sensing range, adjustable	7.9...78.7 in (200...2000 mm)	■	■	■	■					
Background suppression	15.7...78.7 in (400...2000 mm)	■	■	■	■					
Background suppression capability	% of set sensing distance (see previous page)	■	■	■	■					
Light source[1], **light type**	LED, infrared light	■	■	■	■					
Light spot diameter	1.4 in at 78.7 in (35 mm at 2000 mm)	■	■	■	■					
Angle of divergence	Approx. 1°	■	■	■	■					
Supply voltage V_S	24...240 V UC (+ 10%, – 25%)	■	■	■	■					
Power consumption	≤ 3 VA		■		■					
	≤ 6 VA, front lens heating	■		■						
Switching outputs	Relay, SPDT, isolated[2]	■	■	■	■					
Max. switching voltage	AC: 250 V / DC: 120 V	■	■	■	■					
Switching current	4 A / 240 V AC o. 24 V DC	■	■	■	■					
Max. switching capacity	AC: 1000 VA / DC: 100 W	■	■	■	■					
Response time	≤ 20 ms	■	■	■	■					
Max. switching frequency[3]	10 Hz	■	■	■	■					
Connection types	PG 13.5 terminal chamber	■	■							
	1/2" NPSM terminal chamber			■	■					
VDE protection class	⏚	■	■	■	■					
Circuit protection[4]	A, C	■	■	■	■					
Enclosure rating	IP 67/NEMA 4	■	■	■	■					
Ambient temperature T_A[5]	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	28.2 oz (800 g)	■	■	■	■					
Front lens heating		■		■						
Housing material	Metal	■	■	■	■					

1) Average service life 100,000 h at $T_A = 25°C$
2) Provide suitable spark suppression for inductive or capacitive loads
3) With light/dark ratio 1:1
4) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
5) Up to 140°C with cooling plates (see Accessories)

Connection Diagram



VT 18-2

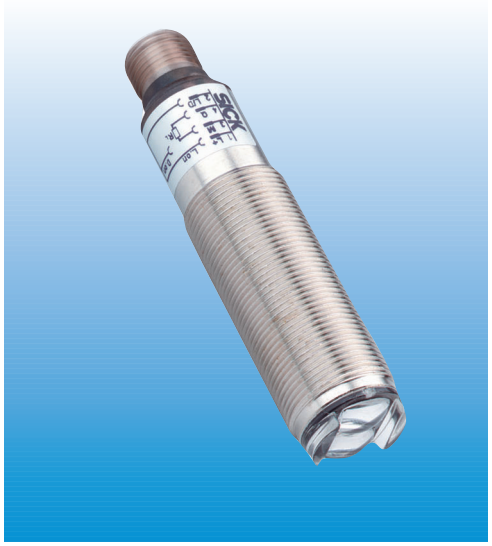
Proximity/Diffuse Sensors-Energetic

0.1...15.7 in (2...400 mm)
sensing range

Highlights

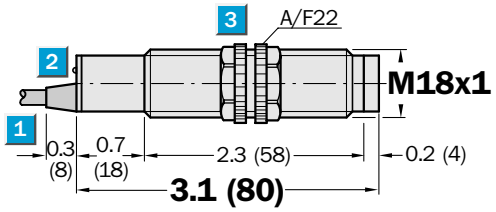
- Rugged plastic housing
- Three sensing ranges can be selected: 100, 200 or 400 mm
- Voltage supply 20...253 V AC; triac output
- Infrared sender
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

VT 18-2

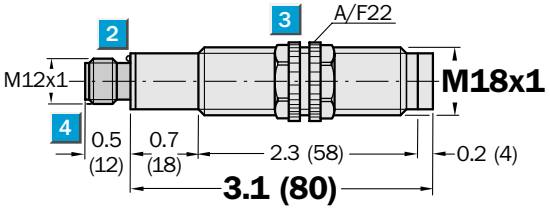


Dimensional Drawing

VT 18-2T1112
VT 18-2T1132
VT 18-2T1152



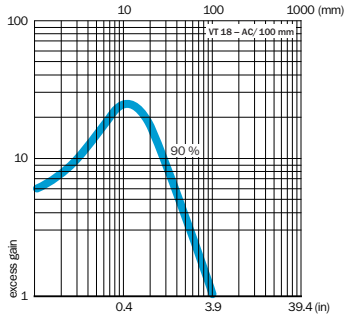
VT 18-2T1410
VT 18-2T1430
VT 18-2T1450

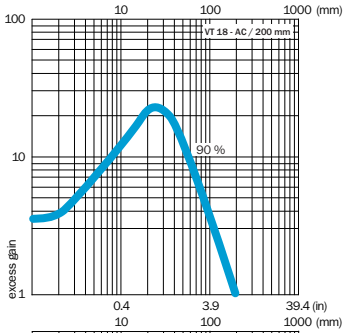


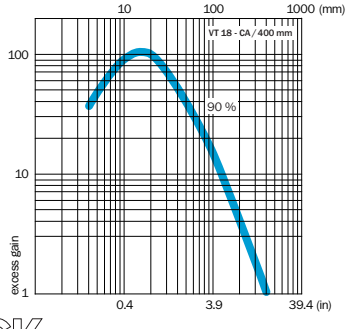
dimensions in inches (mm)

1 Connecting cable
2 Signal strength indicator
3 Fastening nuts, width across 22 mm, (included)
4 Equipment plug, M12 4-pin

Excess Gain







Order Information

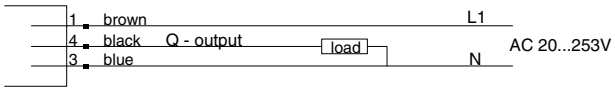
Type	Part no.
VT 18-2T1112	6 011 370
VT 18-2T1410	6 011 373
VT 18-2T1132	6 011 371
VT 18-2T1430	6 011 374
VT 18-2T1152	6 011 372
VT 18-2T1450	6 011 375

Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

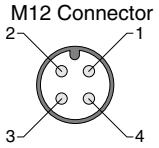
Technical Data	VT 18-2T-	1112	1410	1132	1430	1152	1450			
Housing	Straight	■	■	■	■	■	■			
Sensing range	0.1...3.9 in (2...100 mm)[1]	■	■							
Light source[2], light type	LED, infrared light	■	■							
Light spot diameter	Approx. 0.5 in at 3.9 in (12 mm at 100 mm)	■	■							
Angle of divergence	Approx. 3.5°	■	■							
Sensing range	0.1...7.9 in (2...200 mm)[1]			■	■					
Light source[2], light type	LED, infrared light			■	■					
Light spot diameter	Approx. 0.9 in at 7.9 in (24 mm at 200 mm)			■	■					
Angle of divergence	Approx. 3.5°			■	■					
Sensing range	0.1...15.7 in (2...400 mm)[1]					■	■			
Light source[2], type	LED, infrared light					■	■			
Light spot diameter	Approx. 1.9 in at 15.7 in (48 mm at 400 mm)					■	■			
Angle of divergence	Approx. 3.5°					■	■			
Supply voltage V_S[3]	20 ...253 V AC/50 ... 60 Hz	■	■	■	■	■	■			
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■			
Switching output	Triac	■	■	■	■	■	■			
Switching current I_A max.	5 ... 300 mA	■	■	■	■	■	■			
voltage drop	3 V max. (U = 250 V AC)	■	■	■	■	■	■			
max. switching current	6 A/10 ms; f = 10 Hz	■	■	■	■	■	■			
leakage current	max. 1.5 mA (V_S = 250 V AC)	■	■	■	■	■	■			
Switching voltage	V_S	■	■	■	■	■	■			
Operation mode	Light switching	■	■	■	■	■	■			
Response time[5]	≤ 20 ms	■	■	■	■	■	■			
Max. switching frequency[6]	25 Hz	■	■	■	■	■	■			
Connection types	Cable, PVC, 2 m[7]; 3 x 0.34 mm², Ø 4.7 mm	■		■		■				
	Plug, M12 4-pin		■		■		■			
VDE protection class[8]	⧈	■	■	■	■	■	■			
Circuit protection[9]	C	■	■	■	■	■	■			
Enclosure rating	IP 67 / NEMA 6	■	■	■	■	■	■			
Ambient temperature T_A	-13...158°F (-25...70°C)	■	■	■	■	■	■			
Approximate weight	3.4 oz (95 g)	■		■		■				
	1.1 oz (30 g)		■		■		■			
Housing material	Body: PBT/PC	■	■	■	■	■	■			
	Lens: PMMA	■	■	■	■	■	■			

1) Object with 90% reflectance (referred to standard white DIN 5033
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Without load
5) With resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 250 V AC
9) C = Interference suppression

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.



Theory of Operation...Reflex/Retro-Reflective Sensors

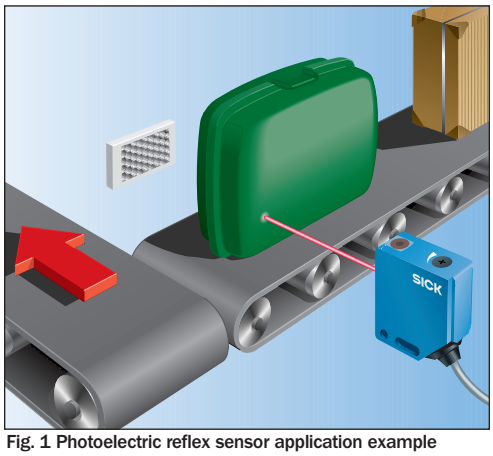


Fig. 1 Photoelectric reflex sensor application example

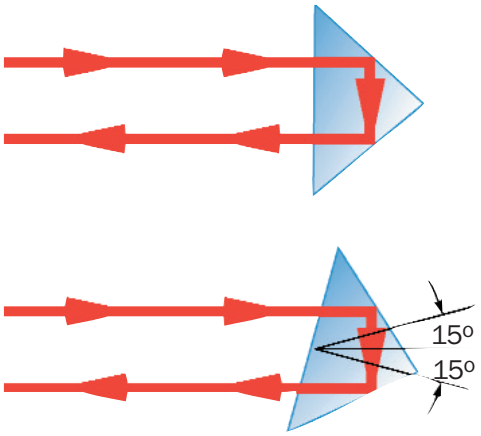


Fig. 2 Corner cube elements within a reflector

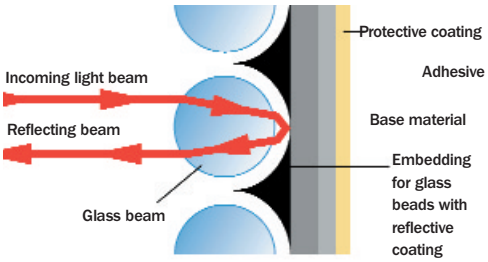


Fig. 3 Glass or plastic bead type reflector

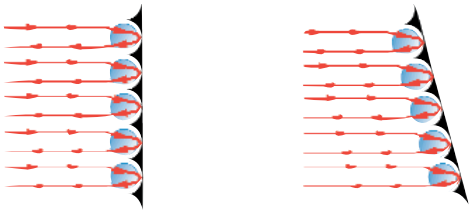
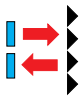


Fig. 4 Glass or plastic bead type reflector



About Photoelectric Reflex Sensors

Photoelectric reflex switches (designated by an "L," as in the WL 2000) contain both the sender and receiver in a single housing. The emitted light is returned by the corner cube reflector and evaluated by the sensor (Fig. 1). With the corner cube reflector this becomes a two-part device that requires wiring on only one side, making it more economical than a through beam sensor.

Polarizing filters (p. xx for more information) prevent false readings on reflective objects. There are many different types of reflectors, from the very simple to the very specialized, and each will provide a different sensing distance.

Corner cube reflectors are most common in opto-electronics. They can absorb deviations in alignment of up to ±15 degrees. This parallel reflection of light, (Fig. 2), allows higher tolerances in alignment of reflex photoelectric switches, as opposed to mirrors which require perfect alignment and might fail from external influences (vibration, etc.). SICK 2000X tape uses microcorner cube technology.

Some retro-reflective tape consists of small glass or plastic beads of approximately 0.1 mm (0.004 in) diameter, which are embedded side-by-side on a tape having an adhesive backing (Fig. 3, 4). This relatively low-cost reflector is used for temporarily marking cartons and similar applications.
retro-reflective tapes have a reflectivity, which can vary with quality from 200 to 2000 times greater than a 90% reflective test card. Beads create only a triple shift and cannot be used with systems using polarized light.

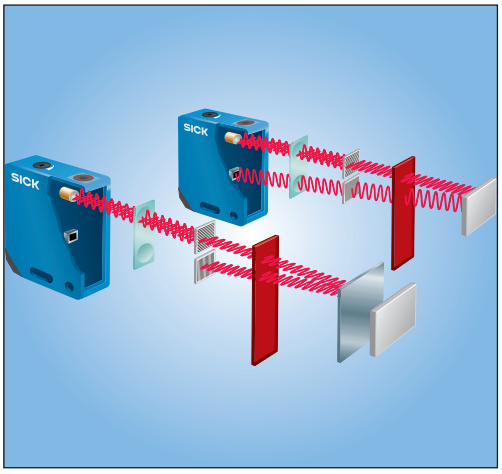


Fig. 1 Polarization filters

Polarizing Filters

A reflex sensor detects objects when its reflector does not return the beam of emitted light. When the objects to be detected are themselves reflective, the sensor may falsely register that there is no object present.

Using a polarizing filter can eliminate these false readings. A polarizing filter has two parts; the sender filter is "striped" horizontally, and the receiver filter is "striped" vertically. The sensor emits light that oscillates on an arbitrary plane, but the sender filter will only allow horizontally oscillating light to pass through it. If no object is present, the beam of light will strike the reflector. The reflectors we recommend are "optically active"; when the beam strikes the reflector it rotates the light 90°. When the light returns to the receiver it has been vertically aligned and can pass through the receiver filter (Fig. 2). A reflective object will still reflect the beam, but without rotating it. The light will not be able to pass through the receiver filter and the sensor will register an object as being present (Fig. 3).

The possible exception to this is the case of materials such as plastic wraps, films, and coatings. As the light passes through this material, it is turned 45°. The beam then hits the reverse side of the material and is directed back to the sensor; however, as it passes back through the material it is turned a further 45°. The light is then able to pass through the receiver filter, and the sensor reacts as if no object were present.

This type of false reflection is generally less intense than a reflection from the reflector, and the problem can be solved by adjusting the optical alignment or sensitivity control. In extreme cases it may be necessary to use a clear material sensor.

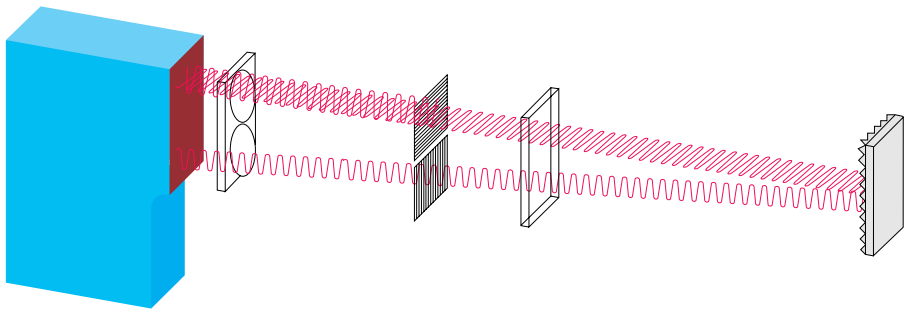


Fig. 2 When the light beam is reflected by the reflector, it can pass through the filter.

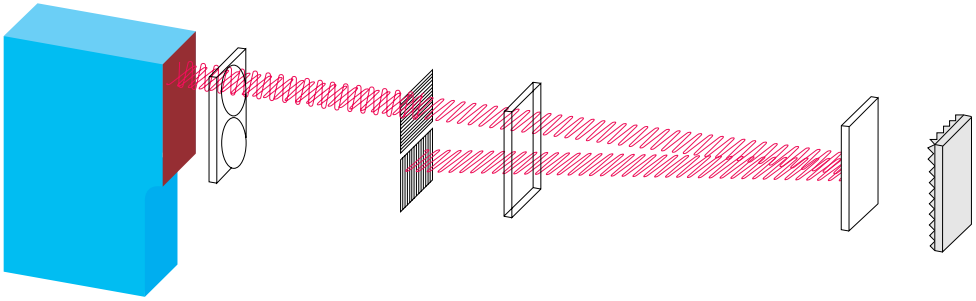
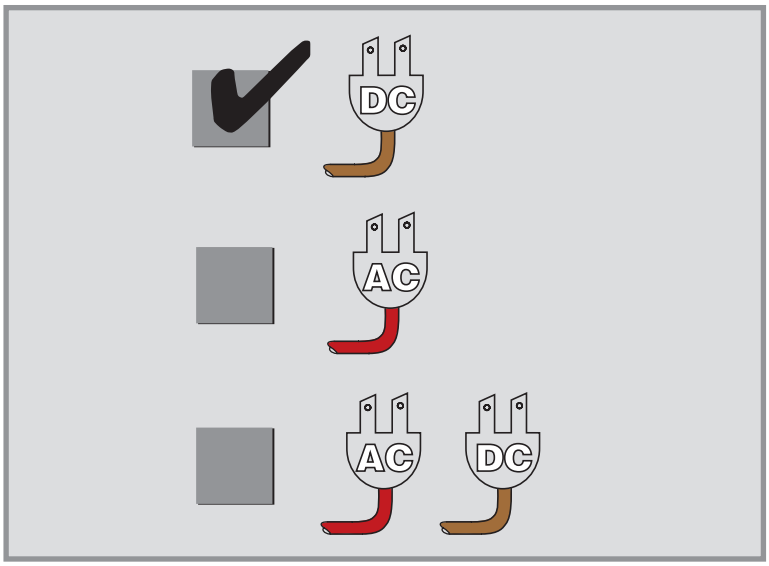


Fig. 3 When the light beam is reflected by the object, it cannot pass through the filter.

Reflex/Retro-Reflective Sensors

Reflex/Retro-Reflective Sensors



EL 1

Reflex/Retro-Reflective Sensors

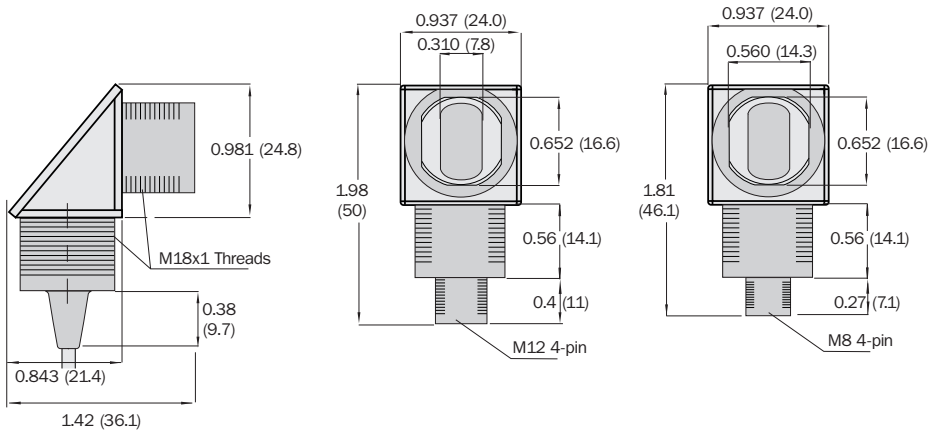
0.2...13.1 ft (0.07...4 m)
sensing range

Highlights

- ELF - Economical Little Functional
- Extremely compact to fit almost any application
- Universal mounting configuration for simple installation
- Unparalleled optical performance
- Electrical functionality previously available only in large sensors
- Available with M8 or M12 connector or pre-leaded cable

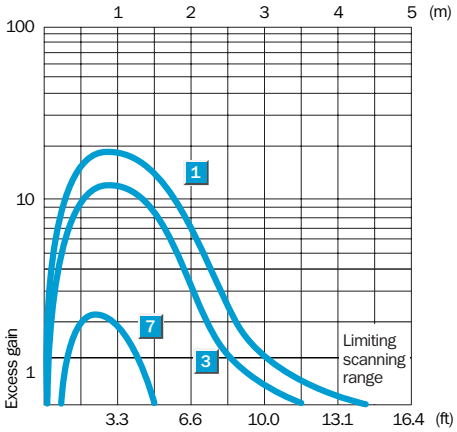
EL 1

Dimensional Drawing



dimensions in inches (mm)

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0.07...4.0 m
2	PL 50 A	0.07...2.7 m
3	P250	0.07...3.3 m
4	PL 40 A	0.07...2.4 m
5	PL 30 A	0.07...2.1 m
6	PL 20 A	0.07...1.5 m
7	2000X reflective tape	0.2...1.5 m
	min 50 x 50 mm²	

Order Information

Type	Part no.
EL 1-P122	7 027 206
EL 1-F122	7 027 207
EL 1-N122	7 027 208
EL 1-E122	7 027 209
EL 1-P123	7 027 210
EL 1-F123	7 027 211
EL 1-N123	7 027 212
EL 1-E123	7 027 213
EL 1-P124	7 027 214
EL 1-F124	7 027 215
EL 1-N124	7 027 216
EL 1-E124	7 027 217
EL 1-P125	7 027 218
EL 1-F125	7 027 219
EL 1-N125	7 027 220
EL 1-E125	7 027 221
EL 1-P127	7 027 268
EL 1-F127	7 027 269
EL 1-N127	7 027 270
EL 1-E127	7 027 271
EL 1-P128	7 027 272
EL 1-F128	7 027 273
EL 1-N128	7 027 274
EL 1-E128	7 027 275

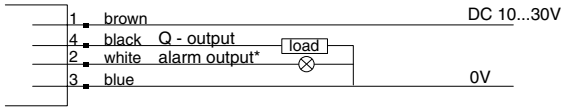
Accessories	page
Cables and connectors	908, 909
Reflectors	936
Mounting bracket 18 mm	925, 926

Technical Data	EL 1-	P122	F122	N122	E122	P123	F123	N123	E123
Sensing range	0.2...13.1 ft (0.07...4 m)	■	■	■	■	■	■	■	■
Light source[1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■				
	w/ alarm 4.7 x 4.7 in at 78.7 in (120 x 120 mm at 2 m)					■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■
Ripple	$< 5\ V_{SS}$, must be within V_S tolerances	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Alarm					■	■	■	■
	Light operate	■		■		■		■	
	Dark operate		■		■		■		■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■
Connection types	Cable[2], 2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■	■	■				
	Cable[2], with alarm 4 conductor 28 AWG, 2.7 mm O.D.					■	■	■	■
Enclosure rating	IP 54	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122 °F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■
	overload and short circuit protection	■	■	■	■	■	■	■	■
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■
	used near connector or lens								

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

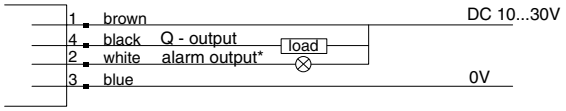
Connection Diagram

PNP Models



wire colors refer to standard cable, not included with quick disconnect models

NPN Models



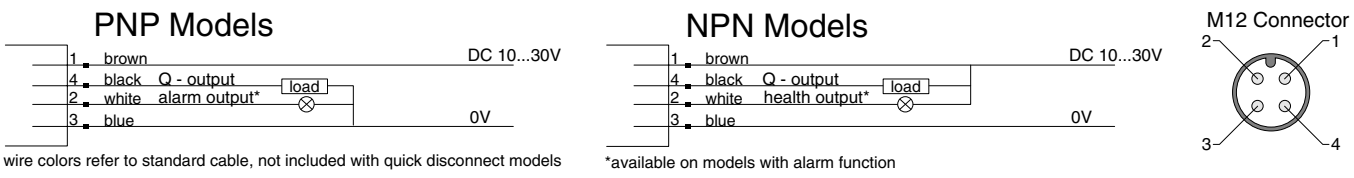
*available on models with alarm function

EL 1

Technical Data	EL 1-	P124	F124	N124	E124	P125	F125	N125	E125
Sensing range	0.2...13.1 ft (0.07...4 m)	■	■	■	■	■	■	■	■
Light source [1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■				
	w/ alarm 4.7 x 4.7 in at 78.7 in (120 x 120 mm at 2 m)					■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■
Ripple	$< 5\ V_{SS}$, must be within V_S tolerances	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Alarm					■	■	■	■
	Light operate	■		■		■		■	
	Dark operate		■		■		■		■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■
Connection type	Plug, M12 4-pin	■	■	■	■	■	■	■	■
Enclosure rating	IP 54	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122 °F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■
	overload and short circuit protection	■	■	■	■	■	■	■	■
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■
	used near connector or lens								

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

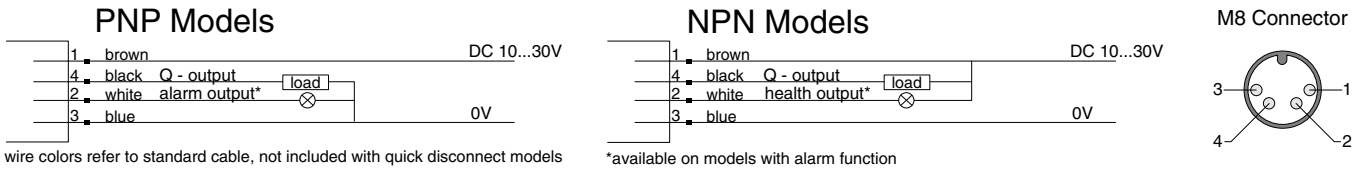
Connection Diagram



Technical Data	EL 1-	P127	F127	N127	E127	P128	F128	N128	E128
Sensing range	0.2...13.1 ft (0.07...4 m)	■	■	■	■	■	■	■	■
Light source [1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■				
	w/ alarm 4.7 x 4.7 in at 78.7 in (120 x 120 mm at 2 m)					■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■
Ripple	$< 5\ V_{SS}$, must be within V_S tolerances	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Alarm					■	■	■	■
	Light operate	■		■		■		■	
	Dark operate		■		■		■		■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■
Connection type	Plug, M8 4-pin	■	■	■	■	■	■	■	■
Enclosure rating	Housing IP 54	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122 °F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■
	overload and short circuit protection	■	■	■	■	■	■	■	■
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■
	used near connector or lens								

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

Connection Diagram



MHL 1

Reflex/Retro-Reflective Sensors

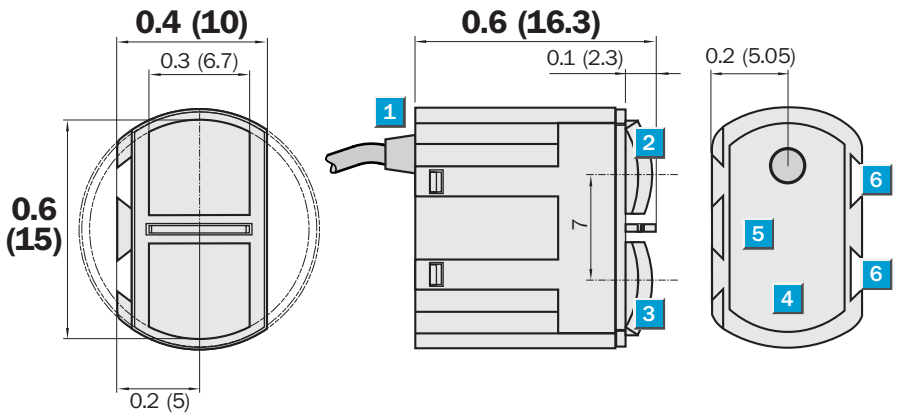
0...13.1 ft (0...4 m)
sensing range

Highlights

- With polarization filter
- Excellent price/performance ratio
- Mounting via dovetail
- Can be mounted quickly and reliably using a snap holder
- PNP or NPN output
- Stackable sensors
- Red light for easy alignment

MHL 1

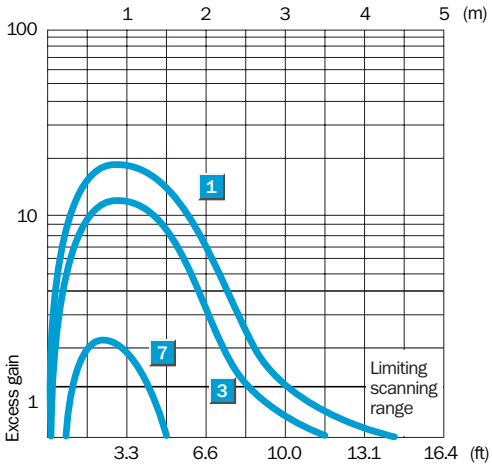
Dimensional Drawing



dimensions in inches (mm)

1 Connection cable 2 m, 3 x 0.25 mm²
2 Optical axis, sender
3 Optical axis, receiver
4 LED output indicator
5 Translucent back
6 Mounting slots

Excess Gain



	Reflector Type	Sensing Range
1	PL 80 A	0.07...4.0 m
2	PL 50 A	0.07...2.7 m
3	PL 250	0.07...3.3 m
4	PL 40 A	0.07...2.4 m
5	PL 30 A	0.07...2.1 m
6	PL 20 A	0.07...1.5 m
7	Reflective tape diamond grade*	0.2...1.5 m

* size min. 50 x 50 mm²

Order Information	
Type	**Part no.**
MHL 1-P122	1 019 709
MHL 1-F122	1 019 845
MHL 1-N122	1 019 710
MHL 1-E122	1 019 846
MHL 1-P122S07	1 025 344
MHL 1-F122S01	1 023 616
MHL 1-N122S05	1 025 343
MHL 1-E122S02	1 023 617

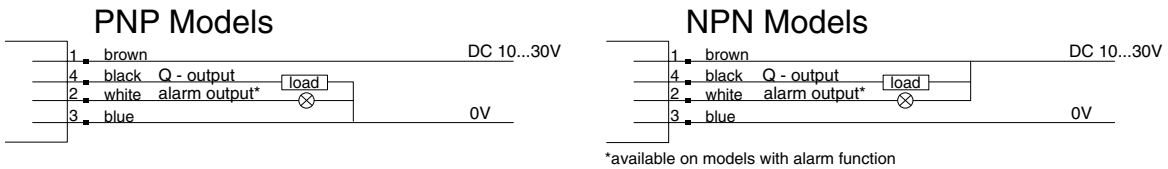
Accessories	page
Snap holder*	932
Mini ball joint bracket	932
Reflectors	936

*included with delivery

Technical Data	MHL 1-	P122	F122	N122	E122	P122S07	P122S01	P122S05	P122S02
Sensing range	0...13.1 ft (0...4 m) / PL 80 A	■	■	■	■	■	■	■	■
Light source[1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2000 mm)	■	■	■	■	■	■	■	■
Supply voltage V_S[2]	10...30 V DC	■	■	■	■	■	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	< 20 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Light switching	■		■		■		■	
	Dark switching		■		■		■		■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency[5]	200 Hz	■	■	■	■	■	■	■	■
Connection type[6]	Cable[2], 2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■	■	■				
	Cable[2], with alarm 4 conductor 28 AWG, 2.7 mm O.D.					■	■	■	■
Enclosure rating	IP 40	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at $T_U = 25°C$
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Programmable up to 700/s on request
6) Do not bend below 0°C

Connection Diagram



*available on models with alarm function

WL 2S

Reflex/Retro-Reflective Sensors

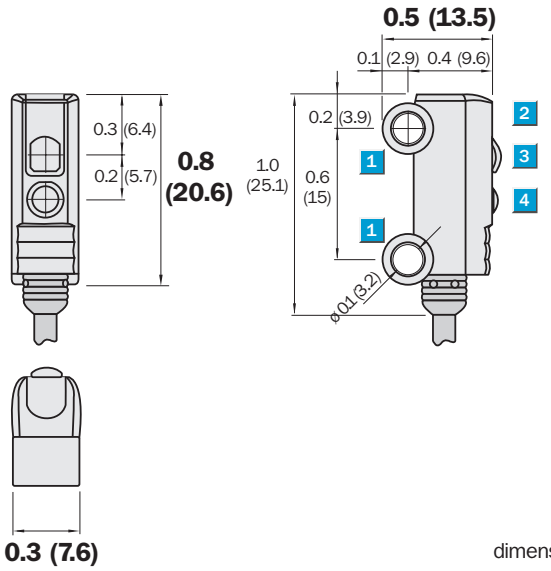
0...4.9 ft (0...1.5 m)
sensing range

Highlights

- Extremely good size to performance ratio
- Easy and fast alignment using ball joint bracket
- Sturdy housing with metal sleeves for M3 bolts

WL 2S

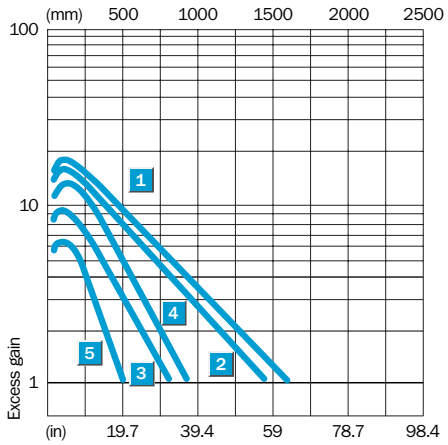
Dimensional Drawing



dimensions in inches (mm)

1 Mounting hole Ø 3.2 mm
2 LED signal strength indicator
3 Optical axis, receiver
4 Optical axis, sender

Excess Gain



	Reflector Type	Sensing Range
1	PL 40 A	0.045 ... 1.5 m
2	PL 30 A	0.045 ... 1.4 m
3	PL 20 A	0.045 ... 0.8 m
4	PL 22	0.06 ... 0.9 m
5	PL 10 F	0.045 ... 0.5 m

Order Information	
Type	**Part no.**
WL 2S-F111	1 022 666
WL 2S-E111	1 022 667
WL 2S-P111	1 023 869
WL 2S-N111	1 023 870
WL 2S-F111	1 023 868
WL 2S-P211	1 024 249
WL 2S-F411	1 023 644

Accessories	page
Reflectors	936
Cables and connectors	908
Mounting systems	932
Mounting set of screws[1]	

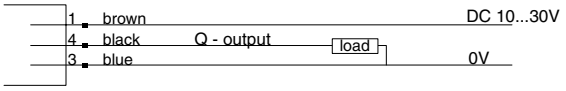
[1] Included with delivery

Technical Data	WL 2S-	F111	E111	P111	N111	F211	P211	F411		
Sensing range, typ. max.	0...4.9 ft (0...1.5 m)	■	■	■	■	■	■	■		
Light source[1], light type	Pin-point LED, red light, polarized	■	■	■	■	■	■	■		
Light spot diameter	0.4 in at 3.9 in (10 mm at 100 mm)	■	■	■	■	■	■	■		
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■		
Ripple[3]	$< 5\ V_{PP}$	■	■	■	■	■	■	■		
Current consumption[4]	< 20 mA	■	■	■	■	■	■	■		
Switching outputs	PNP, Q	■		■		■	■	■		
	NPN, Q		■		■					
	Light switching			■	■		■			
	Dark switching	■	■			■		■		
Output current I_A max.	< 50 mA	■	■	■	■	■	■	■		
Response time[5]	< 0.6 ms	■	■	■	■	■	■	■		
Max. switching frequency[6]	800/s	■	■	■	■	■	■	■		
Connection types	Cable[7], 2 m	■	■	■	■					
	Plug, M8 3-pin, cable, 200 mm					■	■			
	Plug, M8 4-pin, cable, 200 mm							■		
VDE protection class[8]	III	■	■	■	■	■	■	■		
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■		
Enclosure rating	IP 67	■	■	■	■	■	■	■		
Ambient temperature	Operation -4...122°F (-20...50°C)	■	■	■	■	■	■	■		
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■	■		
Approximate weight	0.6 oz (18 g)	■	■	■	■					
	0.7 oz (20 g)					■	■	■		
Housing material	ABS, PMMA	■	■	■	■	■	■	■		

1) Average service life 75.000 h at $T_A = +25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) 2 m, PVC, 2.4 mm Ø, do not bend below 0°C
8) Reference voltage 50 V
9) A = V_S-connections reverse-polarity protected
B = Output Q and $\overline{Q}$ reverse-polarity protected
C = interference pulse suppression

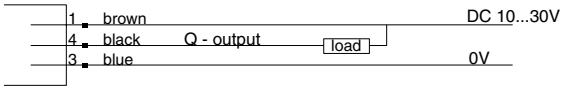
Connection Diagram

PNP Models

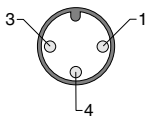


wire colors refer to standard cable, not included with quick disconnect models.

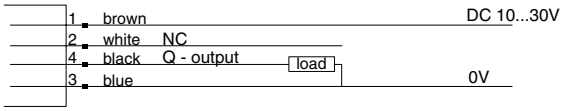
NPN Models



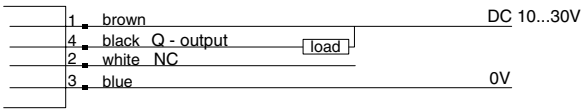
M8 Connector



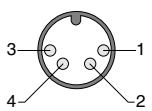
PNP Models



NPN Models



M8 Connector

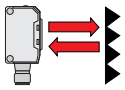


wire colors refer to standard cable, not included with quick disconnect models

SICK

WL 150

Reflex/Retro-Reflective Sensors



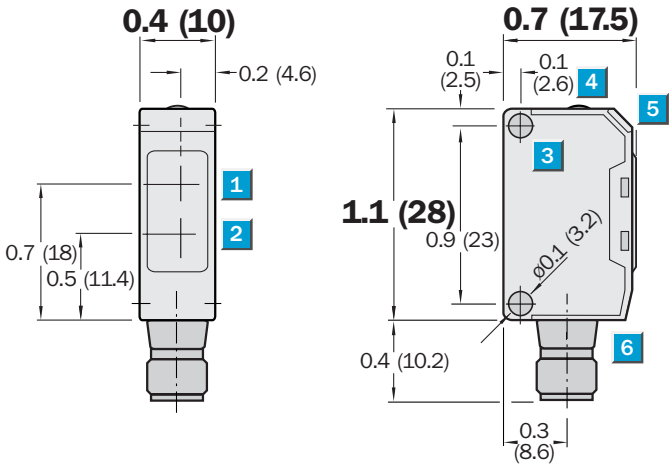

0.02...7.9 ft (0.005...2.4 m)
sensing range

Highlights

- Rugged plastic housing
- Polarizing filter prevents false readings on reflective surfaces
- Also suitable for "Diamond Grade" reflective tape
- Sensitivity adjustment
- Red light for easy alignment
- Signal strength indicator
- Cable or M8 quick disconnect versions

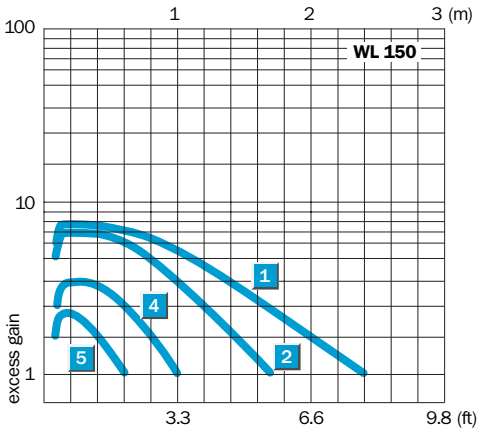
WL 150

Dimensional Drawing



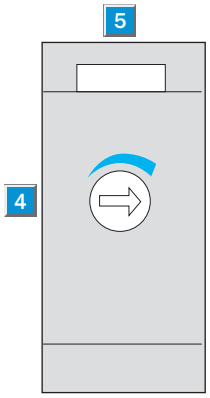
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Mounting hole Ø 3.2 mm
4 Sensitivity adjustment 270°
5 LED indicator, red:
Light received ≥ switching threshold
6 Plug, M8 4-pin or cable

Reflector Type		Sensing Range
1	PL 80 A	0.01...2.4 m
2	P 250	0.01...1.7 m
3	PL 50 A or PL 40 A	0.01...1.7 m
4	PL 30 A or PL 31 A	0.01...1.5 m
5	PL 20 A	0.01...1.0 m
6	Reflect. tape diamond grade	0.01...0.6 m

Order Information	
Type	**Part no.**
WL 150-P132	6 011 036
WL 150-P430	6 011 038
WL 150-N132	6 011 033
WL 150-N430	6 011 035

Accessories	page
Cables and connectors	908
Mounting brackets Type A*	919
Reflectors**	936

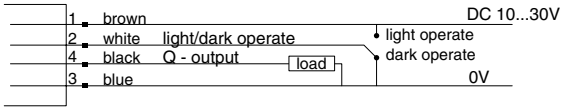
* included with delivery
** reflector PL 20 A included with delivery

Technical Data	WL 150-	P132	P430	N132	N430
Sensing range	00.02...3.3 ft (0.005...1.0 m)/PL 20 A (included)	■	■	■	■
	00.02...7.9 ft (0.005...2.4 m)/PL 80 A	■	■	■	■
Sensitivity, adjustable	Potentiometer 270°	■	■	■	■
Light source[1], light type	LED, visible red light, polarized	■	■	■	■
Light spot diameter	Approx. 5.9 in at 4.9 ft (150 mm at 1.5 m)	■	■	■	■
Angle of divergence	Approx. 6°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	± 10%	■	■	■	■
Current consumption[4]	≤ 20 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Max. output current I_A	100 mA	■	■	■	■
Operation mode[5]	Light/dark switching via control wire L/D	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 0.5 ms	■	■	■	■
Max. switching frequency[7]	1000 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8]; 4 x 0.18 mm², Ø 3.5 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■
Approximate weight	1.6 oz (44 g)	■		■	
	0.3 oz (7 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

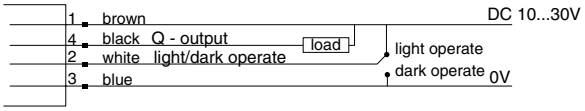
1) Average service life 100,000 h where T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Control cable open:
NPN: light-switching
PNP: dark-switching
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

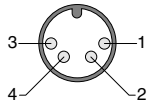
PNP Models



NPN Models



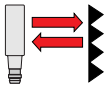
M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

WL 4-2

Reflex/Retro-Reflective Sensors



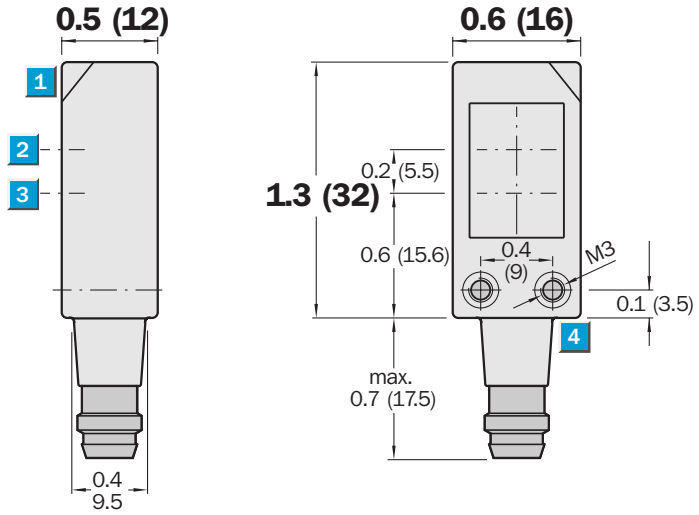

0...9.2 ft (0...2.8 m)
sensing range

Highlights

- Rugged plastic housing
- Insensitive to ambient light
- Crosstalk immunity
- Red light for easy alignment
- Fast response time
- Cable or M8 quick disconnect versions

WL 4-2

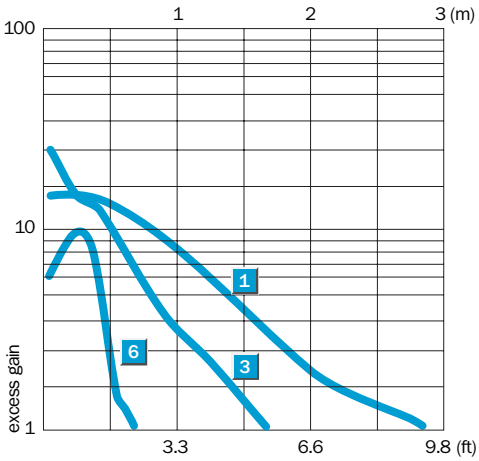
Dimensional Drawing



dimensions in inches (mm)

1 LED signal strength indicator
2 Optical axis, receiver
3 Optical axis, sender
4 M3 threaded mounting hole

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0...1.7 m
2	PL 50 A	0...1.1 m
3	PL 40 A	0...0.8 m
4	PL 30 A	0...0.4 m
5	PL 20 A	0...0.4 m
6	Reflective tape diamond grade	35...400 mm

Order Information	
Type	**Part no.**
WL 4-2P132	1 015 767
WL 4-2P330	1 015 763
WL 4-2P331	1 015 759
WL 4-2N132	1 015 769
WL 4-2N330	1 015 765
WL 4-2N331	1 015 761
WL 4-2P430	1 015 958

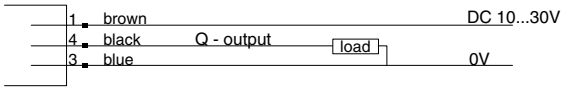
Accessories	page
Cables and connectors	908
Mounting brackets	932, 935
Reflectors	936

Technical Data	WL 4-2-	P132	P330	P331	N132	N330	N331	P430
Sensing range	0...9.2 ft (0...2.8 m)/PL 80 A	■	■	■	■	■	■	■
Light source[1], **light type**	LED, red light, polarized	■	■	■	■	■	■	■
Light spot diameter	9.1 in at 4.9 ft (230 mm at 1.5 m)	■	■	■	■	■	■	■
At focal point	Approx. 0.1 in at 3.5 in (3.5 mm at 90 mm)	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■
Ripple[3]	5 V_{SS}	■	■	■	■	■	■	■
Current consumption[4]	< 20 mA	■	■	■	■	■	■	■
Switching outputs	PNP, Q	■	■	■				
	NPN, Q				■	■	■	
	PNP, Q and $\overline{Q}$							■
Operation mode	Light switching	■	■	■	■	■	■	■
	Dark switching							■
Output current I_A max.	100 mA	■	■	■	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.5 V)	■	■	■				
PNP; signal voltage LOW	Approx. 0 V	■	■	■				
NPN; signal voltage HIGH	Approx. V_S				■	■	■	
NPN; signal voltage LOW	< 1.5 V				■	■	■	
Response time[5]	< 500 µs	■	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■	■
Connection types	Cable[7], 2 m	■			■			
	Plug, M8 3-pin		■			■		■
	Plug, M8 3-pin, cable[7], 100 mm			■			■	
VDE protection class	⧫	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■
Enclosure rating[9]	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■	■
Approximate weight	1.4 oz (20 g)	■	■	■	■	■	■	■
Polarizing filter		■	■	■	■	■	■	■
Housing material	Body: glass fiber reinforced ABS	■	■	■	■	■	■	■
	Lens: polycarbonate	■	■	■	■	■	■	■

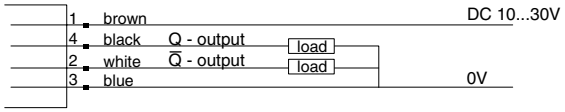
1) Average service life 100,000 h where T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
9) IP 67: with screw-in cable receptacles
IP 65: with plug-in cable receptacles

Connection Diagram

PNP Models

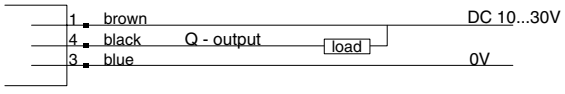


wire colors refer to standard cable, not included with quick disconnect models.

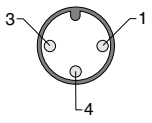


wire colors refer to standard cable, not included with quick disconnect models

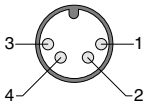
NPN Models



M8 Connector



M8 Connector



SICK

WL 4-2

Reflex/Retro-Reflective Sensors

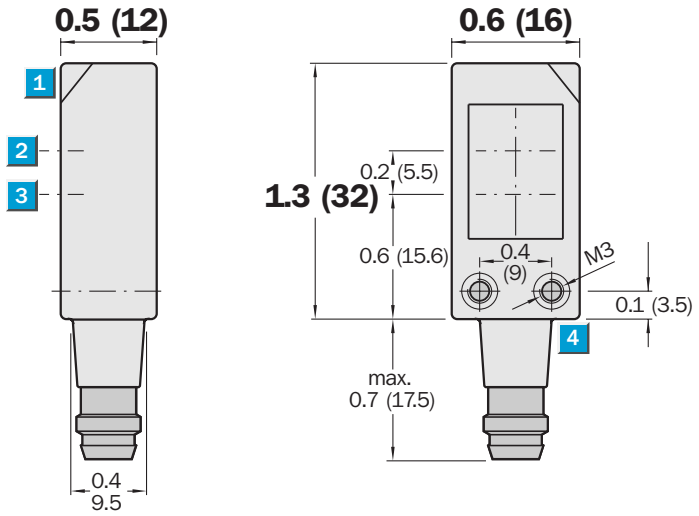
0...9.2 ft (0...2.8 m)
sensing range

Highlights

- Rugged plastic housing
- Insensitive to ambient light
- Crosstalk immunity
- Red light for easy alignment
- Fast response time
- Cable or M8 quick disconnect versions

WL 4-2

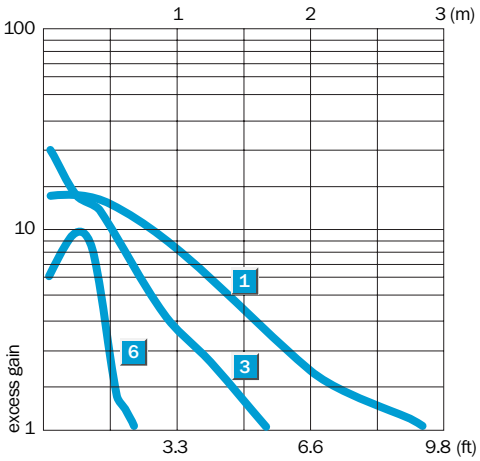
Dimensional Drawing



dimensions in inches (mm)

1 LED signal strength indicator
2 Optical axis, receiver
3 Optical axis, sender
4 M3 threaded mounting hole

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0...2.8 m
2	PL 50 A	0...1.8 m
3	PL 40 A	0...1.5 m
4	PL 30 A	0...0.8 m
5	PL 20 A	0...0.7 m
6	Reflective tape diamond grade	0...0.7 m

Order Information	
Type	**Part no.**
WL 4-2E132	1 015 770
WL 4-2E330	1 015 766
WL 4-2E331	1 015 762
WL 4-2F132	1 015 768
WL 4-2F330	1 015 764
WL 4-2F331	1 015 760

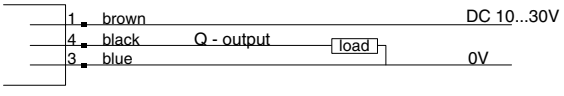
Accessories	page
Cables and connectors	908
Mounting brackets	932, 935
Reflectors	936

Technical Data	WL 4-2-	E132	E330	E331	F132	F330	F331
Sensing range	0...9.2 ft (0...2.8 m)/PL 80 A	■	■	■	■	■	■
Light source[1], **light type**	LED, red light, polarized	■	■	■	■	■	■
Light spot diameter	9.1 in at 4.9 ft (230 mm at 1.5 m)	■	■	■	■	■	■
At focal point	Approx. 0.1 in at 3.5 in (3.5 mm at 90 mm)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	5 V_{SS}	■	■	■	■	■	■
Current consumption[4]	< 20 mA	■	■	■	■	■	■
Switching outputs	PNP, Q				■	■	■
	NPN, Q	■	■	■			
Operation mode	Dark switching	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.5 V)				■	■	■
PNP; signal voltage LOW	Approx. 0 V				■	■	■
NPN; signal voltage HIGH	Approx. V_S	■	■	■			
NPN; signal voltage LOW	< 1.5 V	■	■	■			
Response time[5]	< 500 µs	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■
Connection types	Cable[7], 2 m	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 3-pin, cable[7], 100 mm			■			■
VDE protection class	⏀	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating[9]	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	1.4 oz (20 g)	■	■	■	■	■	■
Polarizing filter		■	■	■	■	■	■
Housing material	Body: glass fiber reinforced ABS	■	■	■	■	■	■
	Lens: polycarbonate	■	■	■	■	■	■

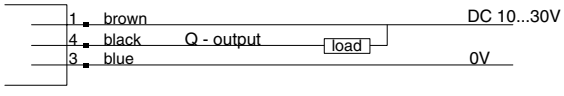
1) Average service life 100,000 h where $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
9) IP 67: with screw-in cable receptacles
IP 65: with plug-in cable receptacles

Connection Diagram

PNP Models

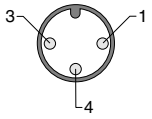


NPN Models



wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



WL 9-2 Small Parts

Reflex/Retro-Reflective Sensors

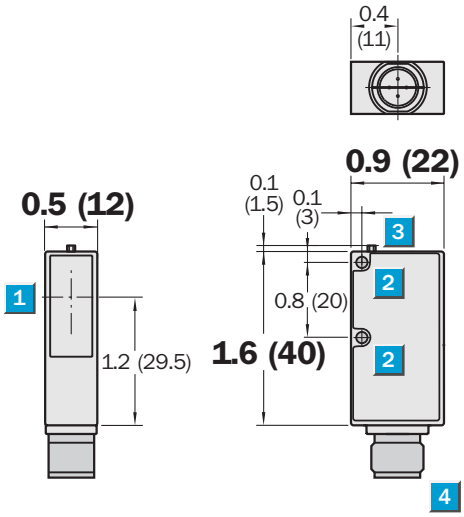
0...1.3 ft (0...0.4 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Outputs short-circuit protected
- Cable, M8 or M12 quick disconnect versions available
- Push button Teach-in

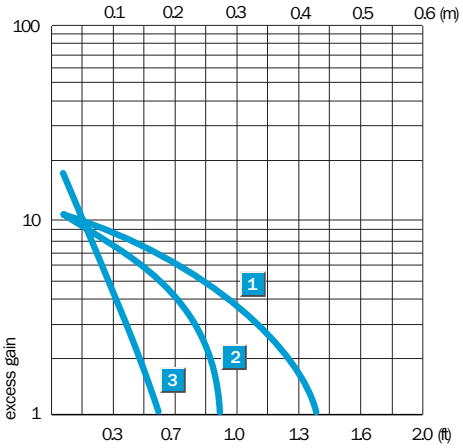
WL 9-2

Dimensional Drawing



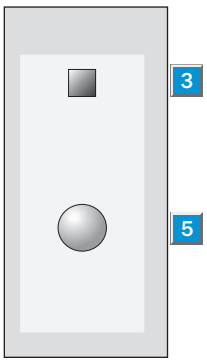
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis
2 Mounting hole Ø 3.2 mm
3 LED signal strength indicator
4 Plug, M12 or M8 4-pin,
2 m connection cable or
120 mm cable with plug M12 4-pin
5 Teach-in button

Reflector Type		Sensing Range
1	PL 80 A	0...0.4 m
2	PL 40 A	0...0.3 m
3	Reflective tape diamond grade*	0...0.2 m

* 100 x 100 mm²

Order Information	
Type	**Part no.**
WL 9-2P121	1 018 289
WL 9-2P421	1 018 291
WL 9-2N121	1 018 290
WL 9-2N421	1 018 292
WL 9-2P321	1 019 270
WL 9-2P621	1 019 271

Accessories	page
Cables and connectors	908, 909
Mounting brackets	933, 921
Reflectors	936

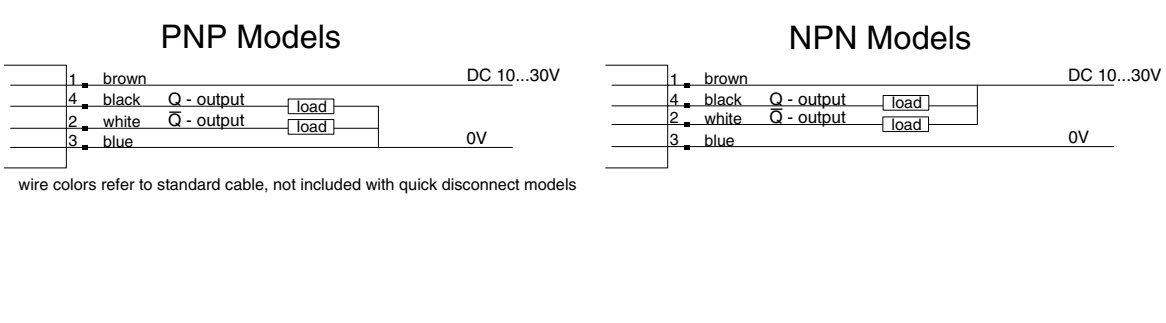
Technical Data	WL 9-2	P121	P421	N121	N421	P321	P621
Sensing range	0...1.3 ft (0...0.4 m)/PL 80 A	■	■	■	■	■	■
Supply voltage V_S[1]	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V_{PP}	■	■	■	■	■	■
Current consumption[3]	≤ 30 mA	■	■	■	■	■	■
Light source	LED, red light, polarized[4]	■	■	■	■	■	■
Light spot size	0.06 x 0.06 in at 1.4 in (1.5 x 1.5 mm at 35 mm)	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■			■	■
	NPN			■	■		
Signal voltage HIGH	V_S – 2.9 V	■	■			■	■
	V_S			■	■		
Signal voltage LOW[5]	Approx. 0 V	■	■			■	■
	≤ 2.9 V			■	■		
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[6]	≤ 625 µs	■	■	■	■	■	■
Max. switching frequency[7]	800 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■		■			
	Plug, M12 4-pin, cable, 120 mm						■
	Plug, M12 4-pin		■		■		
	Plug, M8 4-pin					■	
VDE protection class[8]	□	■	■	■	■		■
	⏚					■	
Enclosure rating	IP 67	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■
Ambient temperature T_A[10]	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■			■
	0.7 oz (20 g)		■		■	■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Limit values
2) Must be within V_S tolerances
3) Without load
4) Average service life at room temperature 100,000 h at T_A = 25°C
5) At T_A = 25°C and 100 mA output current
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = supply connections reverse-polarity protected
B = outputs short-circuit protected
C = interference suppression
10) Do not bend below 0°C

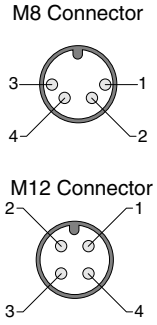
Teach-in Function

- **Programming via Teach-in button.**
- **Simple programming:**
  Position reflector in the beam and push the button: finished;
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram

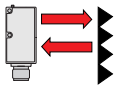


wire colors refer to standard cable, not included with quick disconnect models



WL 9-2

Reflex/Retro-Reflective Sensors




0...13.1 ft (0...4 m)

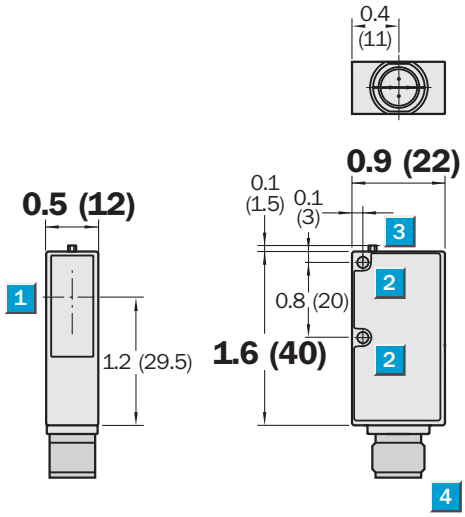
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Outputs short-circuit protected
- Cable, M8 or M12 quick disconnect versions available

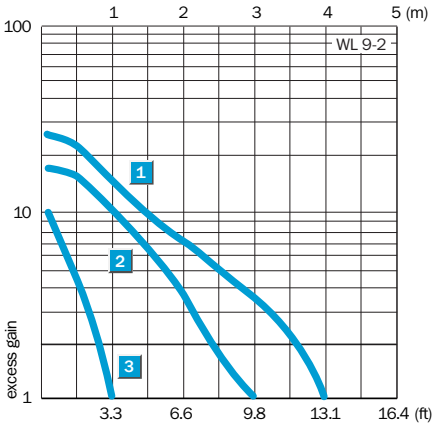
WL 9-2

Dimensional Drawing



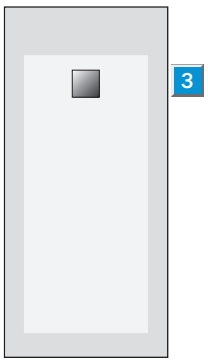
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis
2 Mounting hole Ø 3.2 mm
3 LED signal strength indicator
4 Plug, M12 or M8 4-pin,
2 m connection cable or
120 mm cable with plug M12 4-pin

Reflector Type		Sensing Range
1	PL 80 A	0...3.0 m
2	PL 40 A	0...2.0 m
3	Reflective tape diamond grade*	0...0.6 m

* 100 x 100 mm²

Order Information	
Type	**Part no.**
WL 9-2P130	1 018 281
WL 9-2P430	1 018 283
WL 9-2N130	1 018 282
WL 9-2N430	1 018 284
WL 9-2P330	1 019 024
WL 9-2P630	1 019 268
WL 9-2N330	1 019 511

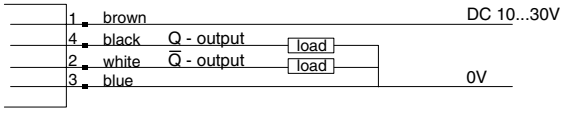
Accessories	page
Cables and connectors	908, 909
Mounting brackets	933, 921
Reflectors	936

Technical Data	WL 9-2-	P130	P430	N130	N430	P330	P630	N330
Sensing range	0...13.1 ft (0...4 m)/PL 80 A	■	■	■	■	■	■	■
Supply voltage V_S[1]	10...30 V DC	■	■	■	■	■	■	■
Ripple[2]	≤ 5 V_{PP}	■	■	■	■	■	■	■
Current consumption[3]	≤ 30 mA	■	■	■	■	■	■	■
Light source	LED, red light, polarized[4]	■	■	■	■	■	■	■
Angle of divergence	2.5°	■	■	■	■	■	■	■
Light spot size	4.7 x 4.7 in at 9.8 ft (120 x 120 mm at 3 m)	■	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■			■	■	
	NPN			■	■			■
Signal voltage HIGH	V_S – 2.9 V	■	■			■	■	
	V_S			■	■			■
Signal voltage LOW[5]	Approx. 0 V	■	■			■	■	
	≤ 2.9 V			■	■			■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■	■
Response time[6]	≤ 625 µs	■	■	■	■	■	■	■
Max. switching frequency[7]	800 Hz	■	■	■	■	■	■	■
Connection types	Cable, 2 m	■		■				
	Plug, M12 4-pin, cable, 120 mm						■	
	Plug, M12 4-pin		■		■			
	Plug, M8 4-pin					■		■
VDE protection class[8]	□	■	■	■	■		■	
	⏚					■		■
Enclosure rating	IP 67	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■
Ambient temperature T_A[10]	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■		■	■	
	0.7 oz (20 g)		■		■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■

1) Limit values
2) Must be within V_S tolerances
3) Without load
4) Average service life at room temperature 100,000 h at T_A = 25°C
5) At T_A = 25°C and 100 mA output current
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = supply connections reverse-polarity protected
B = outputs short-circuit protected
C = interference suppression
10) Do not bend below 0°C

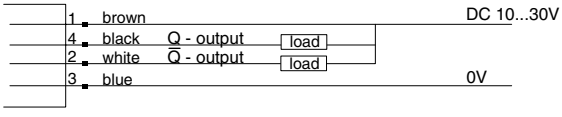
Connection Diagram

PNP Models

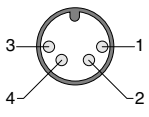


wire colors refer to standard cable, not included with quick disconnect models

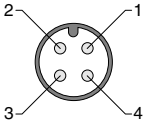
NPN Models



M8 Connector



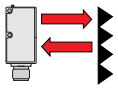
M12 Connector



SICK

WL 9-2 Teach

Reflex/Retro-Reflective Sensors



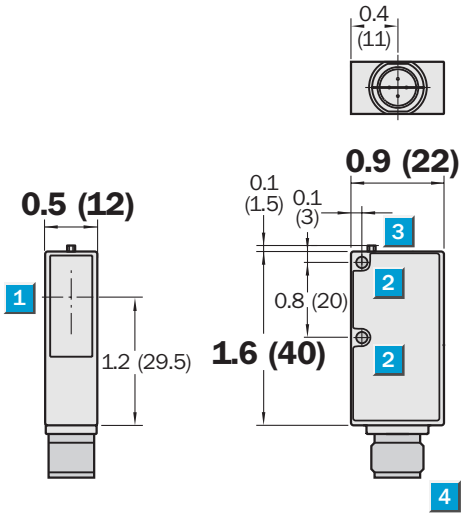

0...13.1 ft (0...4 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Outputs short-circuit protected
- Push button Teach-in
- Cable, M8 or M12 quick disconnect versions available
- Polarizing filters prevent false readings on shiny surfaces

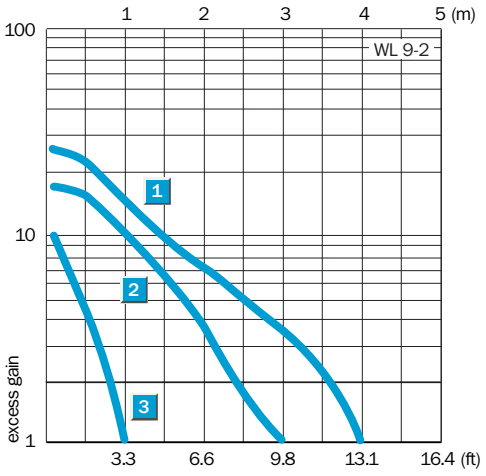
WL 9

Dimensional Drawing



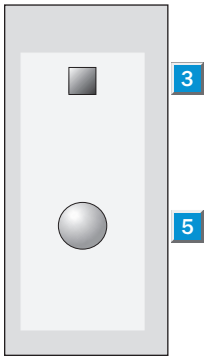
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis
2 Mounting hole Ø 3.2 mm
3 LED signal strength indicator
4 Plug, M12 or M8 4-pin,
2 m connection cable or
120 mm cable with plug M12 4-pin
5 Sensitivity adjustment with Teach-in

Reflector Type		Sensing Range
1	PL 80 A	0...4.0 m
2	PL 50 A	0...3.0 m
3	Reflective tape diamond grade*	0...1.0 m

* 100 x 100 mm²

Order Information	
Type	**Part no.**
WL 9-2P131	1 018 285
WL 9-2P331	1 019 025
WL 9-2P431	1 018 287
WL 9-2P631	1 019 269
WL 9-2N131	1 018 286
WL 9-2N431	1 018 288

Accessories	page
Cables and connectors	908, 909
Mounting brackets	933, 921
Reflectors	936

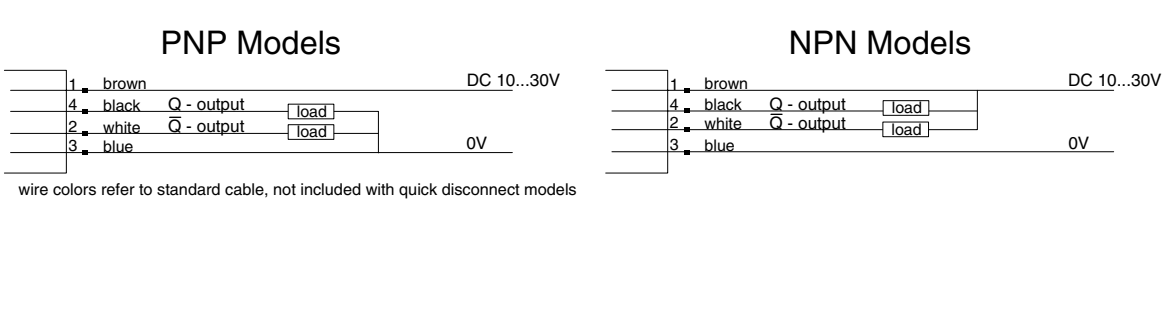
Technical Data	WL 9-2-	P131	P331	P431	P631	N131	N431
Sensing range	0...13.1 ft (0...4 m)/PL 80 A	■	■	■	■	■	■
Supply voltage V_S[1]	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V_{PP}	■	■	■	■	■	■
Current consumption[3]	≤ 30 mA	■	■	■	■	■	■
Light source	LED, red light, polarized[4]	■	■	■	■	■	■
Angle of divergence	2.5°	■	■	■	■	■	■
Light spot size	4.7 x 4.7 in at 9.8 ft (120 x 120 mm at 3 m)	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■	■	■		
	NPN					■	■
Signal voltage HIGH	V_S – 2.9 V	■	■	■	■		
	V_S					■	■
Signal voltage LOW[5]	Approx. 0 V	■	■	■	■		
	≤ 2.9 V					■	■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[6]	≤ 625 µs	■	■	■	■	■	■
Max. switching frequency[7]	800 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■				■	
	Plug, M12 4-pin, cable, 120 mm				■		
	Plug, M12 4-pin			■			■
	Plug, M8 4-pin		■				
VDE protection class[8]	□	■		■	■	■	■
	⏚		■				
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■
Ambient temperature T_A[10]	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■			■	■	
	0.7 oz (20 g)		■	■			■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Limit values
2) Must be within V_S tolerances
3) Without load
4) Average service life at room temperature 100,000 h at T_A = 25°C
5) At T_A = 25°C and 100 mA output current
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = supply connections reverse-polarity protected
B = outputs short-circuit protected
C = interference suppression
10) Do not bend below 0°C

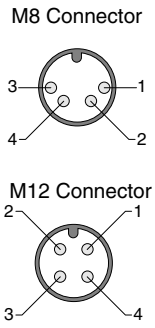
Teach-in Function

- **Programming via Teach-in button.**
- **Simple programming:**
  Position reflector in the beam and push the button: finished;
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models



WL 9L

Reflex/Retro-Reflective Sensors

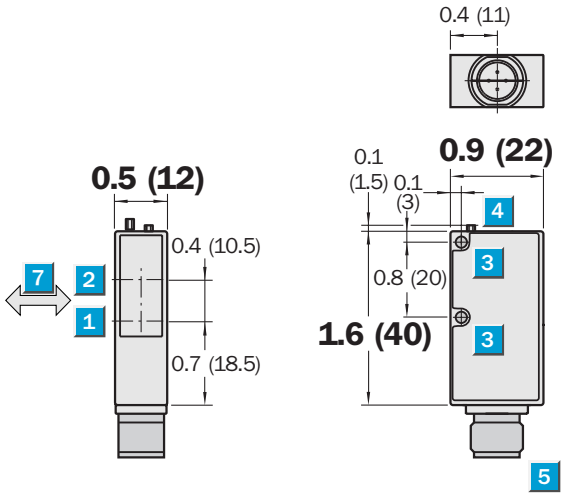
0.3...39.4 ft (0.1...12 m)
sensing range

Highlights

- Class 2 laser, red light
- Teach-in sensitivity adjustment
- 1000 hz switching frequency
- Polarizing filter prevents false readings on shiny objects
- Compact ABS plastic housing

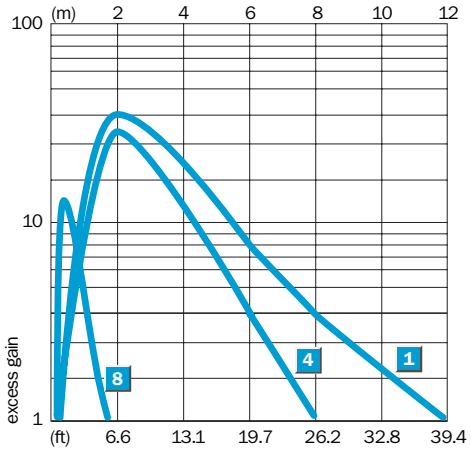
WL 9L

Dimensional Drawing



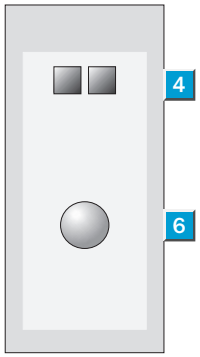
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 Mounting hole Ø 3.2 mm
4 Power indicator green;
LED signal strength indicator yellow
5 Plug, M12 or M8 4-pin
6 Teach-in button
7 Standard direction of the material to be sensed

	Reflector Type	Sensing Range
1	PL 80 A	0 – 8.0 m
2	PL 250 F	0 – 7.0 m
3	PL 50 A	0 – 6.0 m
4	PL 40 A	0 – 6.0 m
5	PL 30 A	0 – 5.0 m
6	PL 20 A	0 – 4.0 m
7	PL 20 F	0 – 4.0 m
8	Reflective tape	0 – 1.2 m

Order Information

Type	Part no.
WL 9L-P330	1 023 976
WL 9L-P430	1 023 958
WL 9L-N330	1 023 989
WL 9L-N430	1 023 988

Accessories	page
Cables and connectors	908, 909
Mounting brackets	933, 921
Reflectors	936

Technical Data	WL 9L-	P330	P430	N330	N430
Sensing range	0.3...39.4 ft (0.1...12 m)/PL 80 A	■	■	■	■
Supply voltage V_S	10...30 V DC[1]	■	■	■	■
Ripple[2]	< 5 V_{PP}	■	■	■	■
Current consumption[3]	< 35 mA	■	■	■	■
Light source[4], light type	Laser, red light, Class 2, polarized	■	■	■	■
Light spot size	< 0.019 in at 3.9 in (< 0.5 mm at 100 mm)	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■		
	NPN			■	■
PNP; signal voltage HIGH	V_S – 2 V	■	■		
PNP; signal voltage LOW	Approx. 0 V	■	■		
NPN; signal voltage HIGH	V_S			■	■
NPN; signal voltage LOW[5]	V_S – 2 V			■	■
Output current I_A max.	< 100 mA	■	■	■	■
Response time[6]	< 0.6 ms	■	■	■	■
Max. switching frequency[7]	1000/s	■	■	■	■
Connection types	Plug, M12 4-pin		■		■
	Plug, M8 4-pin	■		■	
VDE protection class[8]	⧈ (plug M12)		■		■
	III (plug M8)	■		■	
Enclosure rating	IP 67	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Ambient temperature T_A[10]	Operation 14...122°F (-10...50°C)	■	■	■	■
	Storage -13...158°F (-25...75°C)	■	■	■	■
Approximate weight	0.7 oz (20 g)	■	■	■	■
Housing material	ABS plastic	■	■	■	■

1) Limit values
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Average service life 50,000 h at T_A = 25°C
5) At T_A = 25°C and 100 mA output current
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs reverse-polarity protected
C = Interference pulse suppression
10) Do not stack devices

Teach-in Function

Standard

1. Align the sensor with the reflector. Yellow and green LEDs are on.
2. Press teach-in button for >2 sec. Green LED momentarily turns off. Teach-in is initiated. Yellow and green LEDs both flash.
3. The reference level is stored permanently when the button is released. Switching threshold is set to standard sensitivity.

Precise

1. Align the sensor with the reflector. Yellow and green LEDs are on.
2. Press teach-in button for >5 sec. Green LED momentarily turns off. Teach-in is initiated. Yellow and green LEDs both flash.
3. The reference level is stored permanently when the button is released. Switching threshold is set to precise sensitivity with a lower switching hysteresis, making detection of transparent objects possible.

Laser Protection

EN 60825-1, Class 2
Conforms to 21 CFR 1040

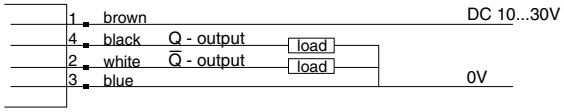
Beam Attenuator

The WL 9L is equipped with an M8 or M12 style quick disconnect. This cable can be quickly and easily be removed in the event that personnel require access to the area where the sensor is mounted.

SICK AG
D-79183 Waldkirch
Sebastian - Kneipp - Str. 1
April 2003 / 7279

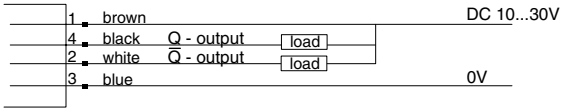
Connection Diagram

PNP Models

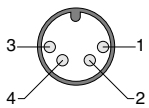


wire colors refer to standard cable, not included with quick disconnect models

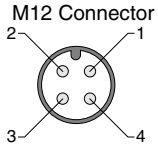
NPN Models



M8 Connector



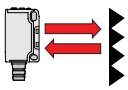
M12 Connector



SICK

WL 140-2

Reflex/Retro-Reflective Sensors



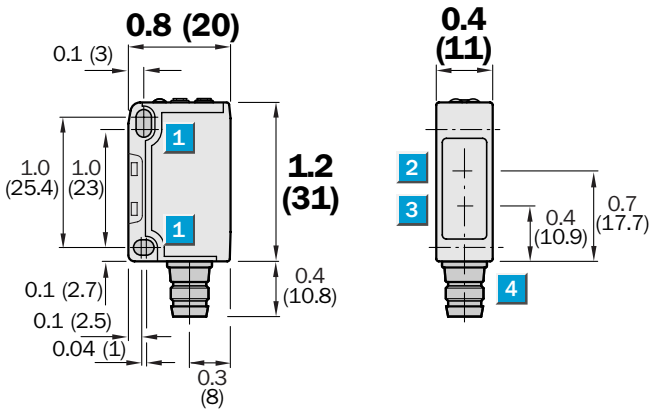

0.03...19.7 ft (0.01...6.0 m)
sensing range

Highlights

- Small, compact housing
- Signal strength indicator
- Cable or quick disconnect versions available
- Adjustable sensitivity

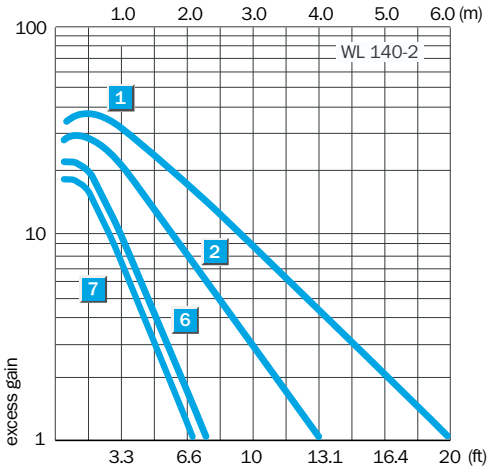
WL 140

Dimensional Drawing



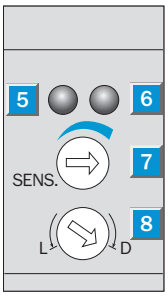
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Mounting hole Ø 3.2 mm for M3
2 Center of optical axis, receiver
3 Center of optical axis, sender
4 Plug, M8 3-/4-pin or connection cable
5 Signal strength indicator, green
6 Output indicator, orange
7 Sensitivity setting (270°)
8 Light/dark rotary switch:
L = light switching, D = dark switching

Reflector Type		Sensing Range
1	PL 80 A	0.01...5.0 m
2	PL 250	0.01...3.5 m
3	PL 50 A/40 A	0.01...3.8 m
4	PL 30 A/31 A	0.01...3.0 m
5	PL 20 A	0.01...2.2 m
6	PL 45	0.01...1.7 m
7	Reflective tape diamond grade	0.01...2.0 m

Order Information	
Type	**Part no.**
WL 140-2P132	6 024 796
WL 140-2P330	6 024 798
WL 140-2P430	6 024 799
WL 140-2N132	6 024 792
WL 140-2N330	6 024 794
WL 140-2N430	6 024 795

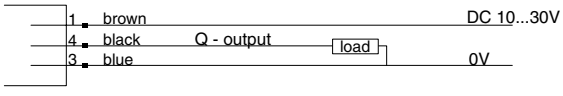
Accessories	page
Cables and connectors	908
Mounting brackets	920
Reflectors	936

Technical Data	WL 140-2-	P132	P330	P430	N132	N330	N430
Sensing range	0.03...19.7 ft (0.01...6.0 m)/PL 80 A	■	■	■	■	■	■
	0.03...7.2 ft (0.01...2.2 m)/P 45[1]	■	■	■	■	■	■
Sensitivity, adjustable	Potentiometer, (270°)	■	■	■	■	■	■
Light source[2]	LED, visible red light, polarized	■	■	■	■	■	■
Light spot diameter	5.9 in at 8.2 ft (150 mm at 2.5 m)	■	■	■	■	■	■
Angle of divergence	Approx. 3.5°	■	■	■	■	■	■
Supply voltage V_S[3]	10...30 V DC	■	■	■	■	■	■
Ripple[4]	± 10%	■	■	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Switching type, adjustable	Light/dark switching via switch[6]	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Response time[7]	≤ 0.5 ms	■	■	■	■	■	■
Max. switching frequency[8]	1000 Hz	■	■	■	■	■	■
Connection type	Cable, PVC, 2 m[9]; 3 x 0.18 mm², Ø 4.0 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class[10]	⧈	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25 ... 55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40... 70°C)	■	■	■	■	■	■
Approximate weight	1.9 oz (53 g)	■			■		
	0.3 oz (9 g)		■	■		■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

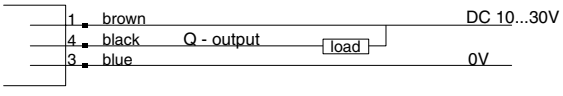
1) Reflector P 45 supplied with equipment
2) Average service life 100.000 h at T_U = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) L = light switching, D = dark switching
7) With resistive load
8) With light/dark ratio 1 : 1
9) Do not bend cable below 0°C
10) Rated voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

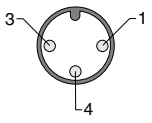


NPN Models

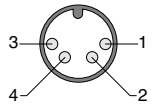


wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



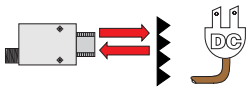
M8 Connector



SICK

WL 1000

Reflex/Retro-Reflective Sensors



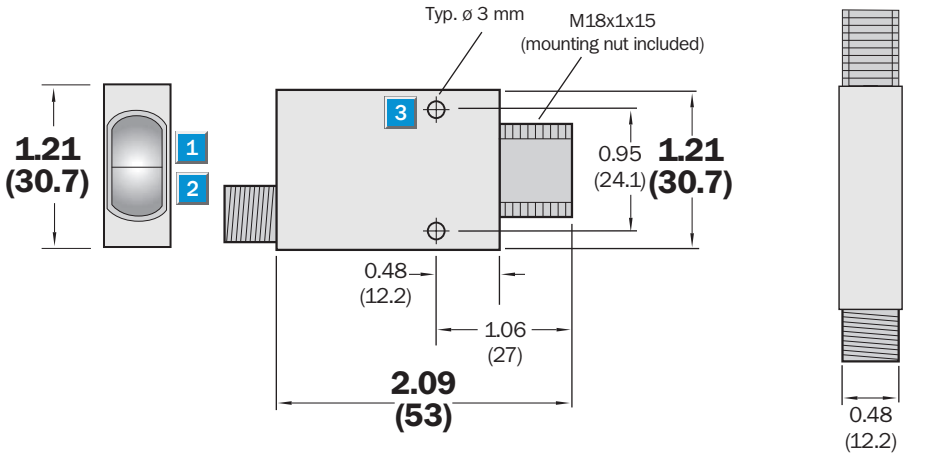
0...13.8 ft (0...4.2 m)
sensing range

Highlights

- Polarized reflex sensor
- Stress-free molded lens for more efficient polarization and superior error rejection
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

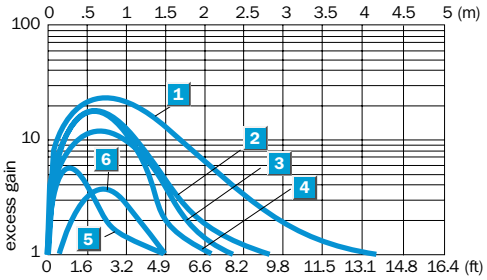
WL 1000

Dimensional Drawing



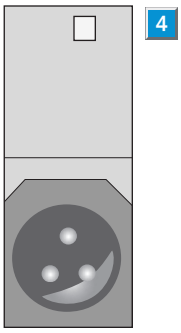
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1. Center of optical axis, sender
2. Center of optical axis, receiver
3. 3 mm through hole for mounting
4. LED output indicator, yellow

Reflector Type		Sensing Range
1	PL 80 A	0...4.2 m
2	PL 50 A	0...2.7 m
3	PL 40 A	0...2.4 m
4	PL 30 A	0...2.0 m
5	PL 20 A	0...1.5 m
6	Reflective tape diamond grade	0...1.5 m

Order Information	
Type	**Part no.**
WL 1000-P132	7 023 829
WL 1000-P430	7 023 830
WL 1000-P431	7 024 619
WL 1000-N132	7 023 831
WL 1000-N430	7 023 832
WL 1000-N431	7 024 620

Accessories	page
Cables and connectors	909
Mounting brackets	925, 936
Reflectors	936

Technical Data	WL 1000-	P132	P430	P431	N132	N430	N431
Sensing range[1]	0...13.8 ft (0...4.2 m)	■	■	■	■	■	■
Light source[2], **light type**	LED, red light, 660 nm, polarized	■	■	■	■	■	■
Light spot diameter	Approx. 4.5 in at 9.8 ft (115 mm at 3 m)	■	■	■	■	■	■
Angle of divergence	Approx. 2.5°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■
Ripple[3]	≤ 5 V peak to peak	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP	■	■	■			
	NPN				■	■	■
Max. output current I_A	100 mA	■	■	■	■	■	■
Switching mode	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■
Response time[5]	600 µs	■	■	■	■	■	■
Max. switching frequency[6]	840 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, M12 4-pin		■			■	
	Plug, M12 4-pin, cable, 150 mm			■			■
VDE protection class[7]	□	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Sensing range with:
PL80A 13.8 ft (4.2 m)
PL50A 8.9 ft (2.7 m)
PL40A 8.5 ft (2.6 m)
P975 8.2 ft (2.5 m)
PL30A 7.5 ft (2.3 m)
PL20A 4.6 ft (1.4 m)
2000X tape 4.6 ft (1.4 m)

2) Average service life 50,000 h where $T_A = 25°C$

3) May not exceed or fall short of V_S tolerances

4) Without load

5) Signal transit time with resistive load

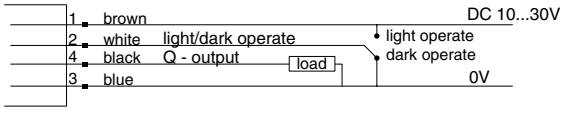
6) With light/dark ratio 1:1

7) Reference voltage 50 V DC

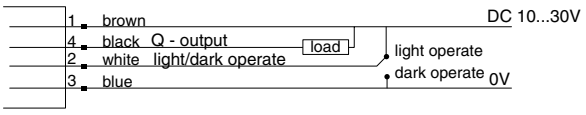
8) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

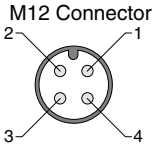
PNP Models



NPN Models



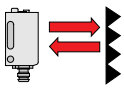
M12 Connector



SICK

WL 160

Reflex/Retro-Reflective Sensors




0.03...19.7 ft (0.01...6 m)
sensing range

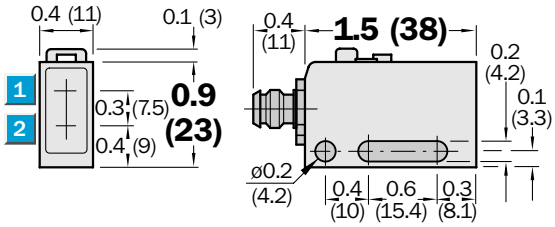
Highlights

- Rugged plastic housing
- Horizontal or vertical housing
- Red light for easy alignment
- Polarizing filters prevent false readings on reflective surfaces
- Test input and alarm output
- Reflector included
- Cable or M8 quick disconnect versions

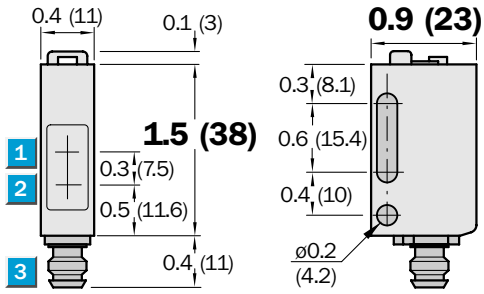
WL 160

Dimensional Drawing

WL 160...3.

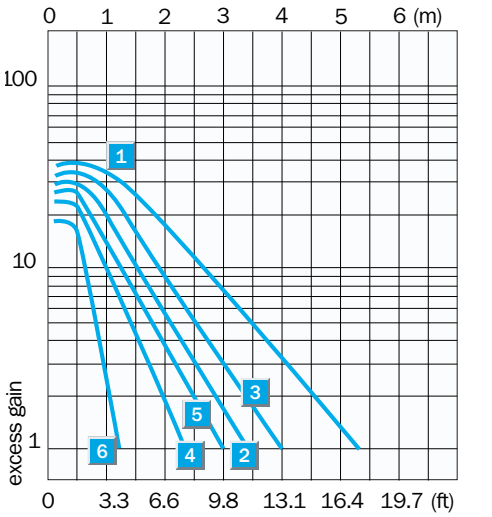


WL 160...4.



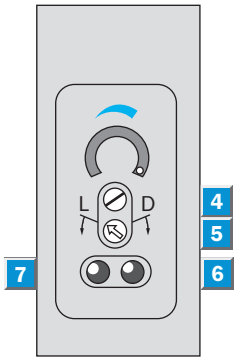
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Plug, M8 4-pin or connection cable
4 Sensitivity adjustment
5 Light/dark rotary switch:
L = light switching
D = dark switching
6 Red LED signal strength indicator
7 Green LED signal strength indicator

Reflector Type		Sensing Range
1	PL 80 A	0.01...4.0 m
2	P 250	0.01...3.0 m
3	PL 50 A/PL 40 A	0.01...3.5 m
4	PL 30 A/PL 31 A	0.01...2.5 m
5	PL 20 A	0.01...2.0 m
6	Reflective tape diamond grade	0.01...1.8 m

Order Information	
Type	**Part no.**
WL 160-F132	6 022 767
WL 160-F430	6 022 772
WL 160-F142	6 022 769
WL 160-F440	6 022 774
WL 160-E132	6 022 759
WL 160-E430	6 022 764
WL 160-E142	6 022 761
WL 160-E440	6 022 766

Accessories	page
Cables and connectors	908
Mounting brackets*	919
Reflectors**	936

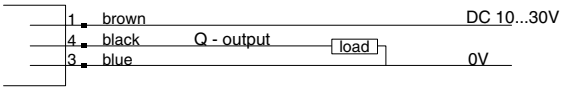
* included with delivery
** Reflector P 250 included with delivery

Technical Data	WL 160-	F132	F430	E132	E430	F142	F440	E142	E440
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Sensing range	0.03...19.7 ft (0.01...6 m)/PL 80 A	■	■	■	■	■	■	■	■
	0.02...13.1 ft (0.005...4 m)/P250 (included)	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[1], light type	LED, red light with polarizing filter	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 11.8 in at 9.8 ft (300 mm at 3 m)	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 4.5°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	± 10%	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 25 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■	■
Response time[6]/max. switching freq.[6]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[7]; 3 x 0.2 mm², Ø 4.2 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Available in Plug, M8 3-pin upon request								
VDE protection class[8]	⧈	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■		■		■		■	
	0.7 oz (20 g)		■		■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

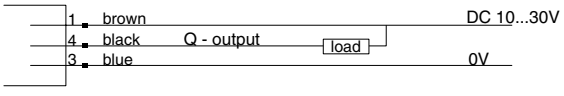
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram

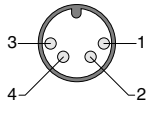
PNP Models



NPN Models



M8 Connector

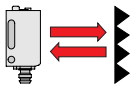


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WL 160T

Reflex/Retro-Reflective Sensors

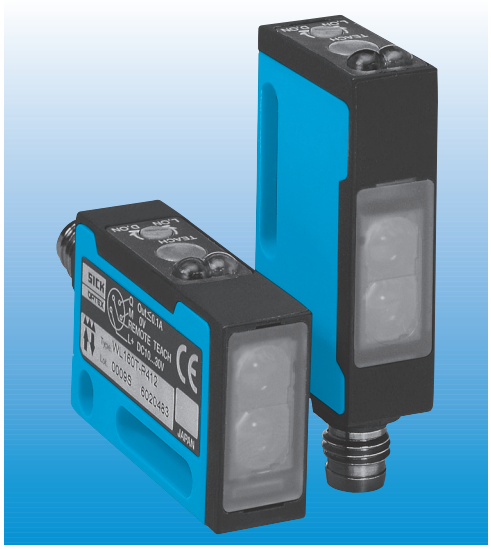



0.03...4.9 ft (0.01...1.5 m)
sensing range

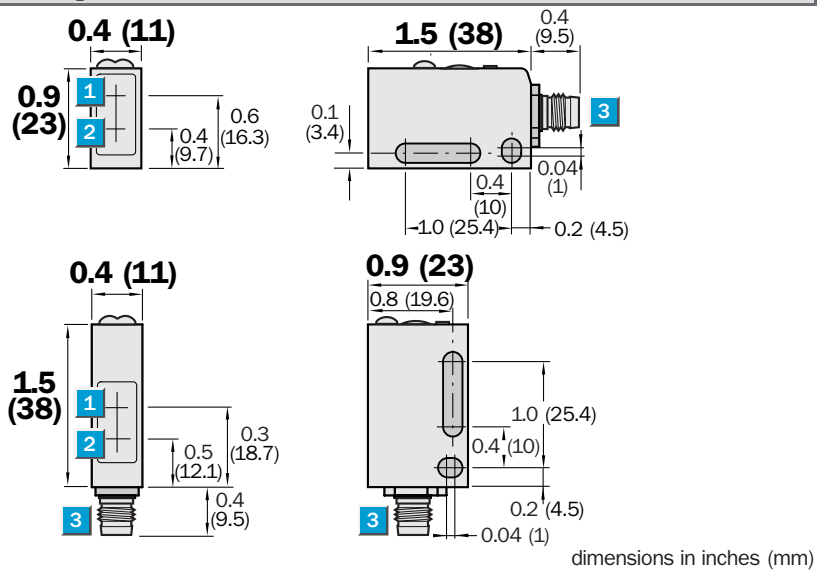
Highlights

- Small light spot
- Detects (semi-)transparent objects
- Signal strength indicator
- Excellent for detection of small objects
- Cable or quick disconnect models

WL 160T

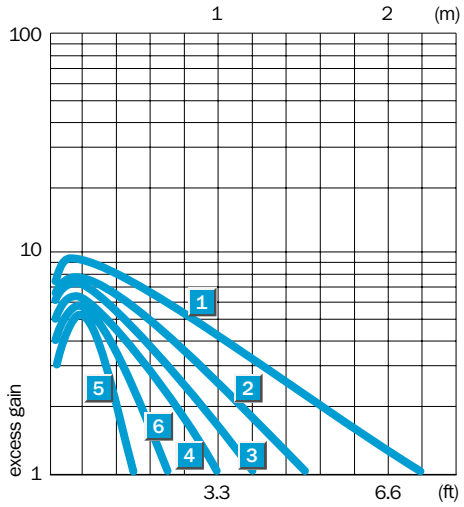


Dimensional Drawing



dimensions in inches (mm)

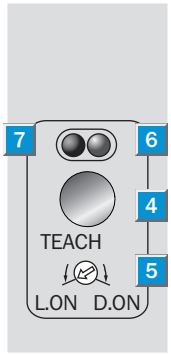
Excess Gain



	Reflector Type	Sensing Range
1	PL 80 A	0.01...1.5 m
2	PL 250/40/50A	0.01...1.0 m
3	PL 30 A/31 A	0.01...0.8 m
4	PL 20 A	0.01...0.7 m
5	PL 45	0.01...0.4 m
6	Reflective tape diamond grade	0.01...0.5 m

Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Plug, M8 3-pin/4-pin or cable
4 Teach-In button
5 Light/dark rotary switch:
L = light switching , D = dark switching
6 Output indicator, orange
7 Signal strength indicator, green

Order Information

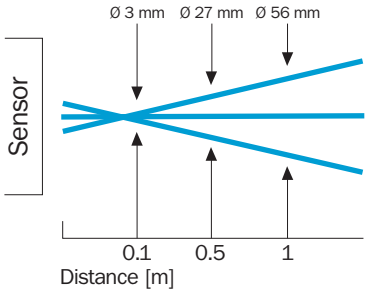
Type	Part no.
WL 160T-P212	6 020 481
WL 160T-P311	6 021 479
WL 160T-P412	6 020 483
WL 160T-N212	6 020 480
WL 160T-N311	6 021 515
WL 160T-N412	6 020 482
WL 160T-F212	6 020 487
WL 160T-F311	6 021 387
WL 160T-F412	6 020 489
WL 160T-E212	6 020 486
WL 160T-E311	6 021 438
WL 160T-E412	6 020 488

Accessories	page
Cables and connectors	908
Mounting brackets	919
Reflectors	936

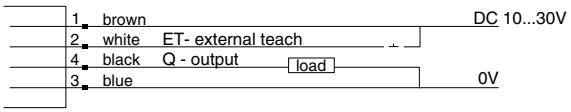
Technical Data	WL-160T-	P[1]/F[2] 212	P[1]/F[2] 311	P[1]/F[2] 412	N[1]/E[2] 212	N[1]/E[2] 311	N[1]/E[2] 412
Sensing range	0.03...3.3 ft (0.01 ...1.0 m)/P 250 (included)	■	■	■	■	■	■
	0.03...4.9 ft (0.01 ...1.5 m)/P 80 A	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[3]	LED, red light with polarizing filter	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[4]	■	■	■	■	■	■
Ripple[5]	± 10%	■	■	■	■	■	■
Current consumption[6]	≤ 40 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[7]/switching freq. max.[8]	≤ 0.2 ms / 2.5 kHz	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 5 x 0.2 mm², Ø 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class		■	■	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...+ 55 °C)	■	■	■	■	■	■
	Storage -40...158°F (-40 ...+ 70 °C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

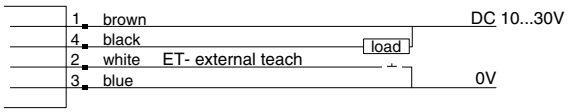
1) Housing form: horizontal
2) Housing form: vertical
3) Average service life 100,000 h at T_U = +25°C
4) Limit values
5) Must be within V_S tolerances
6) Without load
7) With resistive load
8) With light/dark ratio 1:1
9) 5 m are available on request, do not bend cable below 0 °C
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Light Spot Diameter WL 160T

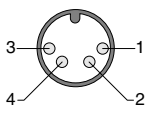


Connection Diagram



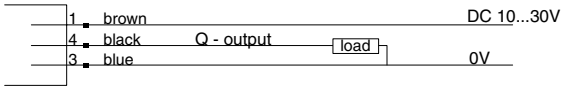


M8 Connector

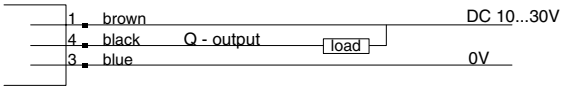


wire colors refer to standard cable, not included with quick disconnect models

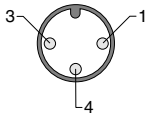
PNP Models



NPN Models



M8 Connector

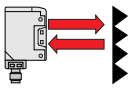


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WL 170

Reflex/Retro-Reflective Sensors



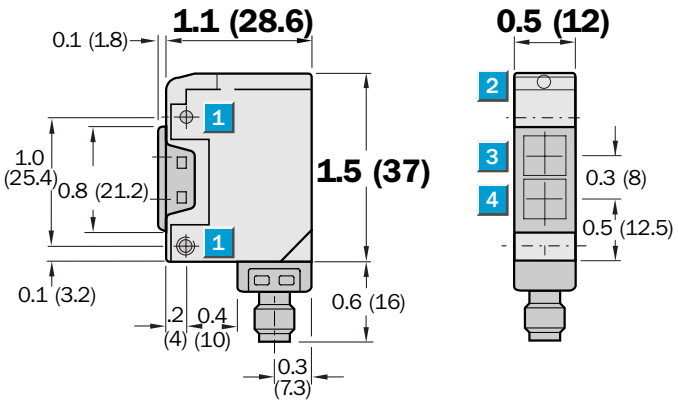

0.03...13.1 ft (0.01...4 m)
sensing range

Highlights

- Rugged stainless steel/plastic housing
- Visible red light LED transmitter for easy alignment
- Reflector included
- Easy mounting with included nuts
- Polarizing filters prevent false readings on shiny objects
- Cable or M8 quick disconnect versions

WL 170

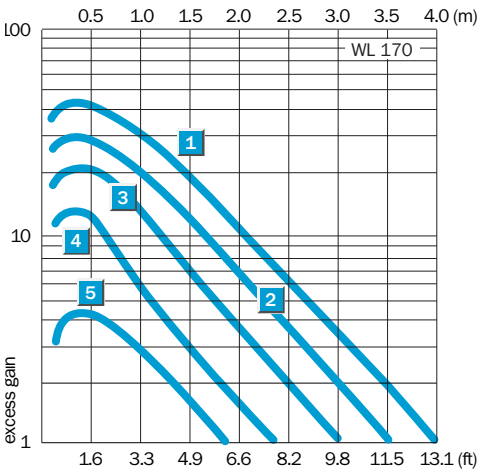
Dimensional Drawing



dimensions in inches (mm)

1 Mounting holes Ø 3 mm with integrated 3 thread
2 LED signal strength indicator, red:
3 Center of optical axis, receiver
4 Center of optical axis, sender

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0.01 – 4.0 m
2	PL 50 A, PL 40 A	0.01 – 3.5 m
3	P 250, PL 30 A, PL 31	0.01 – 3.0 m
4	PL 20	0.01 – 2.3 m
5	Reflective tape diamond grade» 90 x 90 mm	0.01 – 1.8 m

Order Information	
Type	**Part no.**
WL 170-P132	6 010 189
WL 170-P430	6 010 190
WL 170-N132	6 010 191
WL 170-N430	6 010 192

Accessories	page
Cables and connectors	908
Mounting brackets*	919
Reflectors**	936

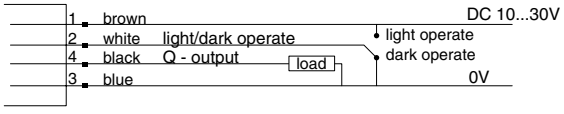
* included with delivery
** Reflector P 250 included with delivery

Technical Data	WL 170-	P132	P430	N132	N430					
Sensing range	0.03...9.8 ft (0.01...3 m)/P 250 (included)	■	■	■	■					
	0.03...13.1 ft (0.01...4 m)/PL 80 A	■	■	■	■					
Light source[1], **light type**	LED, visible red light, polarized	■	■	■	■					
Light spot size	Approx. 7.9 in at 8.2 ft (200 mm at 2.5 m)	■	■	■	■					
Angle of divergence	Approx. 2.7°	■	■	■	■					
Supply voltage V_S	10...30 V DC[3]	■	■	■	■					
Ripple[3]	± 10%	■	■	■	■					
Current consumption[4]	≤ 30 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light/dark switching via wire	■	■	■	■					
	+ V_S = light switching	■	■	■	■					
	0 V = dark switching	■	■	■	■					
Response time[5]	≤ 0.7 ms	■	■	■	■					
Max. switching frequency[6]	700 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[7]; 4 x 0.18 mm², Ø 3.8 mm	■		■						
	Plug, M8 4-pin		■		■					
VDE protection class[8]	⊡	■	■	■	■					
Circuit protection[9]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	0.9 oz (25 g)	■		■						
	2.3 (66 g)		■		■					
Housing material	Stainless steel/glass fiber reinforced ABS	■	■	■	■					

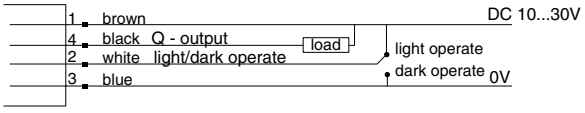
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

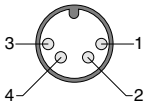
PNP Models



NPN Models



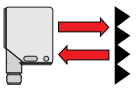
M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

WL 12-2 Small Parts

Reflex/Retro-Reflective Sensors



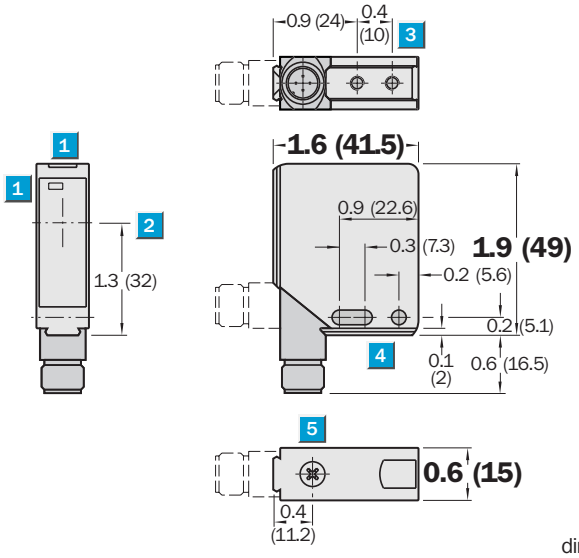

0...6.6 ft (0...2 m)
sensing range

Highlights

- Red light for easy alignment
- Insensitive to ambient light
- Sensitivity adjustment
- Signal strength indicator
- Crosstalk immunity
- Cable connections swivel 90° for easy installation
- Polarizing filters prevent false readings on shiny objects

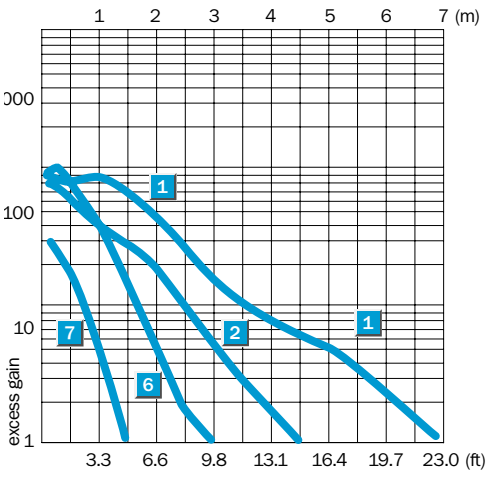
WL 12-2

Dimensional Drawing



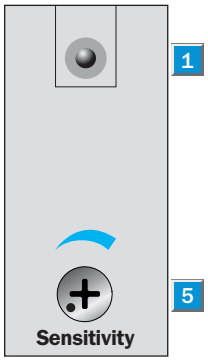
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1. LED signal strength indicator
2. Center of optical axis
3. M4 threaded mounting hole – 4 mm deep
4. Mounting holes Ø 4.2 mm
5. Sensitivity adjustment

Reflector Type		Sensing Range
1	PL 80 A	0...7.0 m
2	P 975	0...4.5 m
3	PL 50 A	0...5.0 m
4	PL 40 A	0...5.0 m
5	PL 30 A	0...4.0 m
6	PL 20 A	0...3.0 m
7	Reflective tape	0...1.5 m

Order Information	
Type	**Part no.**
WL 12-2P420	1 016 101
WL 12-2P120	1 016 095
WL 12-2N420	1 016 091
WL 12-2N120	1 016 084
WL 12-2P190	1 016 100
WL 12-2P490	1 016 107
WL 12-2N190	1 016 090
WL 12-2N490	1 016 094

Accessories	page
Cables and connectors	909
Mounting brackets	921, 922
Clamps*	921, 922
Reflectors	936

* 2 pieces included with delivery

Technical Data	WL 12-2-	P420	P120	N420	N120	P190	P490	N190	N490
Sensing range	0...6.6 ft (0...2 m)	■	■	■	■	■	■	■	■
Sensitivity	adjustable	■	■	■	■	■	■	■	■
Light source[1], light type	LED, red light, polarized	■	■	■	■				
	LED, red light, non-polarized					■	■	■	■
Light spot diameter	0.1 in at 3.5 in (2 mm at 90 mm)	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■			■	■		
	≤ 40 mA			■	■			■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■			■	■		
	NPN, Q and $\overline{Q}$			■	■			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■	■	■	■	■
Max. switching frequency[6]	1500 Hz	■	■	■	■	■	■	■	■
Connection types	Cable[7], 2 m		■		■	■		■	
	Plug, M12 4-pin	■		■			■		■
VDE protection class[8]	⧈	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■	■	■
Approximate weight	4.2 oz (120 g)	■		■			■		■
	7.1 oz (200 g)		■		■	■		■	
Polarizing filter		■	■	■	■	■	■	■	■
Housing material	Die cast zinc	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

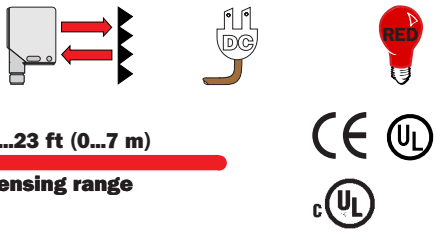
Connection Diagram

wire colors refer to standard cable, not included with quick disconnect models

SICK

WL 12-2

Reflex/Retro-Reflective Sensors



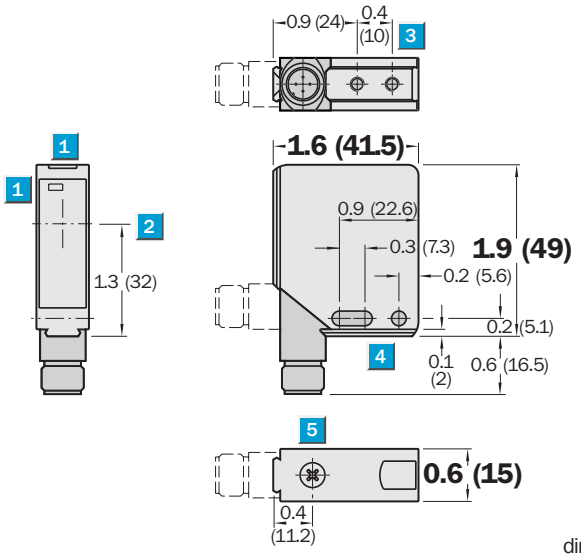
0...23 ft (0...7 m)
sensing range

Highlights

- Red light for easy alignment
- Insensitive to ambient light
- Sensitivity adjustment
- Signal strength indicator
- Crosstalk immunity
- Cable connections swivel 90° for easy installation
- Polarizing filters prevent false readings on shiny objects

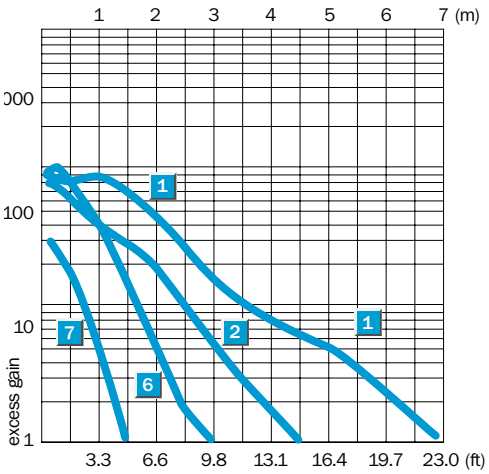
WL 12-2

Dimensional Drawing



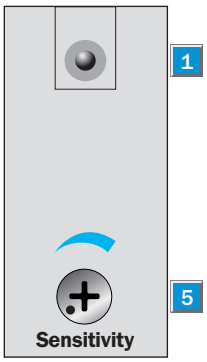
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1. LED signal strength indicator
2. Center of optical axis
3. M4 threaded mounting hole – 4 mm deep
4. Mounting holes Ø 4.2 mm
5. Sensitivity adjustment

Reflector Type		Sensing Range
1	PL 80 A	0...7.0 m
2	P 975	0...4.5 m
3	PL 50 A	0...5.0 m
4	PL 40 A	0...5.0 m
5	PL 30 A	0...4.0 m
6	PL 20 A	0...3.0 m
7	Reflective tape	0...1.5 m

Order Information	
Type	**Part no.**
WL 12-2P430	1 016 102
WL 12-2P130	1 016 096
WL 12-2N430	1 016 092
WL 12-2N130	1 016 085
WL 12-2P180	1 016 099
WL 12-2P480	1 016 106
WL 12-2N180	1 016 089
WL 12-2N480	1 016 093

Accessories	page
Cables and connectors	909
Mounting brackets	921, 922
Clamps*	921, 922
Reflectors	936

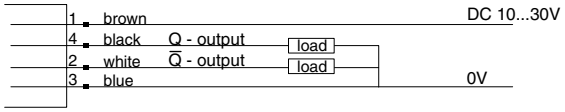
* 2 pieces included with delivery

Technical Data	WL 12-2-	P430	P130	N430	N130	P180	P480	N180	N480
Sensing range	0...23 ft (0...7 m)	■	■	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, red light, polarized	■	■	■	■				
	LED, red light, non-polarized					■	■	■	■
Light spot diameter	3.1 in at 9.8 ft (80 mm at 3 m)	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■			■	■		
	≤ 40 mA			■	■			■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■			■	■		
	NPN, Q and $\overline{Q}$			■	■			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■	■	■	■	■
Max. switching frequency[6]	1500 Hz	■	■	■	■	■	■	■	■
Connection types	Cable[7], 2 m		■		■	■		■	
	Plug, M12 4-pin	■		■			■		■
VDE protection class[8]	□	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■	■	■
Approximate weight	4.2 oz (120 g)	■		■		■		■	
	7.1 oz (200 g)		■		■		■		■
Polarizing filter		■	■	■	■	■	■	■	■
Housing material	Die cast zinc	■	■	■	■	■	■	■	■

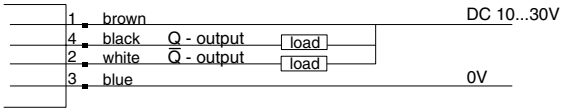
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

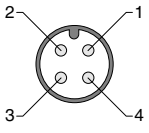
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included with quick disconnect models

SICK

WL 12L-2

Reflex/Retro-Reflective Sensors

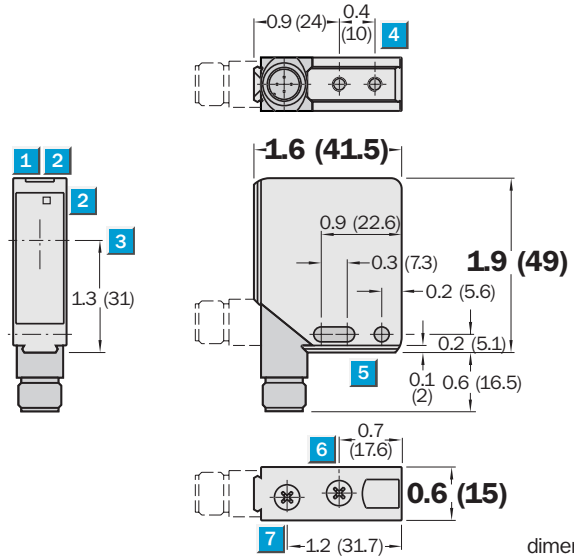
0...59.0 ft (0...18 m)
sensing range

Highlights

- Rugged die cast metal housing
- Class 2 laser
- Light spot can be focused for maximum excess gain
- Cable connections swivel 90° for easy installation
- Polarizing filters prevent false readings on shiny objects

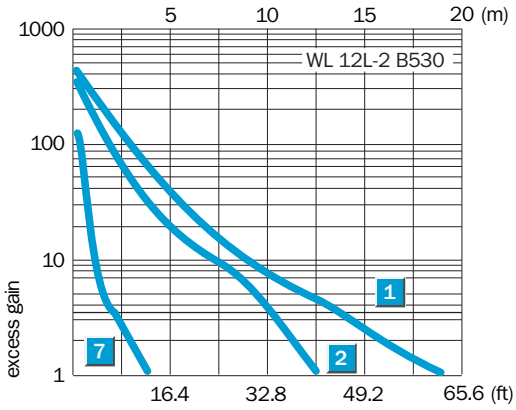
WL 12L-2

Dimensional Drawing



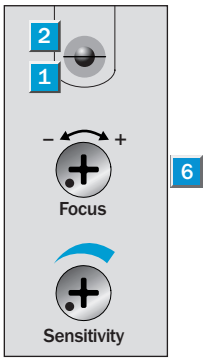
dimensions in inches (mm)

Excess Gain



Adjustments

WL 12L-2B530A01



1	LED operating indicator, green
2	LED output indicator, yellow
3	Center of optical axis
4	M4 threaded mounting hole – 4 mm deep
5	Mounting hole Ø 4.2 mm
6	Focal adjustment
7	Sensitivity adjustment

Reflector Type	Sensing Range
1 PL 80 A	0...18.0 m
2 PL 50 A	0...12.0 m
3 PL 40 A	0...12.0 m
4 P 250	0...12.0 m
5 PL 30 A	0...10.0 m
6 PL 20 A	0...7.5 m
7 Reflective tape diamond grade	0...2.0 m

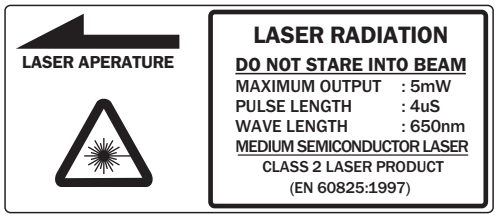
Order Information	
Type	**Part no.**
WL 12L-2B530A01	1 018 479

Accessories	page
Cables and connectors	909
Mounting brackets	921, 922
Clamps*	921, 922
Reflectors	936

* 2 pieces included with delivery

Technical Data	WL 12L-2-	B530 A01
Sensing range	0...59 ft (0...18 m)/PL 80 A	
Light source[1]	Laser, red light, 650 nm, pulsed, polarized	
Light spot diameter	min. 0.03 in (0.8 mm)	
in focal range	11.8 in (300 mm) to ∞	
Supply voltage V_S	10...30 V DC[2]	
Ripple[3]	≤ 5 V_{SS}	
Current consumption[4]	≤ 55 mA	
Switching output Q_N and Q_P	PNP, NPN	
Signal voltage HIGH	V_S – < 2.9 V, V_S	
Signal voltage LOW[5]	0 V, ≤ 1.5 V	
Output current I_A max.	100 mA	
Operating mode	Light or dark switching[6]	
Control input L/D	0 V or open, light switching	
Control input L/D	V_S, dark switching	
Response time max.[7]	Typ. 200 µs	
Max. switching frequency[8]	2.5 kHz	
Laser class	2 (IEC 825-1; EN 60825-1:97)	
VDE protection class[9]	□	
Enclosure rating	IP 67/NEMA 6	
Circuit protection[10]	A, B, C	
Ambient temperature T_A	Operation -14...122°F (-10...50°C)	
	Storage -13...167°F (-25...75°C)	
Connection type	Plug, M12 5-pin	
Approximate weight	4.6 oz (130 g)	
Housing material	Die cast zinc	

1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) At T_A = 25°C and 100 mA output current
6) Reversible via control input L/D
7) Signal transit time with resistive load
8) At light/dark ratio 1:1
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Outputs protected against short-circuiting
C = Interference pulse suppression



Emission Indicator

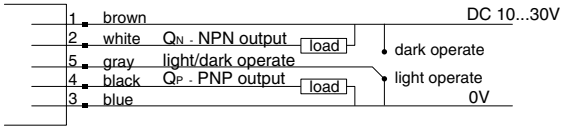
In order to meet the safety requirements for Class II laser products, a visible emission indicator must be located within 2 meters (6.7 ft) of the sensor. We suggest using a switching amplifier with a power-ON indicator (the EN2 or EN3, for example) or a connector cable with a power-ON LED located on the connector.

Beam Attenuator

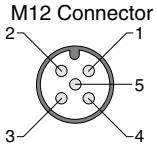
The WL 12L sensor is equipped with an M12 style quick disconnect. The cable can quickly and easily be removed in the event that personnel require access to the area where the sensor is mounted.

Connection Diagram

All Models

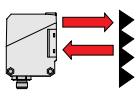


wire colors refer to standard cable, not included



WL 250

Reflex/Retro-Reflective Sensors



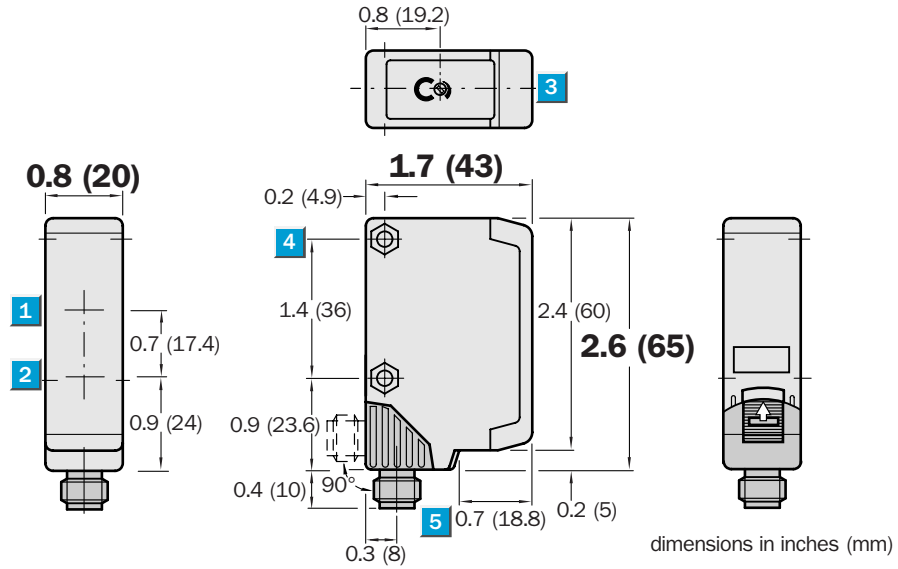

0.03...44.3 ft (0.01....13.5 m)
sensing range

Highlights

- Polarizing filters prevent false readings on reflective surfaces
- Rugged plastic housing
- Red light for easy alignment
- M12 plug connections swivel 90° for easy installation
- Easy mounting with included bracket
- Sensitivity adjustment

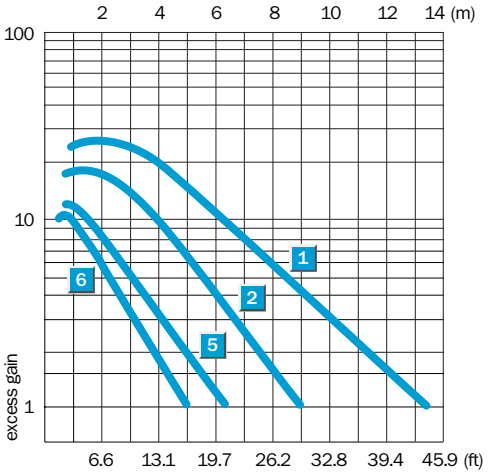
WL 250

Dimensional Drawing



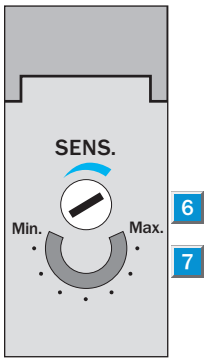
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Red LED signal strength indicator
4 Through borehole Ø 4.2 mm, for M4 hexagon nut on both sides
5 Connection cable or plug, M12 4-pin
plug position rotatable by 90° (V > H),
V Ø vertical final position
H Ø horizontal final position; can be locked with slider
6 Sensitivity adjustment (2 turns), over-turn protection
7 Position indicator for sensitivity setting (270°)

Reflector Type	Sensing Range
1 PL 80 A	0.01…13.5 m
2 P 250	0.01…9.0 m
3 PL 50 A, PL 40 A	0.01…10.5 m
4 PL 30 A, PL 31 A	0.01…8.2 m
5 PL 20 A	0.01…6.3 m
6 Reflective tape diamond grade	0.01…5.0 m

Order Information	
Type	**Part no.**
WL 250-P132	6 010 608
WL 250-P430	6 010 610
WL 250-N132	6 010 605
WL 250-N430	6 010 607

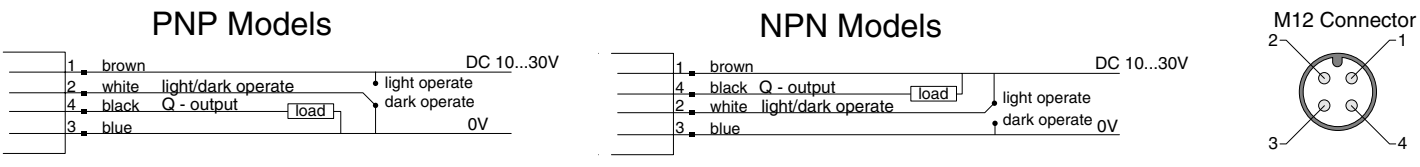
Accessories	page
Cables and connectors	909
Mounting brackets*	924
Reflectors	936

* included with delivery
** reflector P 250 included with delivery

Technical Data	WL 250-	P132	P430	N132	N430					
Sensing range	0.003...29.5 ft (0.01...9 m) / P 250 (included)	■	■	■	■					
	0.003...44.3 ft (0.01...13.5 m) / PL 80 A	■	■	■	■					
Sensitivity, adjustable	Potentiometer, 2 turns, with position indicator	■	■	■	■					
Light source[1], **light type**	LED, visible red light, polarized	■	■	■	■					
Light spot diameter	Approx. 15.7 in at 26.2 ft (400 mm at 8 m)	■	■	■	■					
Angle of divergence	Approx. 2.5°	■	■	■	■					
Supply voltage V_S	10...30 V DC[2]	■	■	■	■					
Residual ripple[3]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[4]	≤ 35 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light/dark switching via wire:	■	■	■	■					
	+ V_S = light switching	■	■	■	■					
	0 V = dark switching	■	■	■	■					
Response time[5]	≤ 0.7 ms	■	■	■	■					
Max. switching frequency[6]	700 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[7] 4 x 0.18 mm², Ø 3.8 mm	■		■						
	Plug, M12 4-pin, 90° rotatable		■		■					
VDE protection class[8]	□	■	■	■	■					
Circuit protection[9]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	2.8 oz (80 g)	■		■						
	1.4 oz (40 g)		■		■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

1) Average service life at T_A = 25°C; LED, red light 100,000 h
2) Limit value
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1, without time delay
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
D = Output overcurrent and short-circuit protected

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WL 14

Reflex/Retro-Reflective Sensors

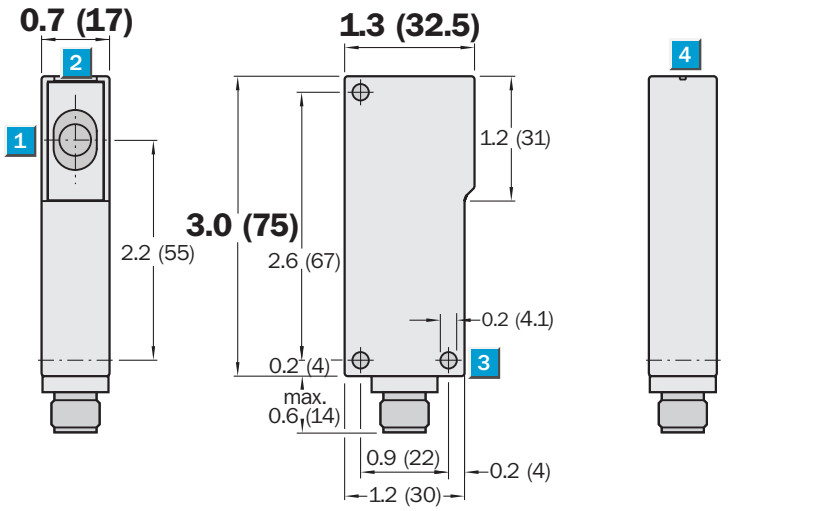
0...16.4 ft (0...5 m)
sensing range

Highlights

- Red light for easy alignment
- Rugged plastic housing
- Cable or M12 quick disconnect versions
- Power supply reverse polarity protected
- Polarizing filters prevent false readings on reflective surfaces

WL 14

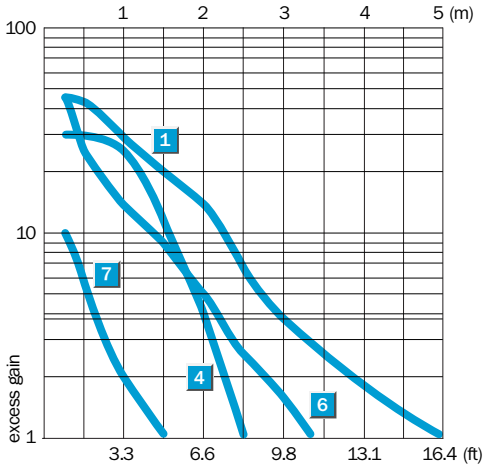
Dimensional Drawing



dimensions in inches (mm)

1 Center of optical axis
2 Status indicator, yellow
3 Mounting hole Ø 4.1 mm
4 Alignment sight

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0.1...5.0 m
2	PL 50 A	0.1...4.0 m
3	PL 40 A	0.1...3.5 m
4	PL 30 A	0.1...2.5 m
5	PL 20 A	0.1...2.2 m
6	P 975	0.1...3.5 m
7	Reflective tape diamond grade	0.1...1.5 m

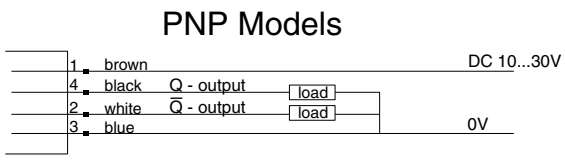
Order Information	
Type	**Part no.**
WL 14-P132	1 012 924
WL 14-P430	1 012 925

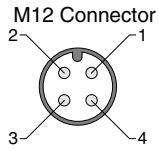
Accessories	page
Cables and connectors	909
Mounting brackets	922, 923
Reflectors	936

Technical Data	WL 14-	P132	P430
Sensing range	0...16.4 ft (0...5 m)/PL 80 A	■	■
Light source[1], **light type**	LED, red light, polarized	■	■
Light spot diameter	Approx. 3.3 in at 9.8 ft (85 mm at 3 m)	■	■
Supply voltage V_S	24 V DC (± 25%)	■	■
Ripple[2]	≤ 5 V_{SS}	■	■
Current consumption[3]	≤ 25 mA	■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■
Output current I_A max.	100 mA	■	■
Response time[4]	2.5 ms	■	■
Max. switching frequency[5]	200 Hz	■	■
Connection types	Cable[6], 2 m	■	
	Plug, M12 4-pin		■
VDE protection class[7]	⧈	■	■
Circuit protection[8]	A, B, C	■	■
Enclosure rating	IP 65	■	■
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	■	■
	Storage -40...167°F (-40...75°C)	■	■
Approximate weight	1.4 oz (40 g)		■
	4.2 oz (120 g)	■	
Housing material	Glass fiber reinforced ABS	■	■

1) Average service life 100,000 h at T_A = 25°C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0°C
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models

WL 18-2

Reflex/Retro-Reflective Sensors

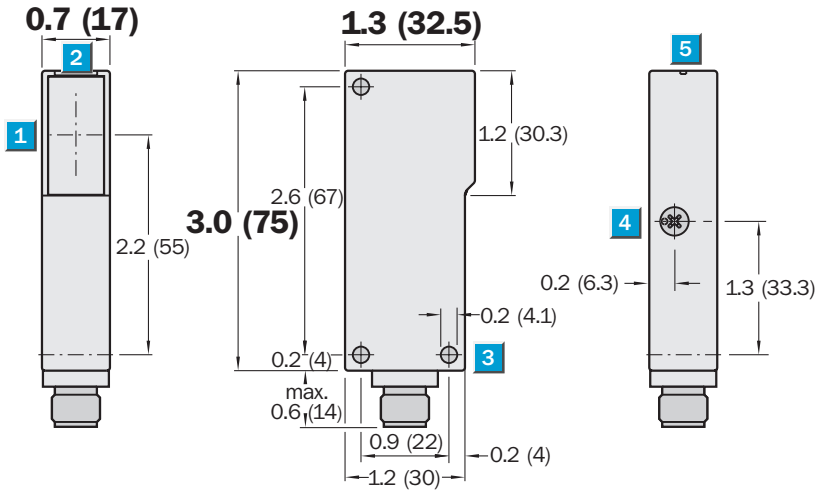
0...23 ft (0...7 m)
sensing range

Highlights

- Insensitive to ambient light
- Crosstalk immunity
- Fast response time
- Test input
- Autocollimation system
- Sensitivity adjustment
- Signal strength indicator

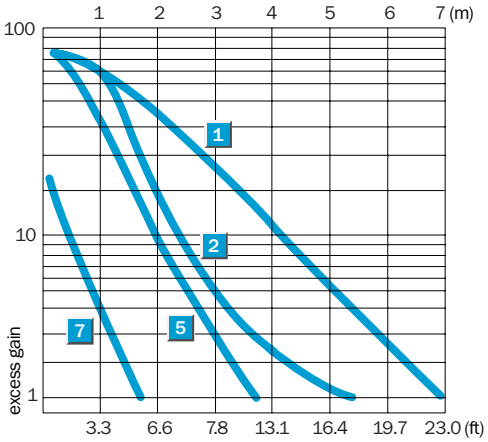
WL 18

Dimensional Drawing



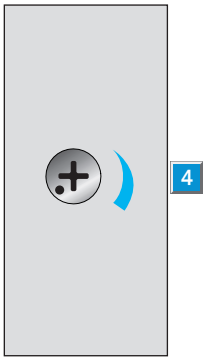
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1	Center of optical axis
2	LED signal strength indicator
3	Mounting hole Ø 4.1 mm
4	Sensitivity adjustment
5	Alignment sight

Reflector Type		Sensing Range
1	PL 80 A	0...7.0 m
2	P 975	0...5.5 m
3	PL 50	0...6.6 m
4	PL 40 A	0...6.6 m
5	PL 30 A	0...3.8 m
6	PL 20 A	0...3.0 m
7	Reflective tape diamond grade	0...1.7 m

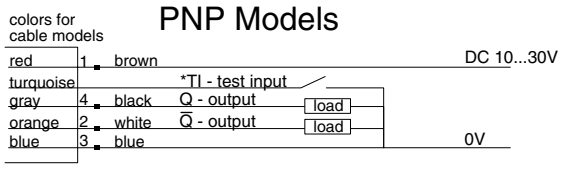
Order Information	
Type	**Part no.**
WL 18-2P132	1 012 906
WL 18-2P135	1 012 907
WL 18-2P430	1 012 908
WL 18-2P630	1 012 912
WL 18-2N132	1 012 903
WL 18-2N135	1 012 911
WL 18-2N630	1 012 904
WL 18-2N430	1 016 205

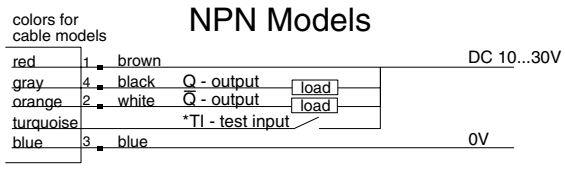
Accessories	page
Cables and connectors	909, 914
Mounting brackets	922, 923
Reflectors	936

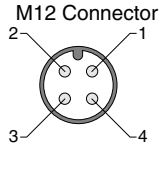
Technical Data	WL 18-2-	P132	P135	P430	P630	N132	N135	N430	N630
Sensing range,	0...23 ft (0...7 m)/PL 80 A	■	■	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■	■	■
Light source[1], light type	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot diameter	1.6 in at 6.6 ft (40 mm at 2 m)	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	< 25 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■	■				
	NPN, Q and $\overline{Q}$					■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.9 V)	■	■	■	■				
PNP; signal voltage LOW	Approx. 0 V	■	■	■	■				
NPN; signal voltage HIGH	Approx. V_S					■	■	■	■
NPN; signal voltage LOW	< 1.5 V					■	■	■	■
Response time[5]/Max. switching freq.[6]	< 500 µs; 1000 Hz	■	■	■	■	■	■	■	■
Test input "TE"									
PNP, sender OFF	Test input to 0	■	■		■				
NPN, sender OFF	Test input to V+					■	■		■
Connection types	Cable[7], 2 m	■				■			
	Cable[7], 5 m		■				■		
	Plug, M12 4-pin			■				■	
	Plug, square 6-pin				■				■
VDE protection class[8]	□	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■		■	■	■	
	IP 65				■				■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

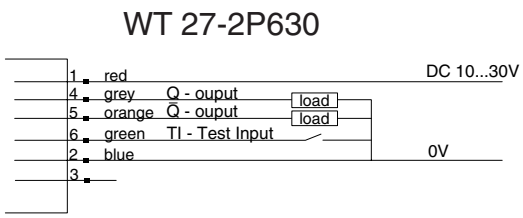
Connection Diagram

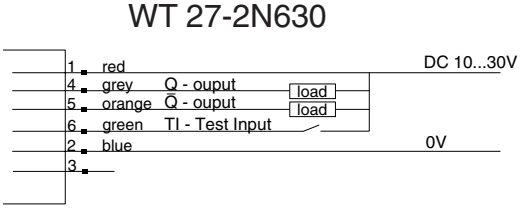


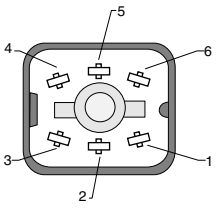




*test input available on cable models only
wire colors refer to standard cable, not included with quick disconnect models







SICK

WL 23

Reflex/Retro-Reflective Sensors

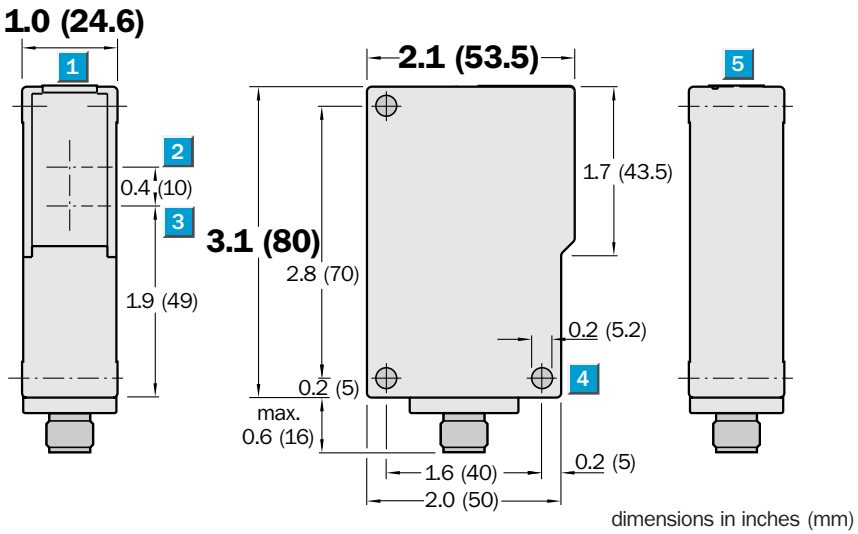
0...29.5 ft (0...9 m)
sensing range

Highlights

- Red light for easy alignment
- Low-cost sensor
- Polarizing filters prevent false readings on reflective surfaces
- Rugged plastic housing
- Cable or M12 quick disconnect versions
- Power supply reverse polarity protected

WL 23

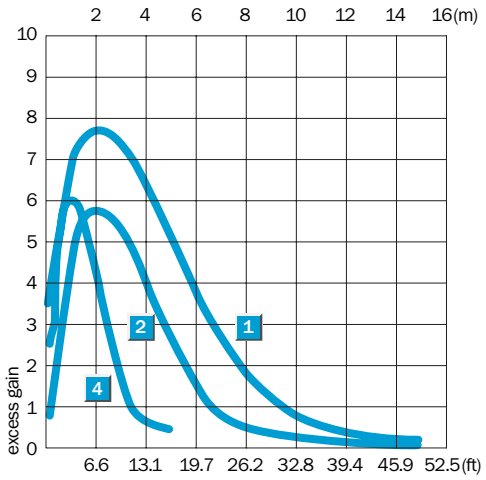
Dimensional Drawing



dimensions in inches (mm)

1 Status indicator
2 Center of optical axis, sender
3 Center of optical axis, receiver
4 Mounting hole Ø 5.2 mm
5 Alignment sight

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0.1...9.0 m
2	P 975	0.1...6.0 m
3	PL 40 A	0.1...6.0 m
4	PL 20 A	0.1...3.0 m

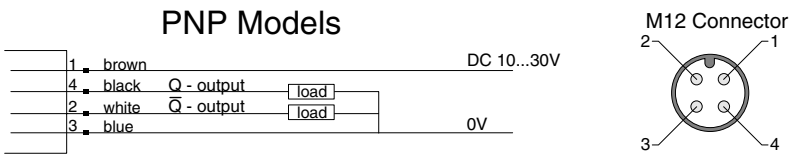
Order Information	
Type	**Part no.**
WL 23-F132	1 015 686
WL 23-F430	1 015 684

Accessories	page
Cables and connectors	909
Mounting brackets	923, 924, 935
Reflectors	936

Technical Data	WL 23-	F132	F430							
Sensing range	0...29.5 ft (0...9 m/PL 80 A)									
Light source[1], **light type**	LED, visible red light, polarized									
Light spot diameter	Approx. 1.6 in at 8.9 ft (40 mm at 2.7 m)									
Supply voltage V_S	12...24 V DC (± 20%)									
Ripple[2]	≤ 5 V_{SS}									
Current consumption[3]	< 25 mA									
Switching outputs	PNP, Q and $\overline{Q}$									
Output current I_A max.	100 mA									
Response time[4]	2.5 ms									
Max. switching frequency[5]	200 Hz									
Connection types	Cable[6], 2 m									
	Plug, M12 4-pin									
VDE protection class[7]	□									
Circuit protection[8]	A, B, C									
Enclosure rating	IP 65/NEMA 4									
Ambient temperature T_A	Operation -13...140°F (-25...60°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	3.5 oz (100 g)									
Polarizing filter										
Housing material	Glass fiber reinforced ABS									

1) Average service life 100,000 h at T_A = 25°C
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0°C
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WL 27-2

Reflex/Retro-Reflective Sensors

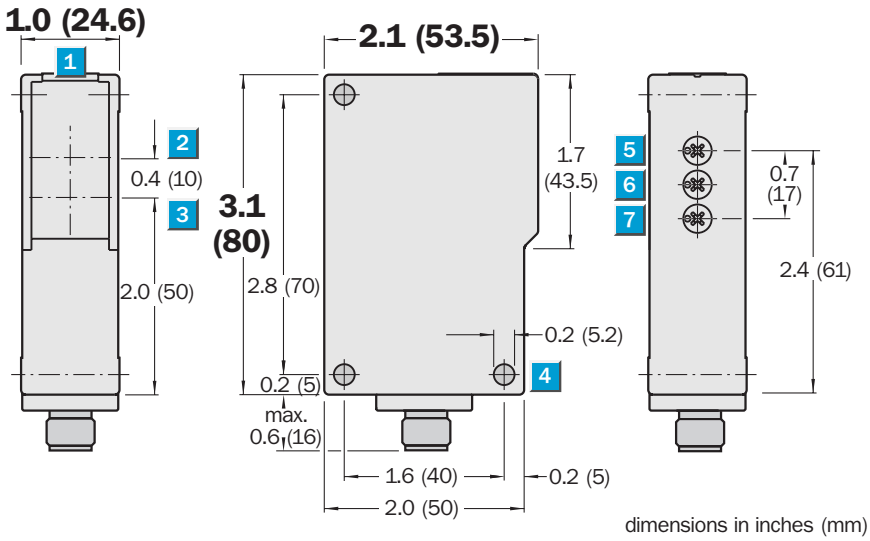
0...45.9 ft (0...14 m)
sensing range

Highlights

- Red light for easy alignment
- Rugged plastic housing
- Selectable time delay
- Crosstalk immunity
- Signal strength indicator
- Models available with integrated lens heater
- Polarizing filters prevent false readings on reflective surfaces
- Cable or M12 quick disconnect versions available

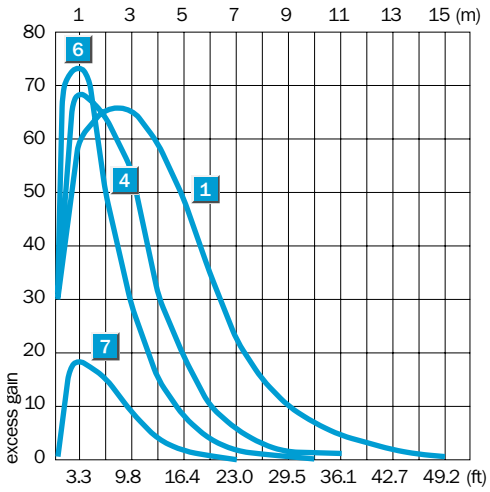
WL 27-2

Dimensional Drawing



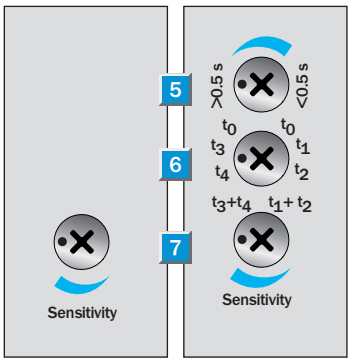
dimensions in inches (mm)

Excess Gain



Adjustments

WL 27-2F132	WL 27-2P630
WL 27-2F430	WL 27-2N630
WL 27-2F440	
WL 27-2F450	
WL 27-2F730	



1	LED signal strength indicator
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 5.2 mm
5	Time control
6	Time delay selector switch
7	Sensitivity adjustment

Switch-selectable Time Delay

0.5 – 10 s

- t_0 Without time delay
- t_3 ON-delay from interruption light path
- t_4 OFF-delay from reset of light path
- $t_3 + t_4$ ON- and OFF-delay

0.02 – 0.5 s

- t_0 Without time delay
- t_1 ON-delay from interruption light path
- t_2 OFF-delay from reset of light path
- $t_1 + t_2$ ON- and OFF-delay

	Reflector Type	Sensing Range
1	PL 80 A	0.1...14.0 m
2	P 975	0.3...10.0 m
3	PL 50 A	0.1...10.0 m
4	PL 40 A	0.1...9.0 m
5	PL 30 A	0.1...9.5 m
6	PL 20 A	0.1...7.0 m
7	Reflective tape diamond grade	0.3...4.3 m

Order Information

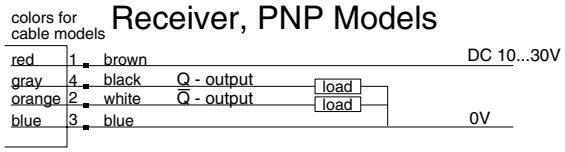
Type	Part no.
WL 27-2F132	1 015 100
WL 27-2F430	1 013 269
WL 27-2F440	1 015 101
WL 27-2F450	1 015 102
WL 27-2P630	1 015 108
WL 27-2F730	1 015 104
WL 27-2N630	1 015 107

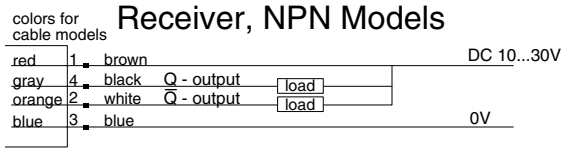
Accessories	page
Cables & connectors	909, 914, 915
Mounting brackets	923, 924, 935
Reflectors	936

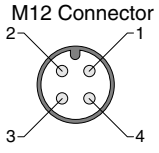
Technical Data	WL 27-2-	F132	F430	F440	F450	P630	F730	N630		
Sensing range	0...45.9 ft (0...14 m)/PL 80 A	■	■	■	■	■	■	■		
	Adjustable sensitivity	■		■		■		■		
Light source[1], **light type**	LED, red light, polarized	■	■	■	■	■	■	■		
Light spot diameter	Approx. 8.7 in at 0.4 in (220 mm at 10 mm)	■	■	■	■	■	■	■		
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■		
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■	■	■		
Current consumption[4]	≤ 25 mA	■	■			■	■	■		
	≤ 35 mA, front screen heating			■	■					
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■	■	■	■			
	NPN, Q and $\overline{Q}$							■		
Output current I_A max.	100 mA	■	■	■	■	■	■	■		
Response time[5]	≤ 500 µs	■	■	■	■	■	■	■		
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■	■		
Selectable delay ranges	0.5…10 s/0.02…0.5 s					■		■		
Test input "TE", sender OFF	PNP : Test input to 0 V					■				
	NPN : Test input to V_S							■		
Connection types	Cable[7], 2 m	■								
	Plug, M12 4-pin		■	■	■					
	Plug, square 6-pin					■		■		
	Plug, square 7-pin						■			
VDE protection class[8]	⧈	■	■	■	■	■	■	■		
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■		
Enclosure rating	IP 67/NEMA 6	■	■	■	■		■			
	IP 65					■		■		
Ambient temperature T_A	Operation -40...140°F (-40…60°C)	■	■	■	■	■	■	■		
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■	■		
Approximate weight	3.5 oz (100 g)	■	■	■	■	■	■	■		
Front screen heating				■	■					
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■		

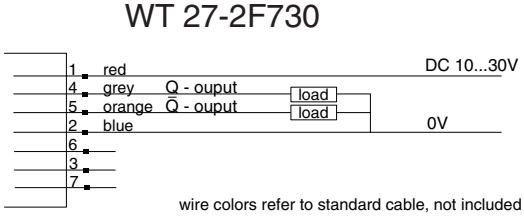
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

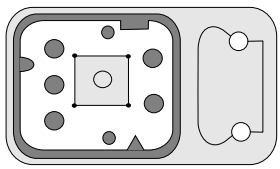
Connection Diagram

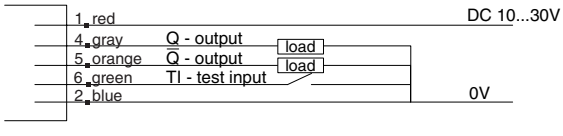


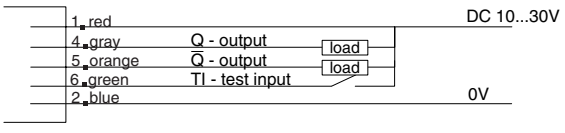


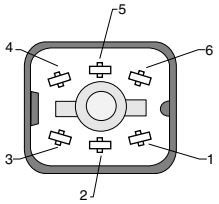








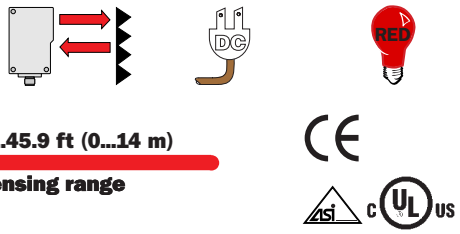




SICK

WL 27-2 ASI

Reflex/Retro-Reflective Sensors



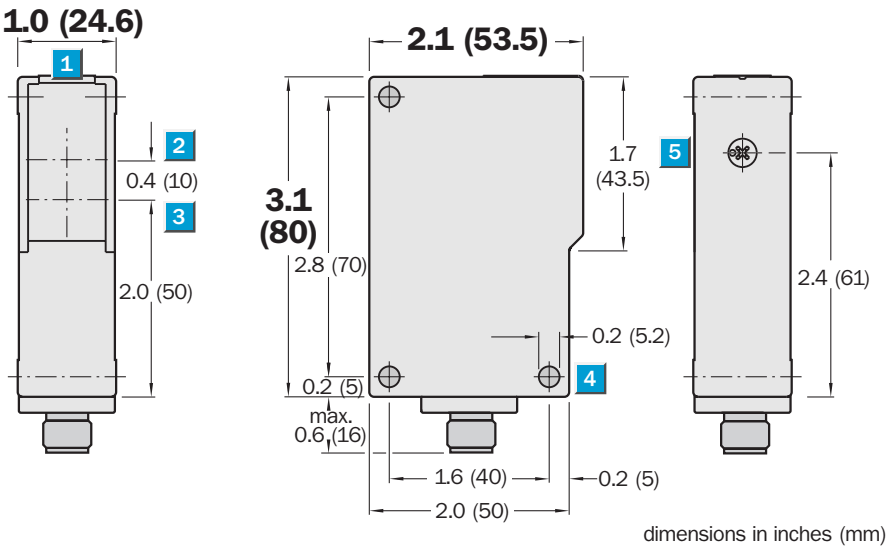
0...45.9 ft (0...14 m)
sensing range

Highlights

- Visible red light
- With integrated ASI chip
- Models available with integrated lens heater

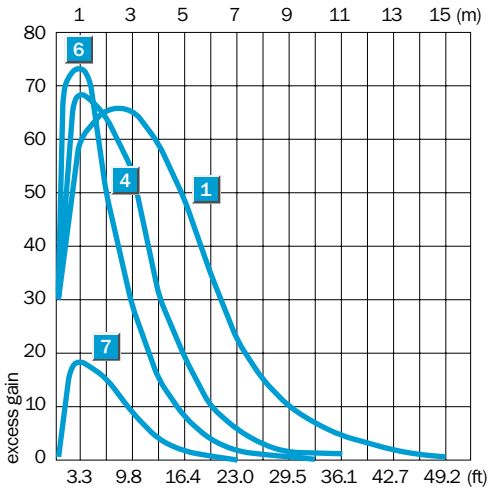
WL 27-2

Dimensional Drawing



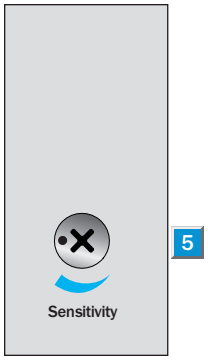
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 LED signal strength indicator
2 Optical axis, sender
3 Optical axis, receiver
4 Mounting hole Ø 5.2 mm
5 Sensitivity adjustment

Reflector Type		Sensing Range
1	PL 80 A	0.1...14.0 m
2	P 975	0.3...10.0 m
3	PL 50 A	0.1...10.0 m
4	PL 40 A	0.1...9.0 m
5	PL 30 A	0.1...9.5 m
6	PL 20 A	0.1...7.0 m
7	Reflective tape «diamond grade»	0.3...4.3 m

Order Information	
Type	**Part no.**
WL 27-2Z230	1 015 112
WL 27-2Z240	1 015 136

Accessories	page
Cables and connectors	909
Mounting brackets	923, 924, 935
Reflectors	936
ASI	972

Technical Data	WL 27-2-	Z230	Z240
Sensing range	0...45.9 ft (0...14 m)/PL 80 A	■	■
Light source[1], **light type**	LED, red light, polarized	■	■
Light spot diameter	8.7 in at 0.4 in (220 mm at 10 mm)	■	■
Supply voltage V_S	26.5...31.6 V DC[2]	■	■
Ripple[3]	≤ 5 V_{SS}	■	■
Current consumption[4]	≤ 30 mA	■	
	≤ 40 mA, front screen heating		■
Response time[5]	550 µs	■	■
Max. switching frequency[6]	1000 Hz	■	■
Connection type	Plug, M12 4-pin	■	■
VDE protection class[7]	□	■	■
Circuit protection[8]	A, C	■	■
Enclosure rating	IP 67/NEMA 6	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■
	Storage -40...167°F (-40...75°C)	■	■
Approximate weight	3.5 oz (100 g)	■	■
Front screen heating			■
Polarizing filter		■	■
Housing material	Glass fiber reinforced ABS	■	■

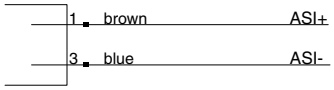
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Assignment of Data Bits			(Host level)
Switching state	0 No reflection	Input	D_0*
	1 Reflection		
Alarm	0 Active	Input	D_1
	1 Inactive		
NC	0	Input	D_2
	1		
Test function	0 Sender ON	Output	D_3*
	1 Sender OFF		

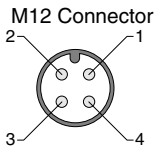
Assignment of Parameter Bits			(Host level)
NC	0	Parameter	P_0*
	1		
Light-/dark-switching	0 Dark-switching	Parameter	P_1*
	1 Light-switching		
NC	0	Parameter	P_2*
	1		
NC	0	Parameter	P_3*
	1		

* Default setting = 1

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models



WL 260

Reflex/Retro-Reflective Sensors

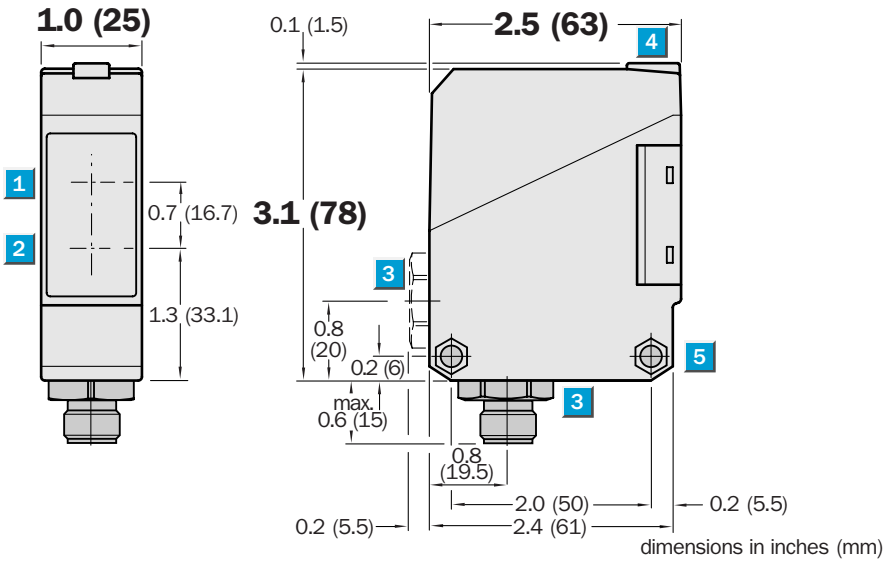
0.03...45.9 ft (0.01...14 m)
sensing range

Highlights

- Rugged plastic housing
- Sensitivity adjustment
- Terminal chamber for connection flexibility
- Test input
- Signal strength indicator
- Polarizing filters prevent false readings on reflective surfaces
- Easy mounting with included nuts

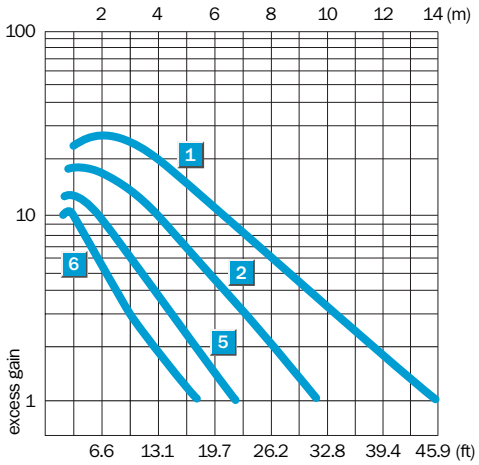
WL 260

Dimensional Drawing



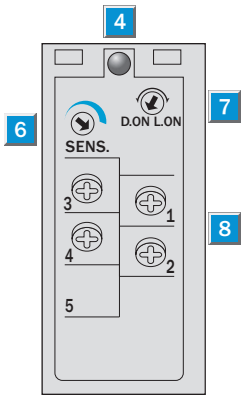
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Cable entry gland 1/2"PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or plug, M12, bottom
4 LED signal strength indicator, yellow,
5 Through hole Ø 5.2 mm on both sides for M 5 hex nut
6 Sensitivity adjustment
7 Light/dark rotary switch
L.ON = light switching, D.ON = dark switching
8 Terminals

Reflector Type		Sensing Range
1	PL 80 A	0.01...14.0 m
2	P 250	0.01...9.5 m
3	PL 50 A, PL 40 A	0.01...11.0 m
4	PL 30 A, PL 31 A	0.01...8.5 m
5	PL 20 A	0.01...7.0 m
6	Reflective tape diamond grade	0.02...5.5 m

Order Information	
Type	**Part no.**
WL 260-F270	6 020 976
WL 260-F470	6 020 977
WL 260-E270	6 020 978
WL 260-E470	6 021 814

Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935
Reflector P 250*	936

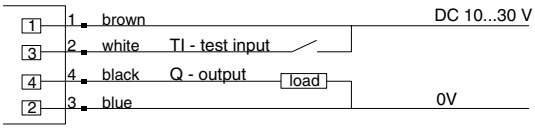
* included with delivery

Technical Data	WL 260-	F270	F470	E270	E470
Sensing range	0.03...31.2 ft (0.01...9.5 m)/P 250 (included)	■	■	■	■
	0.03...45.9 ft (0.01...14 m)/PL 80 A	■	■	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■	■	■
Light source[1], **light type**	LED, visible red light, polarized	■	■	■	■
Light spot diameter	Approx. 9.4 in at 26.2 ft (240 mm at 8 m)	■	■	■	■
Angle of divergence	Approx. 1.7°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 35 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA				
Light receiver, switching mode	Light /dark switching by rotary switch	■	■	■	■
Response time[5]	≤ 1.5 ms	■	■	■	■
Max. switching frequency[6]	333 Hz	■	■	■	■
		■	■	■	■
Test input "TE" sender off	PNP: TE to + V_S	■	■		
	NPN: TE to 0 V			■	■
Connection types	Terminal chamber	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[7]	□	■	■	■	■
Circuit protection[8]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) With resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_s connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

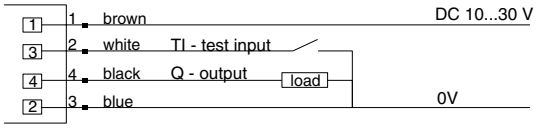
Connection Diagram

PNP Models

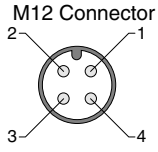


wire colors refer to standard cable, not included

NPN Models



M12 Connector



SICK

WL 24-2

Reflex/Retro-Reflective Sensors

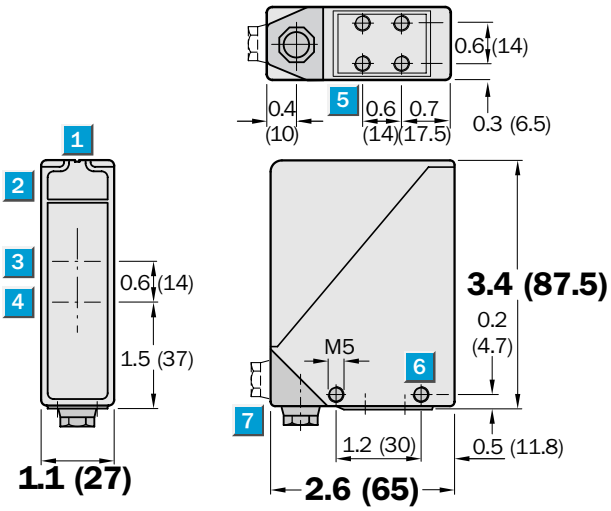
0...72 ft (0...22 m)
sensing range

Highlights

- Rugged metal housing
- Signal strength indicator
- Adjustable sensing range
- Optional dust shield, snow shield and cooling plates available
- Cable connections swivel 90° for easy installation
- Models available with integrated lens heater
- Alarm output and test input

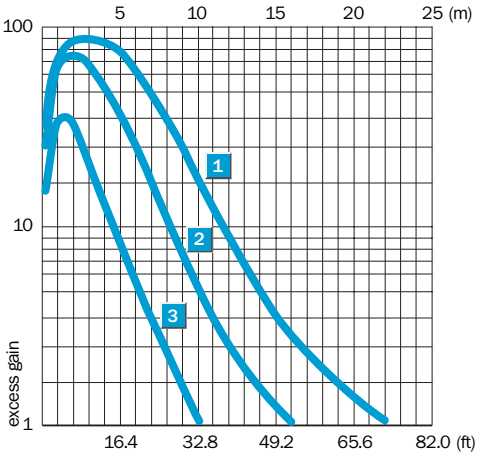
WL 24-2

Dimensional Drawing



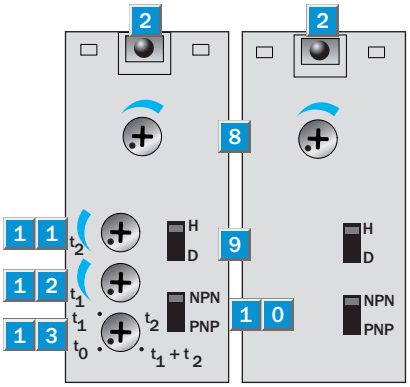
dimensions in inches (mm)

Excess Gain



Adjustments

WL 24-2B240	WL 24-2B230
WL 24-2B440	WL 24-2B430
	WL 24-2V230
	WL 24-2V530



1	Alignment sight
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	M5 threaded mounting hole, 6 mm deep
6	M5 threaded mounting hole, through-hole
7	PG screw fixing or plug rotatable by 90°
8	Sensitivity adjustment
9	Light/dark selector
10	NPN/PNP selector
11	Time control t_2 = OFF-delay
12	Time control t_1 = ON-delay
13	Time delay selector switch

Reflector Type		Sensing Range
1	PL 80 A	0...22.0 m
2	PL 50 A, PL 40 A	0...16.0 m
3	PL 30 A, PL 20 A	0...10.0 m

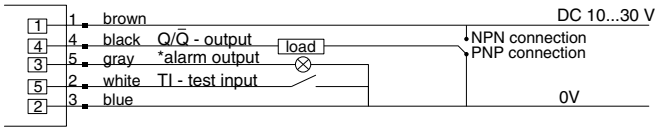
Order Information	
Type	**Part no.**
WL 24-2B230	1 015 852
WL 24-2B240	1 017 859
WL 24-2B430	1 017 860
WL 24-2B440	1 017 879
WL 24-2V230	1 017 880
WL 24-2V530	1 017 881

Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Reflectors	936
Special accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

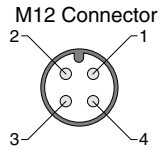
Technical Data	WL 24-2-	B230	B240	B430	B440	V230	V530
Sensing range	0...72.2 ft (0...22 m)/on PL 80 A	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■
Light source[1], light type	LED, red light, polarized	■	■	■	■	■	■
Light spot diameter	Approx. 9.8 in at 49.2 ft (250 mm at 15 m)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■		■		■	■
	≤ 70 mA, front lens heating		■		■		
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■
Alarm output	PNP					■	■
Time delay	Adjustable, 0.5...10 sec		■		■		
Test input "TE"	Sender switched off	■	■	■	■	■	■
Sender OFF	PNP or NPN: TE to 0 V	■	■	■	■	■	■
Connection types	PG 9 terminal chamber	■	■			■	
	Plug, M12 4-pin			■	■		
	Plug, M12 5-pin						■
VDE protection class[7]	□	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■	■	■	■
Front lens heating			■		■		
Polarizing filter		■	■	■	■	■	■
Housing material	Die cast zinc	■	■	■	■	■	■

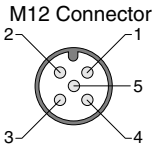
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



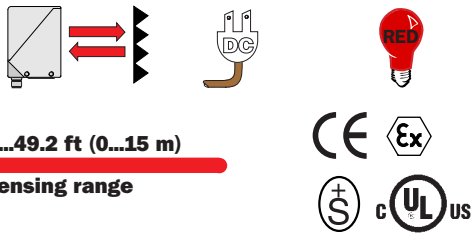
wire colors refer to standard cable, not included
* alarm output available on special models only





WL 24 Exi

Reflex/Retro-Reflective Sensors

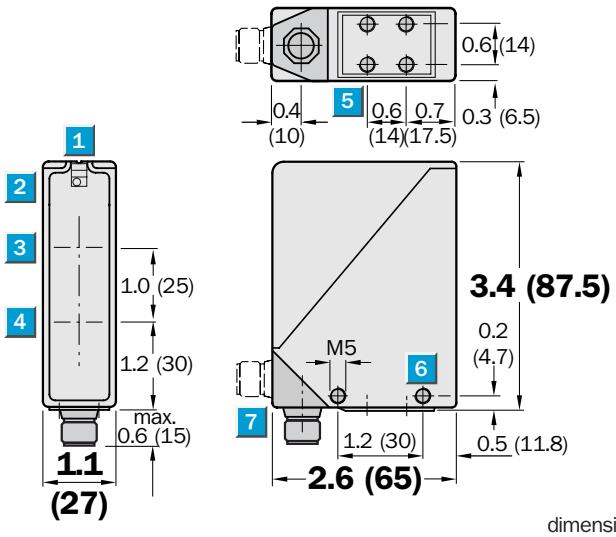


Highlights

- Rugged metal housing
- Red light for easy alignment
- Adjustable sensing range
- Polarizing filters prevent false readings on shiny objects
- Explosion protection EEx iaIICT6
- Cable connections swivel 90° for easy installation
- Terminal chamber for connection flexibility

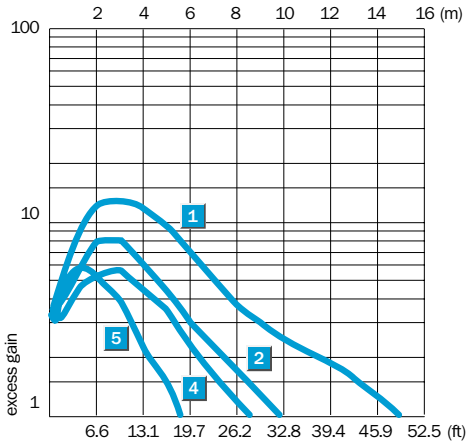
WL 24 Exi

Dimensional Drawing



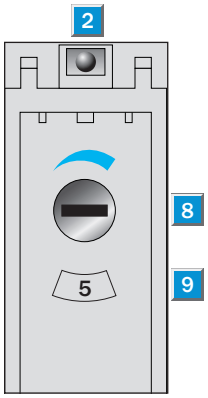
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Alignment sight
2 LED signal strength indicator
3 Center of receiver's optical axis
4 Center of transmitter's optical axis
5 M5 threaded mounting hole – 8 mm deep
6 M5 threaded mounting hole
7 Cable gland, plug, M12, rotatable
8 Sensitivity adjustment
9 Sensitivity indicator

Reflector Type		Sensing Range
1	PL 80 A	0...8.0 m
2	PL 50 A	0...6.0 m
3	PL 40 A	0...5.0 m
4	PL 30 A	0...5.0 m
5	PL 20 A	0...3.0 m

Order Information	
Type	**Part No.**
WL 24-X2301	1 011 972
WL 24-X4301	1 011 971

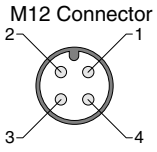
Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Reflectors	936
Power supply units	966

Technical Data	WL-24-	X2301	X4301
Sensing range	0...49.2 ft (0...15 m)/PL 80 A	■	■
Sensitivity	Adjustable	■	■
Light source[1], **light type**	LED, red light, polarized	■	■
Light spot diameter	Approx. 5.7 in at 26.2 ft (145 mm at 8 m)	■	■
Supply voltage V_S[2]	8.2 V DC (5...13.5 V)[3]	■	■
Ripple[4]	0.4 V_{SS}	■	■
Terminal capacitance	≤ 15 nF	■	■
Terminal inductance	≤ 75 µH	■	■
Current consumption[5]			
light beam unbroken	≥ 2.2 mA	■	■
light beam broken	≤ 1 mA	■	■
Switching output	Control current dependent on	■	■
	switching state (to NAMUR EN 50227)		
Switching mode	Light switching	■	■
Response time[6]	≤ 10 ms	■	■
Max. switching frequency[7]	50/s	■	■
Connection types	Plug, M12 4-pin		■
	Terminal chamber	■	
Approval	PTB No. Ex97 D2033	■	■
VDE protection class[8]	□	■	■
Circuit protection[9]	A, C	■	■
Enclosure rating	IP 67	■	■
Ambient temperature T_A	Operation -4...122°F (-20...50°C)	■	■
	Storage -13...158°F (-25...70°C)	■	■
Approximate weight	11.6 oz (330 g)	■	■
Housing material	Die cast zinc	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Supply with disconnector device EN 2 Ex
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

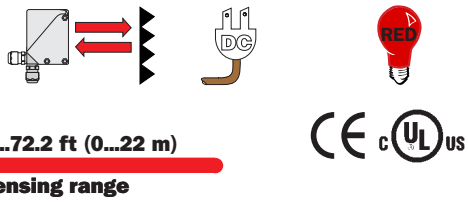
wire colors refer to standard cable, not included



SICK

WL 34

Reflex/Retro-Reflective Sensors



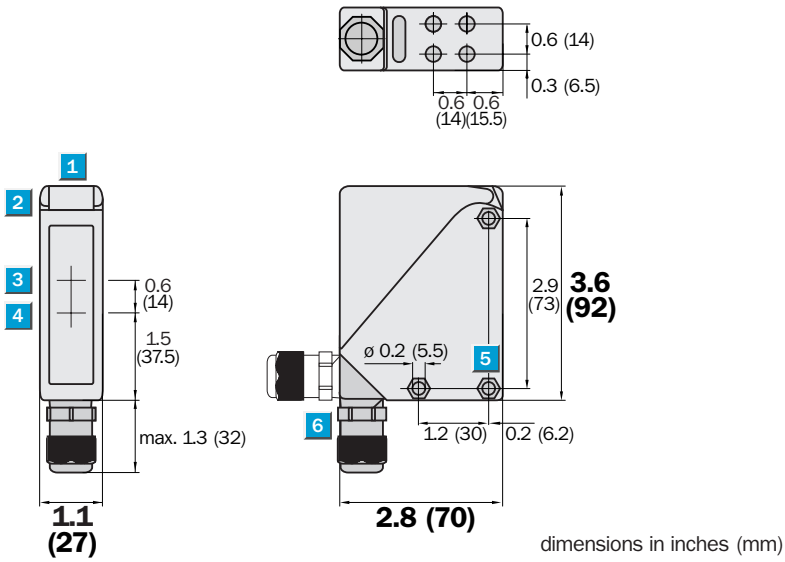
0...72.2 ft (0...22 m)
sensing range

Highlights

- Sturdy plastic housing
- Red light for easy alignment
- Selectable time delays
- Signal strength indicator
- Alarm output and test input
- Cable connections swivel 90° for easy installation

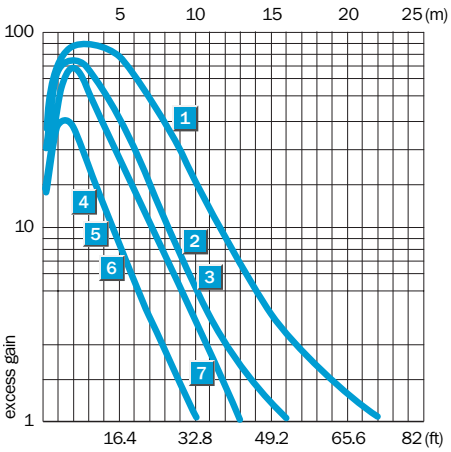
WL 34

Dimensional Drawing



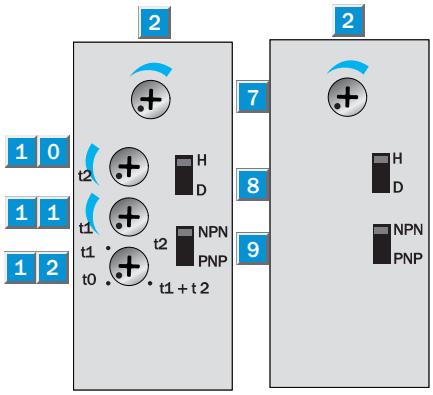
dimensions in inches (mm)

Excess Gain



Adjustments

WL 34-B440	WL 34-B430
WL 34-V240	WL 34-V230
WL 34-V540	WL 34-V530



1 Alignment sight
2 LED signal strength indicator
3 Center of optical axis, sender
4 Center of optical axis, receiver
5 Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
6 M16 screw fixing or plug rotatable by 90°
7 Sensitivity control
8 Light/dark selector
9 NPN/PNP selector
10 Time control t_2 = OFF-delay
11 Time control t_1 = ON-delay
12 Time delay selector switch

Reflector Type		Sensing Range
1	PL 80 A	1...22.0 m
2	PL 50 A	0...16.0 m
3	PL 40 A	0...16.0 m
4	PL 30 A	0...10.0 m
5	PL 20 A	0...10.0 m
6	Reflective tape diamond grade	0...10.0 m

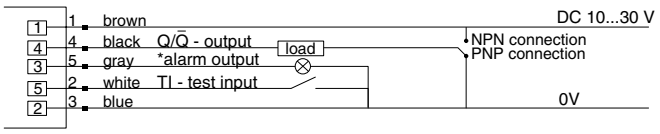
Order Information	
Type	**Part no.**
WL 34-V230	1 019 243
WL 34-V240	1 019 244
WL 34-B430	1 019 245
WL 34-B440	1 019 246
WL 34-V530	1 019 247
WL 34-V540	1 019 248

Accessories	page
Cables and connectors	909
Reflectors	936
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

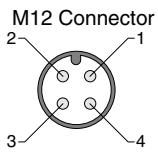
Technical Data	WL 34-	V230	V240	B430	B440	V530	V540
Sensing range	0...72.2 ft (0...22 m)/on PL 80 A	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■
Light source[1], light type	LED, red light, polarized	■	■	■	■	■	■
Light spot diameter	Approx. 9.8 in at 49.2 ft (250 mm at 15 m)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	< 5 V_{PP}	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■
Alarm output	PNP	■	■			■	■
Time delay	Adjustable, 0.5 to 10 s		■		■		■
Test input "TE"	Sender switched off	■	■	■	■	■	■
Sender off	PNP or NPN: TE to 0 V	■	■	■	■	■	■
Connection type	M16 terminal chamber	■	■				
	Plug, M12 4-pin			■	■		
	Plug, M12 5-pin					■	■
VDE protection class[7]	□	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40....75°C)	■	■	■	■	■	■
Approximate weight	4.9 oz (140 g)	■	■	■	■	■	■
Polarizing filter		■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

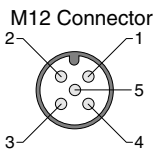
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal flight time with ohmic load
6) With light/dark ratio 1:1
7) Withstand voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



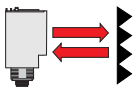
wire colors refer to standard cable, not included
* alarm output available on special models only





WL 2000

Reflex/Retro-Reflective Sensors



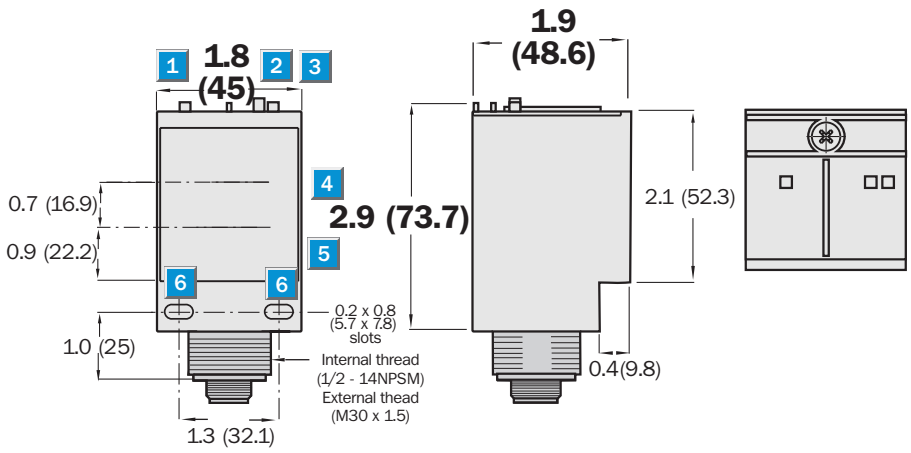

0...59 ft (0...18 m)
sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Alarm output
- Crosstalk immunity
- Polarizing filters prevent false readings on shiny surfaces
- Red light for easy alignment
- Selectable time delays
- Cable or M12 quick disconnect versions

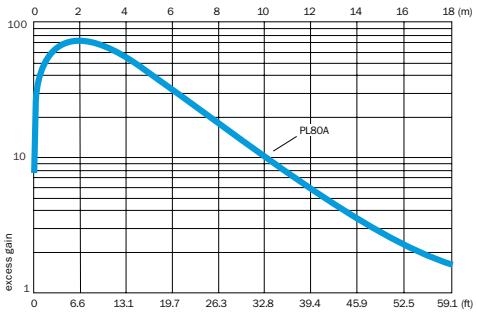
WL 2000

Dimensional Drawing



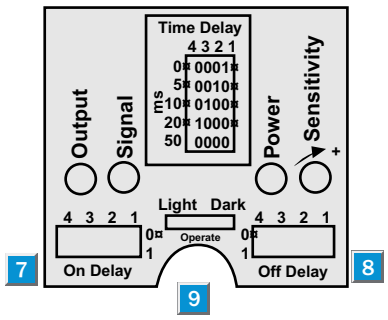
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1. LED power indicator (green)
2. LED signal strength indicator (red)
3. LED output indicator (yellow)
4. Center of optical axis, sender
5. Center of optical axis, receiver
6. Mounting through-hole Ø 0.2 x 0.8 mm,
7. ON delay selector
8. OFF delay selector
9. Light/dark switching selector

Reflector Type		Sensing Range
1	PL 80 A	1...15 m
2	PL 50 A	0...11 m
3	PL 40 A	0...11 m
4	PL 30 A	0...8 m
5	PL 20 A	0...8 m
6	Reflective tape diamond grade	0...8 m

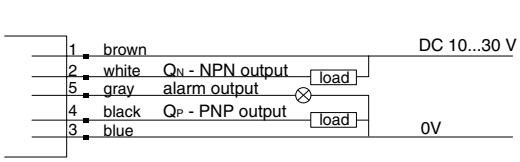
Order Information	
Type	**Part no.**
WL 2000-B1302	7 023 044
WL 2000-B1312	7 023 045
WL 2000-B1322	7 023 046
WL 2000-B5300	7 023 047
WL 2000-B5310	7 023 048
WL 2000-B5320	7 023 049
WL 2000-B4300	7 024 002

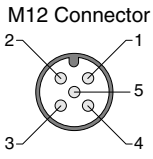
Accessories	page
Cables and connectors	909
Reflectors	936
Mounting brackets	927

Technical Data	WL 2000-	B1302	B1312	B1322	B5300	B5310	B5320	B4300
Sensing range	0...59 ft (0...18 m)	■	■	■	■	■	■	■
Light source[1], **light type**	LED, red light, 660 nm, polarized	■	■	■	■	■	■	■
Light spot diameter	Approx. 12.5 in at 45.9 ft (320 mm at 14 m)	■	■	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V	■	■	■	■	■	■	■
Current consumption[4]	≤ 80 mA	■	■	■	■	■	■	■
Switching outputs	PNP or NPN, Q and $\overline{Q}$	■	■	■	■	■	■	■
Voltage drop (Max.)	2 V	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■
Output current I_A max.	80 mA	■	■	■	■	■	■	■
Response time[5]	≤ 1 ms	■	■	■	■	■	■	■
Max. switching frequency[6]	500 Hz	■	■	■	■	■	■	■
Alarm output	PNP	■	■	■	■	■	■	
Time delay settings	0, 5, 10, 20 or 50 ms		■	■		■	■	
OFF delay			■			■		
ON/OFF delay				■			■	
Connection types	Cable, 2 m, PVC	■	■	■				
	Plug, M12 5-pin				■	■	■	
	Plug, M12 4-pin							■
VDE protection class[8]	□	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■	■

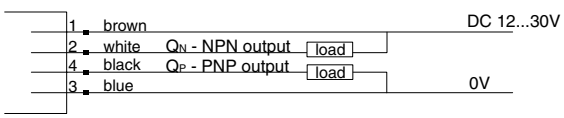
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

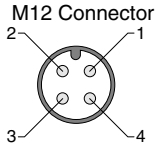
Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models





SICK

WL 36

Reflex/Retro-Reflective Sensors

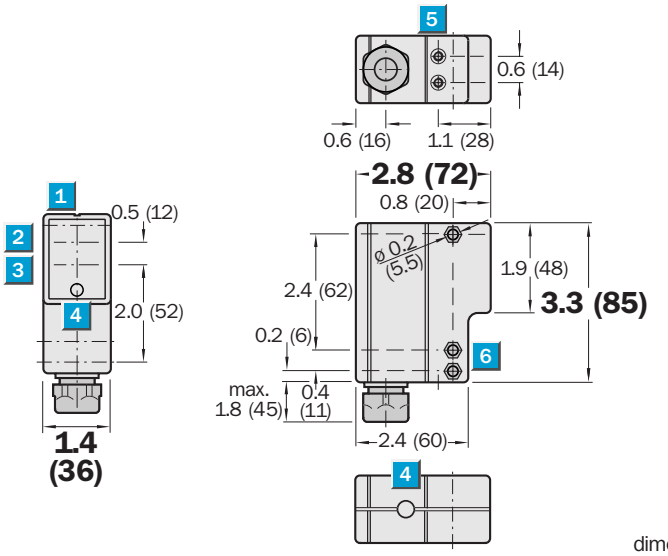
0...72.2 ft (0...22 m)
sensing range

Highlights

- Rugged plastic housing
- Visible red light
- Selectable time delays
- Signal strength indicator
- Alarm output and test input
- High output current
- Optional lens heater
- Polarizing filters prevent false readings on reflective surfaces

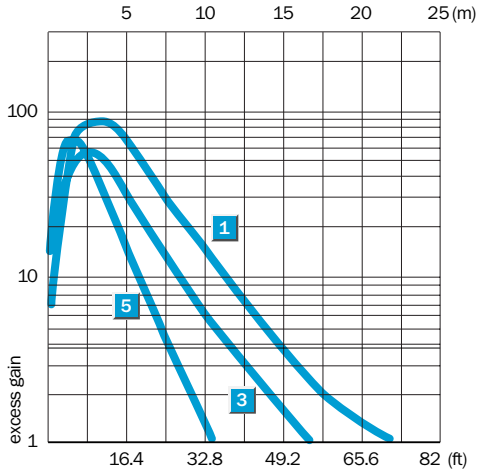
WL 36

Dimensional Drawing



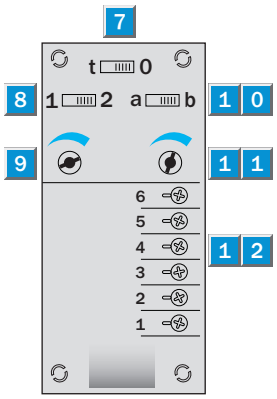
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Alignment sight
2 Center of optical axis, receiver
3 Center of optical axis, sender
4 LED signal strength indicator
5 M5 threaded mounting hole – 5.5 mm deep
6 Mounting holes
recesses on both sides for M5 hex nuts
7 ON/OFF timer switch
t = Time ON, 0 = Time OFF
8 Time delay
1 ON-delay
2 OFF-delay
9 Time control 0.02 to 1 s
10 Light/dark selector
a = Light switching, b = Dark switching
11 Sensitivity adjustment
12 Terminal connections

Reflector Type		Sensing Range
1	PL 80 A	0.1...22.0 m
2	P 975	0.3...12.0 m
3	PL 50 A	0.1...18.0 m
4	PL 40 A	0.1...16.0 m
5	PL 30 A	0.1...16.0 m
6	PL 20 A	0.1...11.0 m
7	Reflective tape diamond grade	0.25...3.0 m

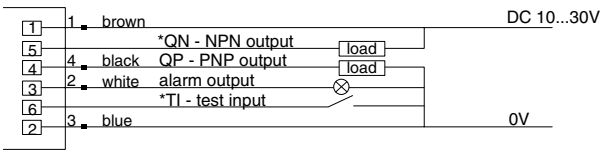
Order Information	
Type	**Part no.**
WL 36-B230	1 005 385
WL 36-B430	1 010 612
WL 36-B730	1 008 848
WL 36-B930	1 008 506

Accessories	page
Cables and connectors	909, 915
Mounting brackets	924
Reflectors	936
Attachable heated cover	959

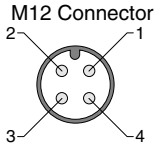
Technical Data	WL 36-	B230	B430	B730	B930
Sensing range	0...72.2 ft (0...22 m)/PL 80 A	■	■	■	■
Sensitivity	Adjustable	■	■	■	■
Light source[1], **light type**	LED, red light, polarized	■	■	■	■
Light spot diameter	Approx. 2 in at 9.8 ft (50 mm at 3 m)	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 40 mA	■	■	■	■
Switching outputs	PNP: Q_P and NPN Q_N	■		■	■
	PNP: Q_P		■		
Light/dark switching	Switch-selectable	■	■	■	■
Output current I_A max.	200 mA	■	■	■	■
Response time[5]	≤ 1.25 ms	■	■	■	■
Max. switching frequency[6]	400 Hz	■	■	■	■
Alarm output	Alarm, PNP, open collector	■	■	■	■
Internal resistance	≥ 1.5 kΩ ± 5%	■	■	■	■
Operating condition "correct"[7]	Output HIGH (V_S – 1.5 V)	■	■	■	■
Operating condition "faulty"	Switching periodically at 5/s to V_S	■	■	■	■
Test input "TE"	Sender switched off	■	■	■	■
Sender OFF	Test input to 0 V	■	■	■	■
Connection types	PG 11 terminal chamber	■			■
	1/2" NPSM terminal chamber				■
	Plug, M12 4-pin		■		
	Plug, square 7-pin			■	
VDE protection class[8]	⧈	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67	■	■		■
	IP 65			■	
		■	■	■	■
Ambient temperature T_A	Operation -40...131°F (-40...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	5.8 oz (165 g)	■	■	■	■
Polarizing filter		■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Signal reserve ≥ 50%
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q_N and Q_P short-circuit protected
C = Interference pulse suppression

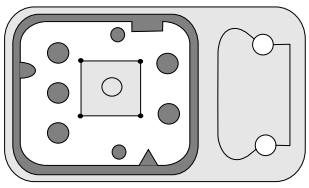
Connection Diagram



wire colors refer to standard cable, not included
*NPN output and test input available on WL 36-B230/-B930 only



7-pin Square WL36-B730



SICK

WL 45

Reflex/Retro-Reflective Sensors

0...180.4 ft (0...55 m)
sensing range

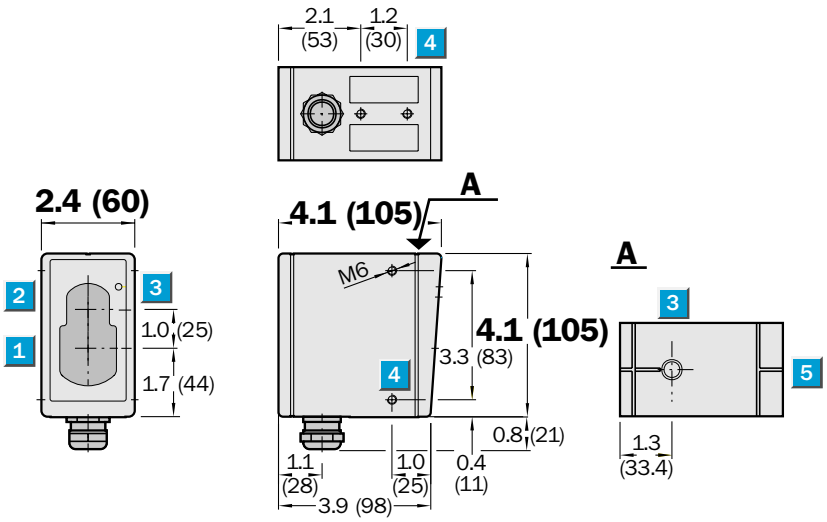
CE

Highlights

- Rugged metal housing
- Red light for easy alignment
- Sensitivity adjustment
- Alarm output and test input
- Selectable time delays
- High output current
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

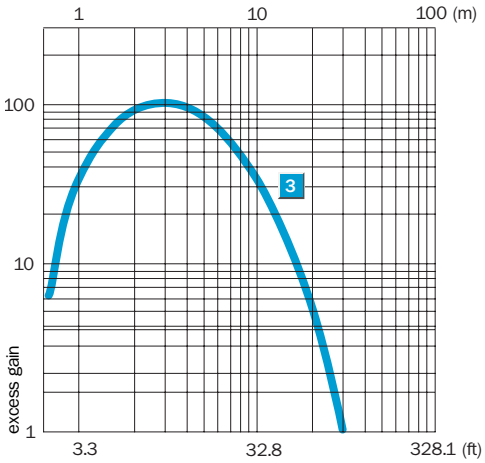
WL 45

Dimensional Drawing



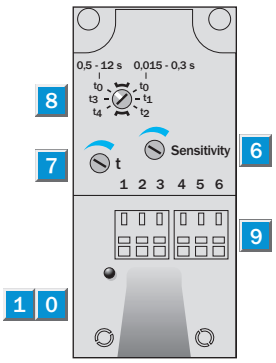
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 LED signal strength indicator
4 M6 threaded mounting hole – 8 mm deep
5 Alignment sight
6 Sensitivity adjustment
7 Time adjustment
8 Time delay selector switch
9 Terminal strip
10 Status indicator

Switch-selectable Time Delay

0.5 – 12 s	0.015 – 0.3 s
t_0 without time delay	t_0 without time delay
t_3 ON-delay when object enters detection zone	t_1 ON-delay when object enters detection zone
t_4 OFF-delay when object leaves detection zone	t_2 OFF-delay when object leaves detection zone

Reflector Type		Sensing Range
1	OP 60 – ∞	1...55.0 m
2	4 x PL 80	0...35.0 m
3	PL 80 A	0...30.0 m
4	P 975	0.1...18.0 m
5	PL 50	0...14.0 m
6	PL 30	0...11.0 m
7	Reflective tape diamond grade	0.3...10.0 m

Order Information

Type	Part no.
WL 45-P250	1 008 840
WL 45-P260	1 008 668
WL 45-N250	1 008 839
WL 45-N260	1 008 669
WL 45-P950	1 010 559
WL 45-P960	1 010 560
WL 45-N950	1 010 557
WL 45-N960	1 010 558

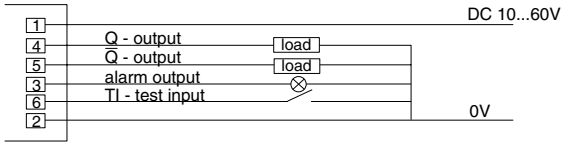
Accessories	page
Mounting brackets	935
Reflectors	936
Cooling plates	958
Dust shield	955
Weather hood	955

Technical Data	WL 45-	P250	P260	N250	N260	P950	P960	N950	N960
Sensing range	0...180.4 ft (0...55 m)/OP 60	■	■	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■	■	■
Light source[1], light type	LED, visible red light, polarized	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 9 in at 52.5 ft (230 mm at 16 m)	■	■	■	■	■	■	■	■
Supply voltage V_S	10...60 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	$< 5\ V_{SS}$	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 50 mA		■		■		■		■
	≤ 250 mA, front lens heating	■		■		■		■	
Switching outputs	PNP, Q and $\overline{Q}$	■	■			■	■		
	NPN, Q and $\overline{Q}$			■	■			■	■
Output current I_A max.	200 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 1.2 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	400 Hz	■	■	■	■	■	■	■	■
Alarm output	Alarm	■	■	■	■	■	■	■	■
Output current I_A max.	100 mA, open collector	■	■	■	■	■	■	■	■
Insufficient light received	Flashes at approx. 5/s, switch to V_S	■	■	■	■	■	■	■	■
(Reserve < 50%)									
Test input "TE"		■	■	■	■	■	■	■	■
Sender OFF	PNP: Test input to 0 V	■	■			■	■		
	NPN: Test input to V_S			■	■			■	■
Connection types	PG 13.5 terminal chamber	■	■	■	■				
	1/2" NPSM terminal chamber					■	■	■	■
VDE protection class[7]	⏚	■	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature T_A[9]	Operation -13...131°F (-25 ...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40 ...70°C)	■	■	■	■	■	■	■	■
Approximate weight	28.2 oz (800 g)	■	■	■	■	■	■	■	■
Front lens heating		■		■		■		■	
Polarizing filter		■	■	■	■	■	■	■	■
Housing material	Die cast metal	■	■	■	■	■	■	■	■

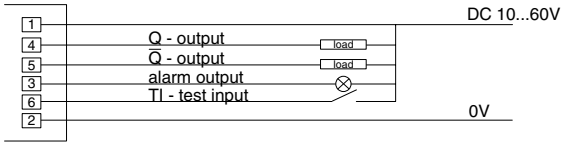
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q_N and Q_P short-circuit protected
C = Interference pulse suppression
9) Up to 140°C with cooling plates (see Accessories)

Connection Diagram

PNP Models



NPN Models



SICK

VL 12-2

Reflex/Retro-Reflective Sensors

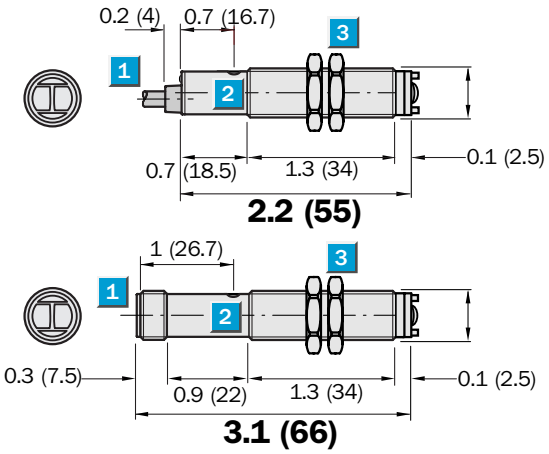
0.1...11.5 ft (0.3...2.8 m)
sensing range

Highlights

- Rugged metal housing
- Signal strength indicator
- Standard 12 mm diameter
- Reverse polarity and short circuit protection
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

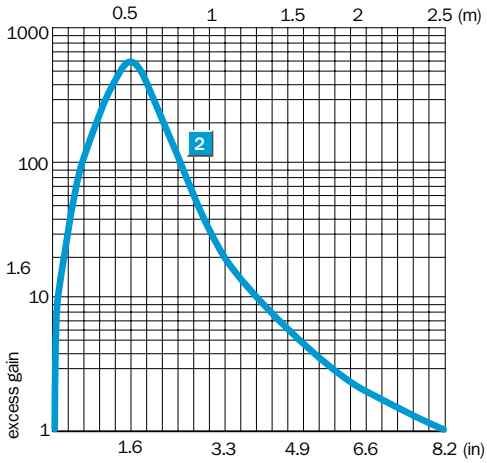
WL 12-2

Dimensional Drawing



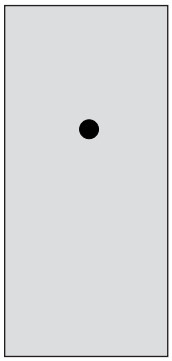
dimensions in inches (mm)

Excess gain



Adjustments

All types



1 Cable or plug, M12 4-pin
2 Yellow LED indicator:
- lights continuously: Reception signal > reserve factor 2
- blinks: Reception signal < reserve factor 2 but > switching threshold 1

3 Mounting nuts (2x), SW 17, metal

Reflector Type		Sensing Range
1	PL 80 A	0.03...2.3 m
2	C 110	0.03...2 m
3	PL 50 A/PL 40 A/ P 250	0.03...1.8 m
4	Reflective tape diamond grade	0.1...0.7 m

Order Information	
Type	**Part no.**
VL12-2P132	6 026 219
VL12-2P430	6 026 220
VL12-2N132	6 026 217
VL12-2N430	6 026 218

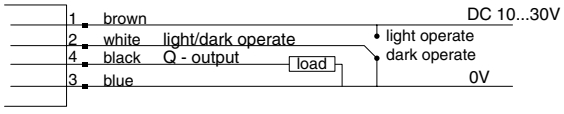
Accessories	page
Cables and connectors	909
Mounting brackets	925
Reflectors	936

Technical Data	VL 12-2-	P132	P430	N132	N430					
Sensing range	0.1...9.2 ft (0.03...2.8 m)/PL 80 A									
Sensitivity setting	Not available									
Light source[2], light type	LED, red light, with polarization filter									
Light spot diameter	Approx. 3.9 in at 78.7 in (100 mm at 200 cm)									
Angle of divergence	Approx. 2.3° (SR = max.)									
	Approx. 6.3° (SR = 1/2 max.)									
Supply voltage V_S	10...30 V DC[4]									
Ripple[5]	± 10%									
Current consumption[6]	≤ 20 mA									
Switching outputs	Q: PNP									
	Q: NPN									
Output current I_A max.	100 mA									
Operation mode	Light/dark switching selectable									
Response time[7]	≤ 1.25 ms									
Max. switching frequency[8]	400 Hz									
Connection types	Cable, PVC, 2 m[9]; 4 x 0.14 mm², Ø 3.75 mm									
	Plug, M 12 4-pin									
VDE protection class[10]	□									
Circuit protection[11]	A, B, C, D									
Enclosure rating	IP 67/NEMA 6									
Ambient temperature T_A	-13...158°F (-25...70°C)									
Approximate weight	1.9 oz (54 g)									
	0.6 oz (18 g)									
Housing material	Nickel-coated brass housing/PA									

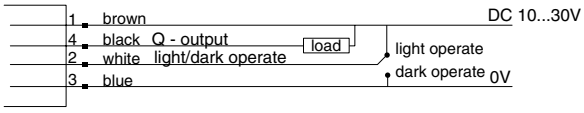
1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Object to be detected with 90% remission 100 x 100 mm
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram

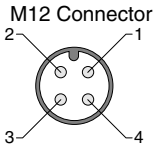
PNP Models



NPN Models



M12 Connector

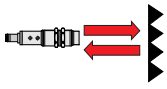


wire colors refer to standard cable, not included with quick disconnect models

SICK

VL 18-3/4

Reflex/Retro-Reflective Sensors



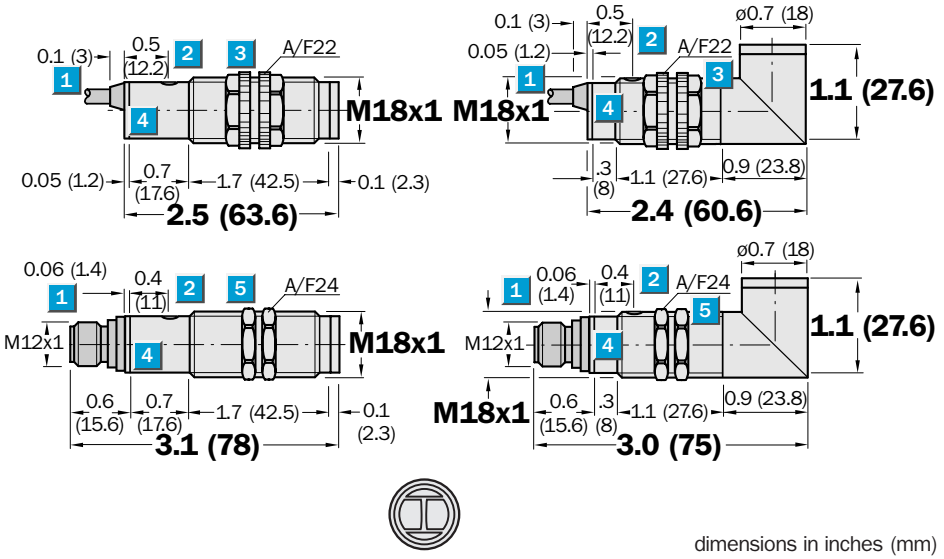

0.2...12.1 ft (0.05...3.7 m)
sensing range

Highlights

- Rugged plastic or metal housing
- Light or dark switching available
- Standard 18 mm diameter
- Easy mounting with included nuts

VL 18-3/4

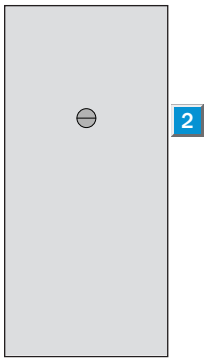
Dimensional Drawing



dimensions in inches (mm)

Adjustments

See selection table on page 896



1 Connecting cable or M12 plug
2 Sensitivity control
3 Fastening nut, width across 22 mm, made of plastic for equipment with plastic housing
4 Signal strength indicator, LED, yellow
5 Fastening nut, width across 24 mm, made of metal for equipment with metal housing

Order Information

See selection table on page 896

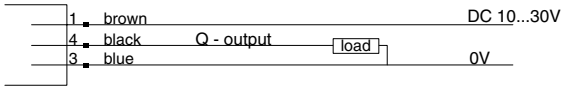
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926, 935
Reflectors	936

Technical Data	VL 18-	3...	4...
Housing	Straight		
	Angled, 90°		
Sensing range[1]	0.2...12.1 ft (0.05...3.7 m)		
Sensitivity adjustable (optional)	Potentiometer 270°		
Light source[2], **light type**	LED, red light with polarizing filter		
Light spot diameter	Approx. 5.9 in at 9.8 ft (150 mm at 3 m)		
Angle of divergence	Approx. 2.8°		
Supply voltage V_S	10...30 V DC[3]		
Ripple[4]	± 10%		
Current consumption[5]	≤ 30 mA		
Switching outputs (optional)	PNP/NPN; open collector: Q		
Operation mode	Q, dark switching		
	Q, light switching		
	Q, light/dark switching via control wire L/D[6]		
	+ V_S = light switching		
	0 V = dark switching		
Output current I_A max.	100 mA		
Response time[7]	≤ 2 ms		
Max. switching frequency[8]	250 Hz		
Connection types	Cable, 2 m,[9] PVC, 3 x 0.14 mm², Ø 3.1 mm		
	Cable, 2 m,[9] PVC, 4 x 0.14 mm², Ø 5 mm		
	Plug, M12 4-pin		
VDE protection class[10]	□		
Circuit protection[11]	A, B, C, D		
Enclosure rating	IP 67/NEMA 6		
Ambient temperature T_A	-13...158°F (-25...70°C)		
Approximate weight	Metal housing: 4.2 oz (120 g)		
	Plastic housing: 3.5 oz (100 g)		
Housing material	Nickel-plated brass, PBT/PC		
	Plastic, PBT/PC		

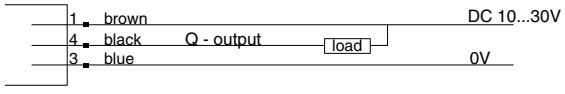
1) Object with 90% reflectance (referred to standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Control wire open:
NPN: light-switching
PNP: dark-switching
7) With resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

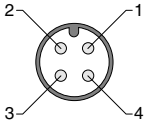
PNP Models



NPN Models

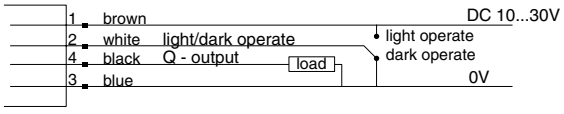


M12 Connector

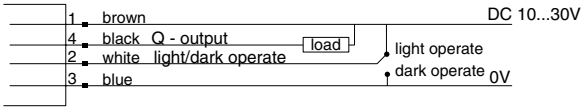


wire colors refer to standard cable, not included with quick disconnect models.

PNP Models



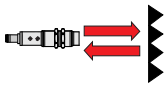
NPN Models



SICK

VL 180

Reflex/Retro-Reflective Sensors

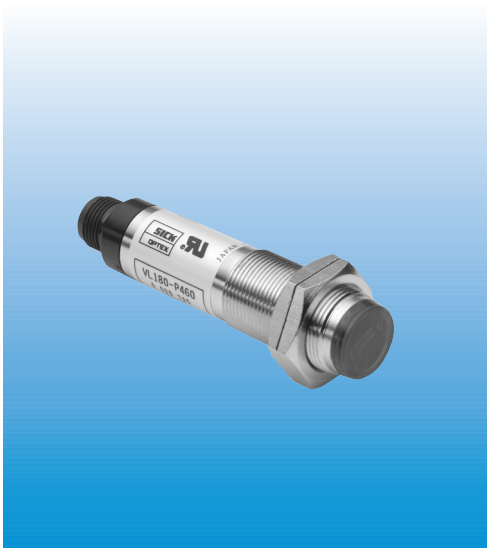



0...7.2 ft (0...2.2 m)
sensing range

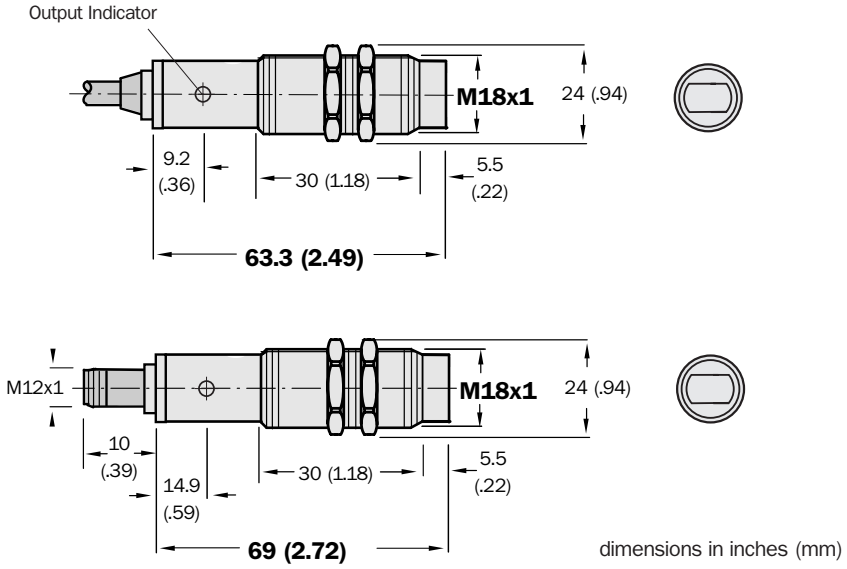
Highlights

- Rugged metal housing
- LED status indicator
- Standard 18 mm size
- Adjustable sensitivity
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions
- Polarizing filters prevent false readings on reflective surfaces

VL 180

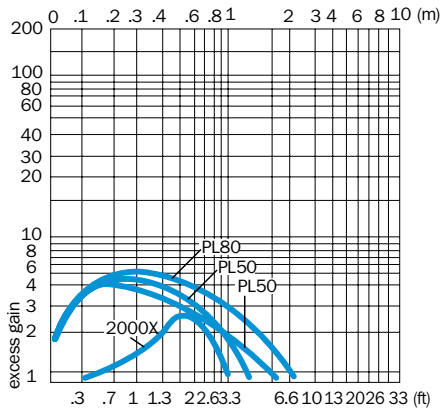


Dimensional Drawing



dimensions in inches (mm)

Excess Gain



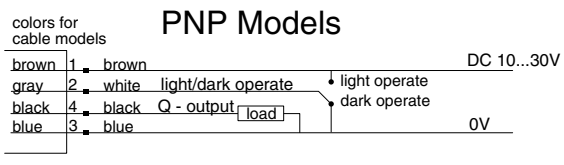
Order Information	
Type	**Part no.**
VL 180-P162	6 008 783
VL 180-N162	6 008 784
VL 180-P460	6 008 785
VL 180-N460	6 008 786

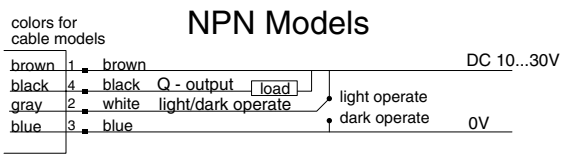
Accessories	page
Mounting brackets	925, 926, 935
Reflectors	936
Connectors	909

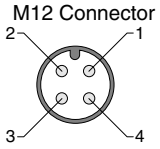
Technical Data	VL 180-	P162	N162	P460	N460
Sensing range	0...5.9 ft (0...2.2 m)/PL 80 A	■	■	■	■
Light source[2], light type	LED, red light, polarized	■	■	■	■
Light spot diameter	Approx. 2 in at 3.3 ft (50 mm at 1 m)	■	■	■	■
Angle of divergence	Approx. 3°	■	■	■	■
Supply voltage V_S	10...30 V DC[4]	■	■	■	■
Ripple[5]	≤ 5 V	■	■	■	■
Current consumption[6]	≤ 30 mA	■	■	■	■
Switching outputs	PNP	■		■	
	NPN		■		■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light or dark switching selectable via wire	■	■	■	■
Response time[7]	≤ 1.5 ms	■	■	■	■
Max. switching frequency[8]	333 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[9]; 3 x 0.14 mm², Ø 3.1 mm	■	■		
	Plug, M12 4-pin			■	■
VDE protection class[10]	□	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 66/NEMA 4	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	4.4 oz (125 g)	■	■		
	2.3 oz (65 g)			■	■
Housing material	Nickel-plated brass housing	■	■	■	■

1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) Object to be detected with 90% remission 100 x 100 mm
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







wire colors refer to standard cable, not included with quick disconnect models

SICK

VL 180

Reflex/Retro-Reflective Sensors

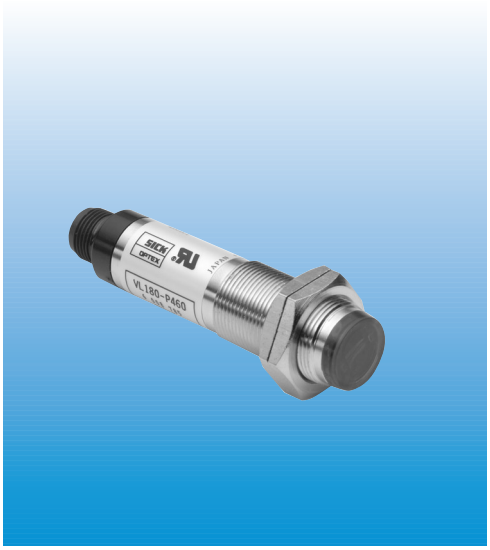
0...18 ft (0...5.5 m)

sensing range

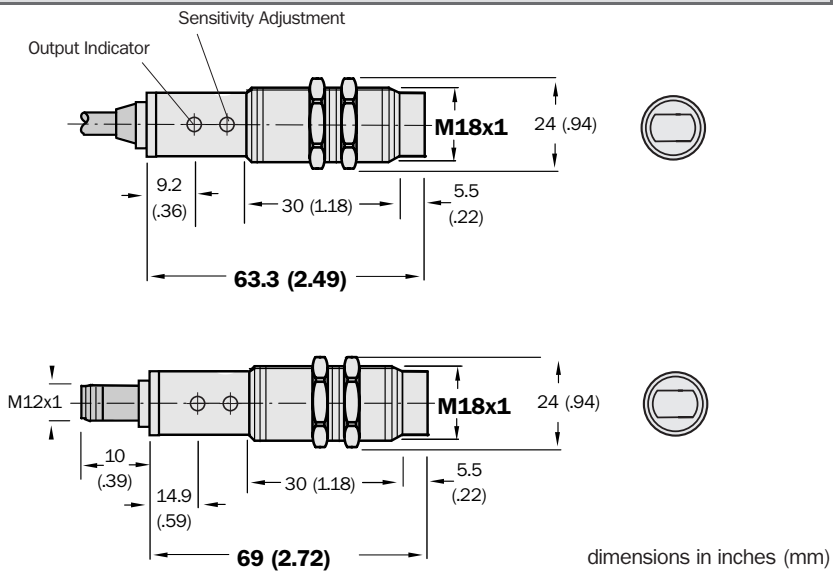
Highlights

- Rugged metal housing
- LED status indicator
- Standard 18 mm size
- Adjustable sensitivity
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

VL 180

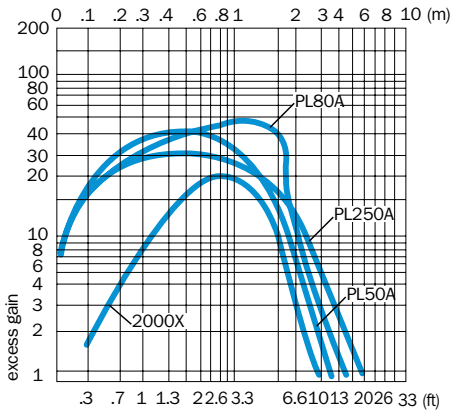


Dimensional Drawing



dimensions in inches (mm)

Excess Gain



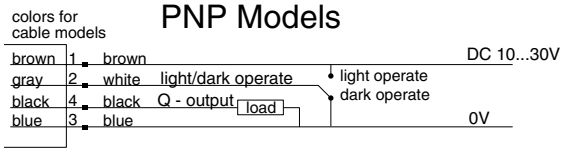
Order Information	
Type	**Part no.**
VL 180-P132	6 008 779
VL 180-N132	6 008 780
VL 180-P430	6 008 781
VL 180-N430	6 008 782

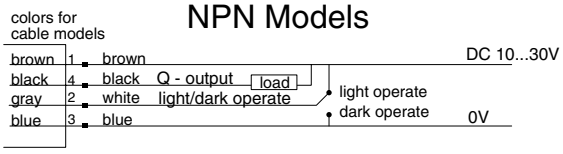
Accessories	page
Mounting brackets	925, 926, 935
Reflectors	936
Connectors	909

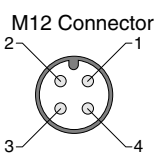
Technical Data	VL 180-	P132	N132	P430	N430					
Sensing range	0...18 ft (0...5.5 m)/PL 80 A	■	■	■	■					
Light source[2], light type	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 5.9 in at 9.8 ft (150 mm at 3 m)	■	■	■	■					
Angle of divergence	Approx. 3°	■	■	■	■					
Supply voltage V_S	10...30 V DC[4]	■	■	■	■					
Ripple[5]	≤ 5 V	■	■	■	■					
Current consumption[6]	≤ 30 mA	■	■	■	■					
Switching outputs	PNP	■		■						
	NPN		■		■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light or dark switching selectable via wire	■	■	■	■					
Response time[7]	≤ 1.5 ms	■	■	■	■					
Max. switching frequency[8]	333 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[9]; 3 x 0.14 mm², Ø 3.1 mm	■	■							
	Plug, M12 4-pin			■	■					
VDE protection class[10]	□	■	■	■	■					
Circuit protection[11]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 66/NEMA 4	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	4.4 oz (125 g)	■	■							
	2.3 oz (65 g)			■	■					
Housing material	Nickel-plated brass housing	■	■	■	■					

1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Object to be detected with 90% remission 100 x 100 mm
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







wire colors refer to standard cable, not included with quick disconnect models

SICK

VL 18 L

Reflex/Retro-Reflective Sensors

0.3...114.8 ft (0.1...35 m)

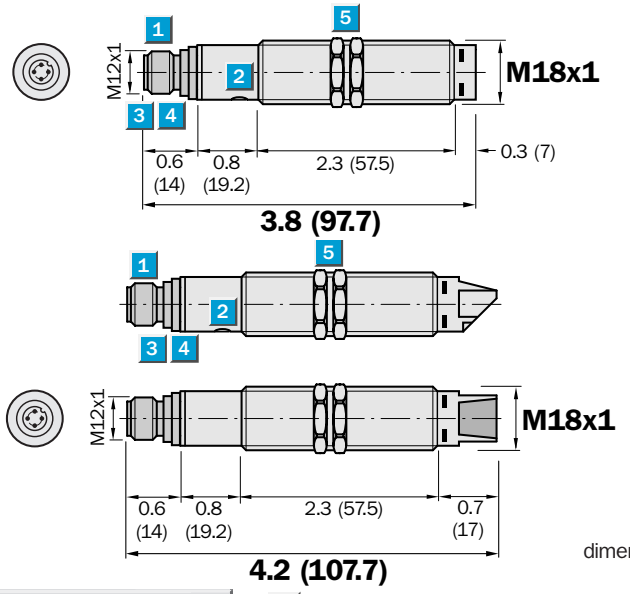
sensing range

Highlights

- Longest ranges
- Detects small parts and switches pecisely thanks to small laser spot
- Laser Class I
- Polarization filter ensures reliable switching even on shiny objects

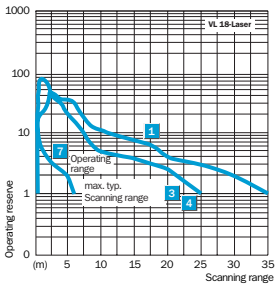
VL 18 L

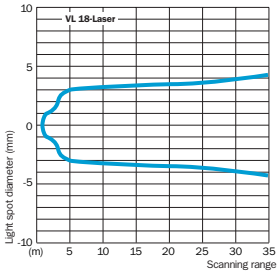
Dimensional Drawing



dimensions in inches (mm)

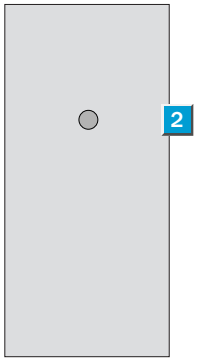
Excess Gain





Adjustments

All types



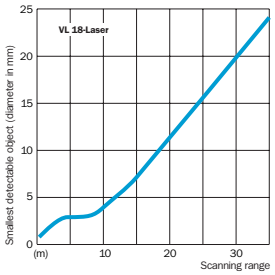
1 Plug M12, 4-pin
2 Sensitivity adjustment (Teach-in button)
3 Green LED indicator: V_S supply voltage feed
4 Yellow LED indicator:
– lights continuously:
reception signal > reserve factor 2
– blinks: Reception signal < reserve factor 2
but > switching threshold 1
5 Mounting nuts (2x), SW 24, metal
(included with delivery)

Reflector Type		Sensing Range
1	PL 250 F	0.1...30 m
2	PL 10 F	0.1...25 m
3	PL 80 A	0.1...22 m
4	P 250	0.1...22 m
5	C 110	0.1...18 m
6	PL 20 F	0.1...15 m
7	Reflective tape diamond grade	0.1...5 m

Order Information

Type	Part no.
VL 18 L-4P324	6 027 430
VL 18 L-4N324	6 027 432
VL 18 L-4P344	6 027 434
VL 18 L-4N344	6 027 436

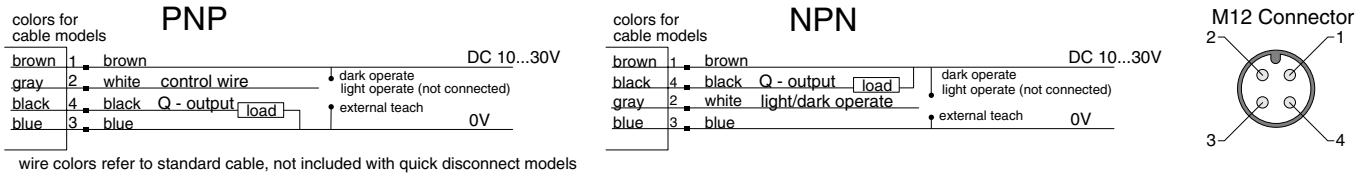
Accessories	page
Mounting brackets	925, 926, 935
Reflectors	936
Connectors	909



Technical Data	VL 18 L-	4P324	4P344	4N324	4N344
Sensing range, max. typical/Reflector	0.3...114.8 ft (0.1 m ... 35 m)/P 250 F	■	■	■	■
Smallest detectable object[1]	Approx. 0.3 in Ø at 3.3 ft (0.7 mm Ø at 1 m)	■	■	■	■
	Approx. 1 in Ø at 114.8 ft (25 mm Ø at 35 m)	■	■	■	■
Light spot diameter	Approx. 0.4 in at 114.8 ft (9 mm at 35 m)	■	■	■	■
Angle of dispersion of sender	Approx. 0.04° (SR = max.)	■	■	■	■
	Approx. 0.02° (SR = 1/2 max.)	■	■	■	■
Light source[2], Light type	Red laser light, 650 nm	■	■	■	■
Laser class	Laser class 1 (IEC 60825-1)	■	■	■	■
Laser sender output capacity	Max. 0.4 mW	■	■	■	■
Housing	Axial optics	■		■	
	Radial optics		■		■
Sensitivity setting	Manual, per Teach-in button	■	■	■	■
	Electronic, per control input C (0 V)[3]	■	■	■	■
Status indicators	Yellow LED:	■	■	■	■
	Switching output active, reserve				
	LED green: supply voltage V_S = ON	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[4]	■	■	■	■
Ripple[5]	≤ 10 %	■	■	■	■
Current consumption[6]	≤ 20 mA	■	■	■	■
Switching outputs	Q: PNP	■	■		
	Q: NPN			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■
Switching mode	Light/dark switching selectable[3]	■	■	■	■
Response time[7]	≤ 0.625 ms	■	■	■	■
Switching frequency max.[8]	800/s	■	■	■	■
Connection types	Plug, M12 4-pin	■	■	■	■
VDE protection class[9]		■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Ambient temperature	Operation 5...131°F (-15... 55°C	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■
Approximate weight	With plug 2.1 oz (60 g)	■	■	■	■
Housing material	Housing: Nickel-coated brass/PC	■	■	■	■
	Optics: PC with protective glass pane	■	■	■	■

1) Suitable reflectors for laser photoelectric reflex switches: We recommend our "F" reflectors with micro triple structure or DG reflector tape for short distances up to 5 m and our standard reflectors for ranges > 5 m (also see the accessories; reflectors for VL 18 L)
2) Average service life 100,000 h at T_A = 25°C
3) Control input C
– L.ON/D.ON and
– external Teach-in
C = open: light-switching L.ON
C = + V_S: dark-switching D.ON
C = 0 V: Sensitivity setting per "external Teach-in"
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Reference voltage 50 V
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

SICK

DS 60

Reflex/Retro-Reflective Sensors

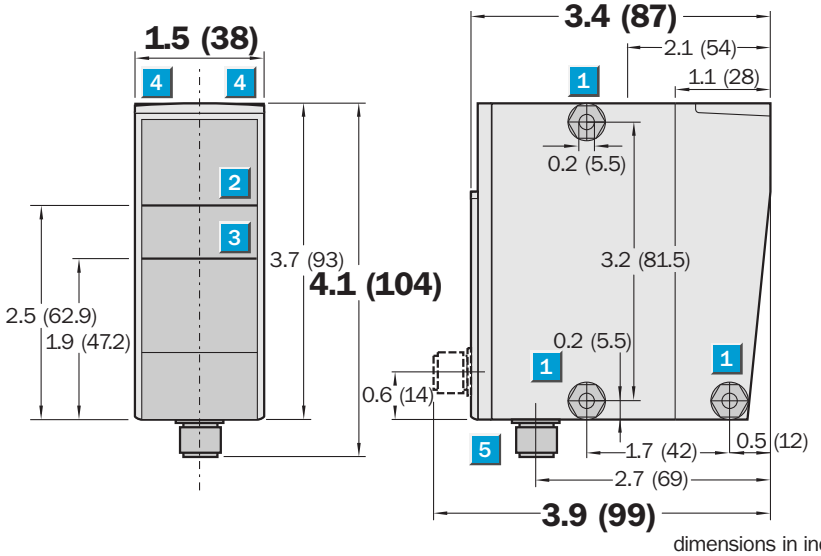
0.7...65.6 ft (0.2...20 m)
sensing range

Highlights

- Distance to diamond grade tape
- Reflex sensor with two programmable outputs
- Test input
- Red light alignment aid for easy set up
- Laser with time of flight technology for distance sensing
- Reliably detects reflex tape up to 65.6 ft (20 m) away
- Outputs set with the push of a button

DS 60

Dimensional Drawing



dimensions in inches (mm)

Adjustments

DS 60-P/-N11121

1 Mounting holes Ø 5.5 mm (through hole)
2 Optical axis, sender
3 Optical axis, receiver
4 Output indicators
5 Plug, M12 5-pin
6 Control panel

Order Information

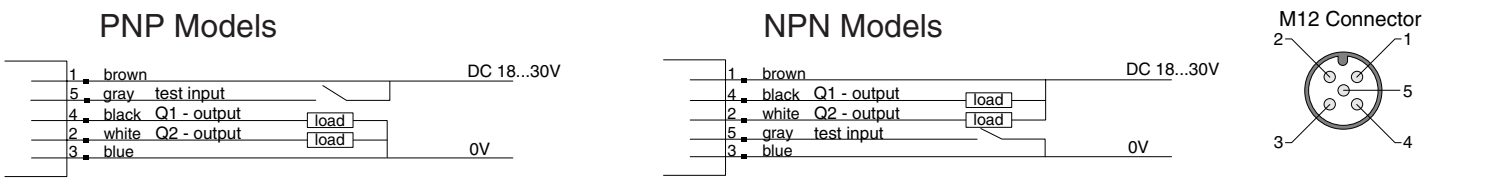
Type	Part no.
DS 60-P11121	1 016 397
DS 60-N11121	1 016 492

Accessories	page
Cables and connectors	909
Mounting brackets	928
Reflectors	936

Technical Data	DS 60-	P11121	N11121							
Sensing range	0.7...65.6 ft (0.2...20 m)	■	■							
Light source[1]	Laser, infrared light, Class I	■	■							
Light spot diameter	0.7. ft at 65.6 ft (0.2 m at 20 m)	■	■							
Supply voltage V_S[2]	18...30 V DC	■	■							
Power consumption[3]	< 3 W	■	■							
Ripple[4]	≤ 5 V_{SS}	■	■							
Switching outputs (invertible)	Q_1, Q_2	■	■							
DS 60-P: PNP	HIGH = V_S – (< 2 V)/LOW = 0 V	■								
DS 60-N: NPN	HIGH = V_S/ LOW ≤ 2 V		■							
Output current I_A[5]	100 mA	■	■							
Response time/switching frequency	10 ms/50 Hz	■	■							
Switching threshold Q_1/Q_2	Adjustable (teach-in)	■	■							
Multi-function MF	Test input	■	■							
Sender on	< 2 V or unswitched	■								
	V_S – (< 2 V) or unswitched		■							
Sender off	> 12 V to < V_S	■								
	0 V to V_S – (> 12 V)		■							
Connection type	Plug, M12 5-pin	■	■							
VDE protection class[6]	⊡	■	■							
Laser protection class	1 (EN 60 825-1)	■	■							
Enclosure rating	IP 67/NEMA 6	■	■							
Ambient temperature T_A[7]	Operation -13...122°F (-25...50°C)	■	■							
	Storage -13...167°F (-25...75°C)	■	■							
Approximate weight	7.2 oz (202 g)	■	■							
Housing material	Glass fiber reinforced ABS	■	■							

1) Average service life 100,000 h at T_A = 25°C
2) Limit values, reverse-polarity protected
3) Without load
4) May not exceed or fall short of V_S tolerances
5) Outputs Q_1 and Q_2 short-circuit protected
6) Reference voltage DC 50 V
7) Do not bend below 0°C

Connection Diagram

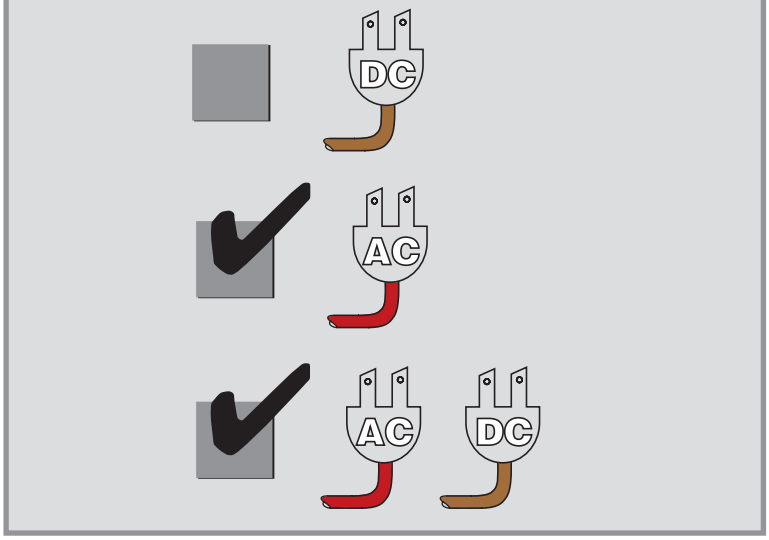


wire colors refer to standard cable, not included

SICK

Reflex/Retro-Reflective Sensors

Reflex/Retro-Reflective Sensors



WL 1000

Reflex/Retro-Reflective Sensors

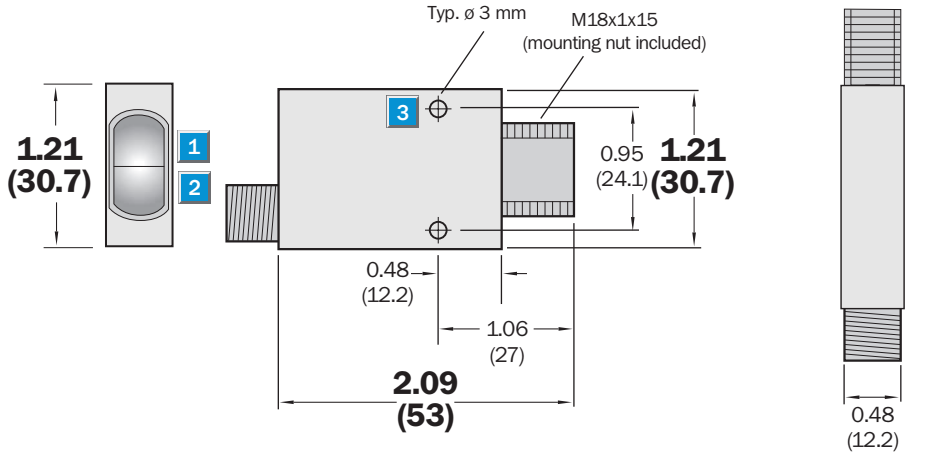
0...13.8 ft (0...4.2 m)
sensing range

Highlights

- Polarized reflex sensor
- Stress-free molded lens for more efficient polarization and superior error rejection
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

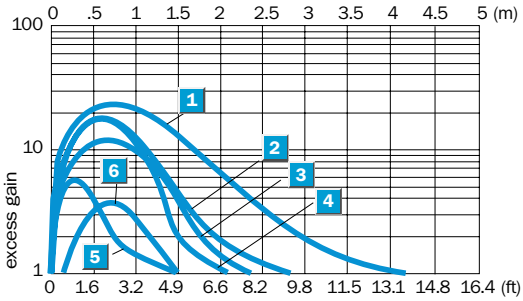
WL 1000

Dimensional Drawing



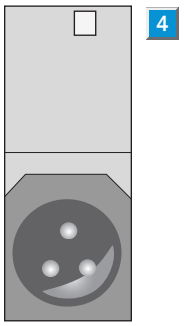
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Reflector Type		Sensing Range
1	PL 80 A	0.01...4.2 m
2	PL 50 A	0.01...2.7 m
3	PL 40 A	0.01...2.6 m
4	P 975	0.01...2.5 m
5	PL 30 A	0.01...2.3 m
6	PL 20 A	0.01...1.4 m
7	Reflective tape diamond grade	0.01...1.4 m

Order Information	
Type	**Part no.**
WL 1000-S132	7 025 935
WL 1000-S330	7 025 937
WL 1000-S331	7 025 938
WL 1000-T132	7 023 833
WL 1000-T330	7 023 834
WL 1000-T331	7 025 940

Accessories	page
Cables and connectors	910
Mounting brackets	925, 926
Reflectors	936

Technical Data	WL 1000-	S132	S330	S331	T132	T330	T331
Sensing range[1]	0...13.8 ft (0...4.2 m)	■	■	■	■	■	■
Light source[2], **light type**	LED, red light, 660 nm, polarized	■	■	■	■	■	■
Light spot diameter	Approx. 4.5 in at 9.8 ft (115 mm at 3 m)	■	■	■	■	■	■
Angle of divergence	Approx. 2.5°	■	■	■	■	■	■
Supply voltage V_S	24...240 V AC	■	■	■	■	■	■
Leakage current, max.	1.7 mA (OFF state)	■	■	■	■	■	■
Switching outputs	Triac	■	■	■	■	■	■
Max. output current I_A	5...100 mA (5...300 mA at ≤50°C)	■	■	■	■	■	■
Switching mode	Light operate				■	■	■
	Dark operate	■	■	■			
Response time[3]	8.3 µs	■	■	■	■	■	■
Max. switching frequency[4]	60 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, micro 3-pin		■			■	
	Plug, micro 3-pin, cable, 150 mm			■			■
VDE protection class[5]	⧈	■	■	■	■	■	■
Circuit protection	Interference pulse suppression	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Sensing range with:
PL80A 13.8 ft (4.2 m)
PL50A 8.9 ft (2.7 m)
PL40A 8.5 ft (2.6 m)
P975 8.2 ft (2.5 m)
PL30A 7.5 ft (2.3 m)
PL20A 4.6 ft (1.4 m)
Diamond grade tape 4.6 ft (1.4 m)

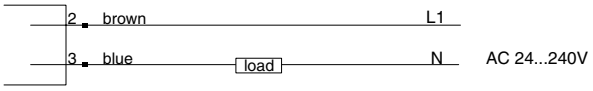
2) Average service life 50,000 h where $T_A = 25°C$

3) Signal transit time with resistive load

4) With light/dark ratio 1:1

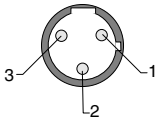
5) Reference voltage 250 V AC

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

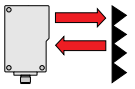
Micro Connector



SICK

WL 23

Reflex/Retro-Reflective Sensors



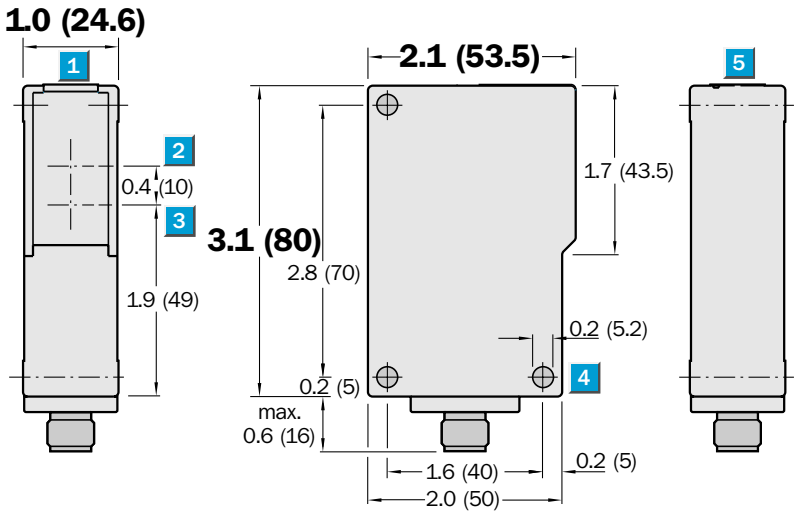

0...29.5 ft (0...9 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Low-cost sensor
- Wide range supply voltage
- Polarizing filters prevent false readings on reflective surfaces

WL 23

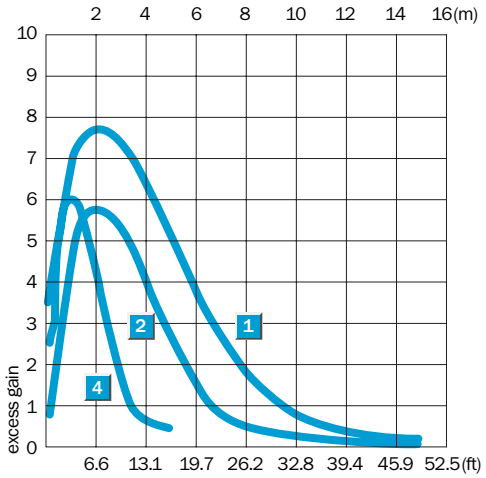
Dimensional Drawing



dimensions in inches (mm)

1 Output indicator
2 Center of optical axis, sender
3 Center of optical axis, receiver
4 Mounting hole Ø 5.2 mm
5 Alignment sight

Excess Gain



Reflector Type		Sensing Range
1	PL 80 A	0.1...9.0 m
2	P 975	0.1...6.0 m
3	PL 40 A	0.1...6.0 m
4	PL 20 A	0.1...3.0 m

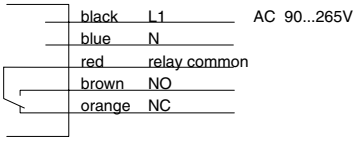
Order Information	
Type	**Part no.**
WL 23-S132	1 015 687

Accessories	page
Mounting brackets	923, 924
Reflectors	936

Technical Data	WL 23-	S132
Sensing range	0...29.5 ft (0...9 m)/PL 80 A	
Light source[1], **light type**	LED, visible red light, polarized	
Light spot diameter	Approx. 1.6 in at 8.9 ft (40 mm at 2.70 m)	
Supply voltage V_S	90...265 V AC	
Power consumption	< 2 VA	
Switching outputs	Relay, SPDT, isolated[2]	
Max. switching voltage	90…265 V AC	
Max. switching current	2.5 A	
Max. switching capacity	150 VA	
Response time	6 ms	
Max. switching frequency[3]	10 Hz	
Connection type	Cable[4], 2 m	
VDE protection class[5]	⧈	
Circuit protection[6]	A, C	
Enclosure rating	IP 65	
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	
	Storage -40...167°F (-40...75°C)	
Approximate weight	3.5 oz (100 g)	
Polarizing filter		
Housing material	Glass fiber reinforced ABS	

1) Average service life 100,000 h at T_A = 25°C
2) Provide suitable spark suppression for inductive or capacitive loads
3) With light/dark ratio 1:1
4) Do not bend below 0°C
5) Reference voltage 250 V AC
6) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



SICK

WL 27-2

Reflex/Retro-Reflective Sensors

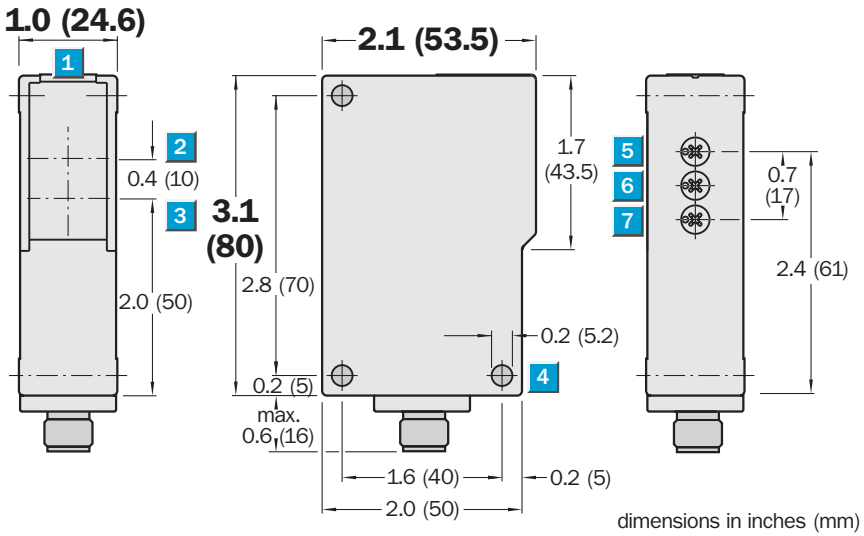
0...45.9 ft (0...14 m)
sensing range

Highlights

- Red light for easy alignment
- Selectable time delays
- Rugged plastic housing
- Wide range supply voltage
- Sensitivity adjustment
- Crosstalk immunity
- Polarizing filters prevent false readings on reflective surfaces
- Cable or mini quick disconnect

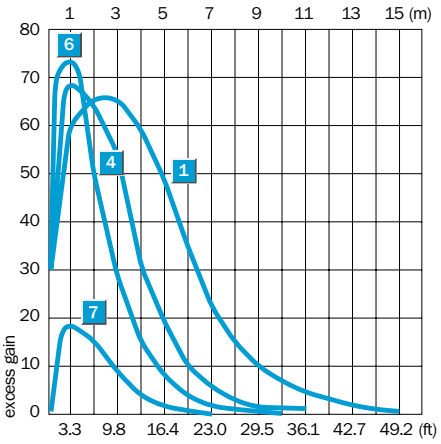
WL 27-2

Dimensional Drawing



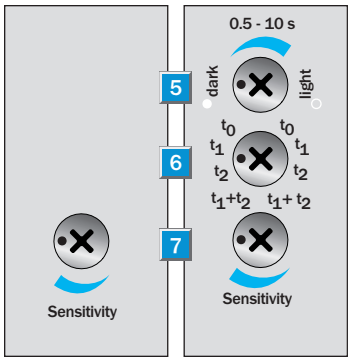
dimensions in inches (mm)

Excess Gain



Adjustments

WL 27-2S132	WL 27-2R830
WL 27-2S030 S18	



1	LED signal strength indicator
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 5.2 mm
5	Time control
6	Time delay selector switch
X	Light switching
●	Dark switching
7	Sensitivity adjustment

Switch-selectable Time Delay

0.5 – 10 s

t_0	Without time delay
t_1	ON-delay from interruption of light path
t_2	OFF-delay from reset of light path
$t_1 + t_2$	ON- and OFF-delay

Reflector Type		Sensing Range
1	PL 80 A	0.1…14.0 m
2	P975	0.3…10.0 m
3	PL 50 A	0.1…10.0 m
4	PL 40 A	0.1…9.0 m
5	PL 30 A	0.1…9.5 m
6	PL 20 A	0.1…7.0 m
7	Reflective tape diamond grade	0.3…4.3 m

Order Information	
Type	**Part no.**
WL 27-2-S132	1 015 110
WL 27-2S030 S18	1 015 896
WL 27-2R830	1 016 072

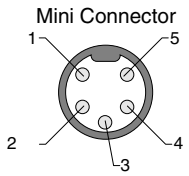
Accessories	page
Cables and connectors	911
Mounting brackets	923, 924, 935
Reflectors	936

Technical Data	WL 27-2-	S132	S030S18	R830
Sensing range	0...45.9 ft (0...14 m)/PL 80 A			
Sensitivity	Adjustable			
Light source[1], **light type**	LED, red light polarized			
Light spot diameter	Approx. 8.7 in at 0.4 in (220 mm at 10 mm)			
Supply voltage V_S	24...240 V UC (+ 10%, – 20%)			
Current consumption	< 2 VA			
Switching outputs	Relay, SPDT, electrically isolated[2]			
Max. switching voltage	250 V AC / 120 V DC			
Max. switching current	4 A / 240 V AC or 24 V DC			
Max. switching capacity	AC 1000 V A / DC 100 W			
Response time	< 6 ms			
Max. switching frequency[3]	10 Hz			
Timing	0.5…10 s (ON delay, OFF delay, ON/OFF delay)			
Connection types	Cable[4], 2 m			
	Plug, mini 5-pin			
VDE protection class[5]	⧈			
Circuit protection[6]	A, C			
Enclosure rating	IP 67			
Ambient temperature T_A	Operation -40...140°F (-40...60°C)			
	Storage -40...167°F (-40...75°C)			
Approximate weight	3.5 oz (100 g)			
Polarizing filter				
Housing material	Glass fiber reinforced ABS			

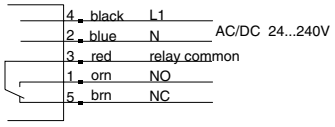
1) Average service life 100,000 h at $T_A = +25$ °C
2) Provide suitable spark suppression for inductive and capacitive loads.
3) With light/dark ratio 1:1
4) Do not bend below 0 °C
5) Reference voltage 250 V AC
6) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

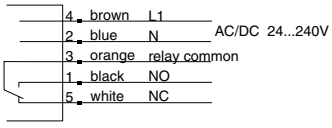
WL 27-2S030S18



WT 27-2S132



WT 27-2R830



wire colors refer to standard cable,
not included with quick disconnect models

SICK

WL 250

Reflex/Retro-Reflective Sensors

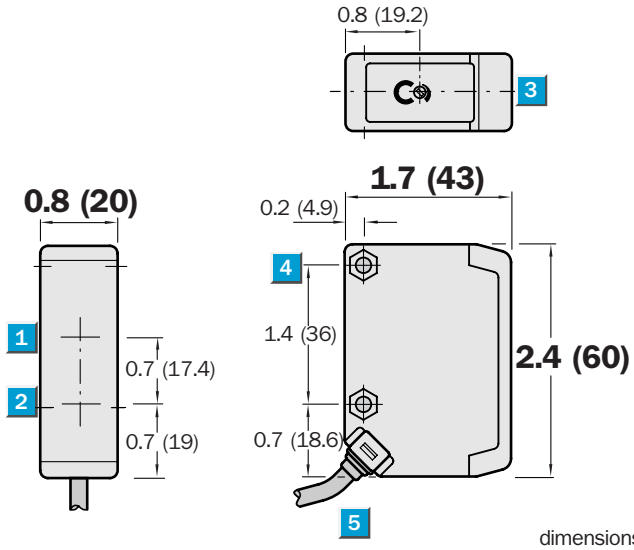
0.3...44.3 ft (0.01...13.5 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Sensitivity adjustment
- Wide range supply voltage
- Polarizing filters prevent false readings on reflective surfaces

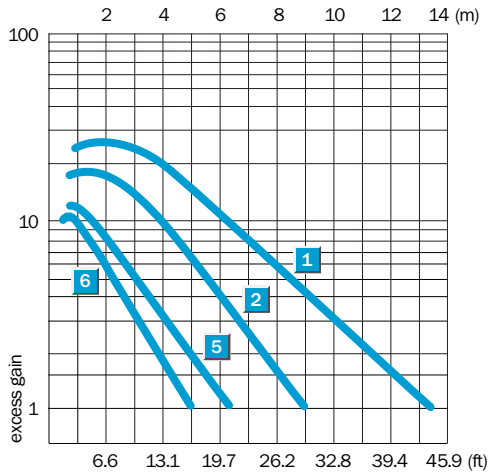
WL 250

Dimensional Drawing



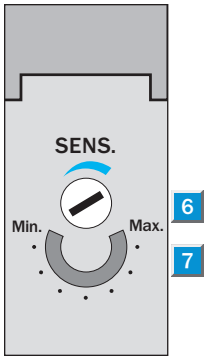
dimensions in inches (mm)

Excess Gain



Adjustments

WL 250-S132



1 Receiver axis
2 Sender axis
3 Red LED signal strength indicator
4 Through borehole Ø 4.2 mm, for M4 hexagon nut on both sides
5 Connection cable
6 Sensitivity adjustment (2 turns), over-turn protection
7 Position indicator for sensitivity setting (270°)

Reflector Type		Sensing Range
1	PL 80 A	0.01...13.5 m
2	P 250	0.01...9.0 m
3	PL 50 A, PL 40 A	0.01...10.5 m
4	PL 30 A, PL 31 A	0.01..8.2 m
5	PL 20 A	0.01...6.3 m
6	Reflective tape diamond grade	0.01...5.0 m

Order Information	
Type	**Part no.**
WL 250-S132	6 010 611

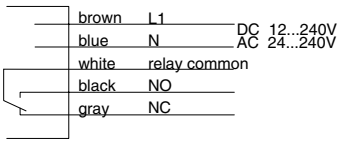
Accessories	page
Mounting brackets*	924, 935
Reflectors**	936

* included with delivery
** reflector P 250 included with delivery

Technical Data	WL 250-	S132								
Sensing range	03...29.5 ft (0.01...9 m)/P 250 (included)									
	03...44.3 ft (0.01...13.5 m)/PL 80 A									
Sensitivity, adjustable	Potentiometer, 2 turns,									
	with position indicator									
Light source[1], light type	LED, visible red light, polarized									
Light spot diameter	Approx. 15.7 in at 26.2 ft (400 mm at 8 m)									
Angle of divergence	Approx. 2.5°									
Supply voltage V_S[2]	12...240 V DC									
	24...240 V AC									
Power consumption	≤ 2 VA									
Switching outputs	Relay, SPDT, electrically isolated									
Switching current I_A max.[3]	3 A/240 V AC; 3 A/30 V DC									
Operation mode	Light switching									
Response time	≤ 15 ms									
Max. switching frequency[4]	33 Hz									
Connection type	Cable, PVC, 2 m[5] 5 x 0.76 mm², Ø 6.3 mm									
VDE protection class[6]	⧈									
Circuit protection[7]	A, C									
Enclosure rating	IP 67									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight	5.6 oz (160 g)									
Housing material	Glass fiber reinforced ABS									

1) Average service life at T_A = 25°C; LED, red light 100,000 h
2) ± 10%
3) Ensure spark extinguishing with inductive or capacitive load
4) With light/dark ratio 1:1, without time delay
5) Do not bend below 0°C
6) Reference voltage 250 V UC
7) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



WL 260

Reflex/Retro-Reflective Sensors

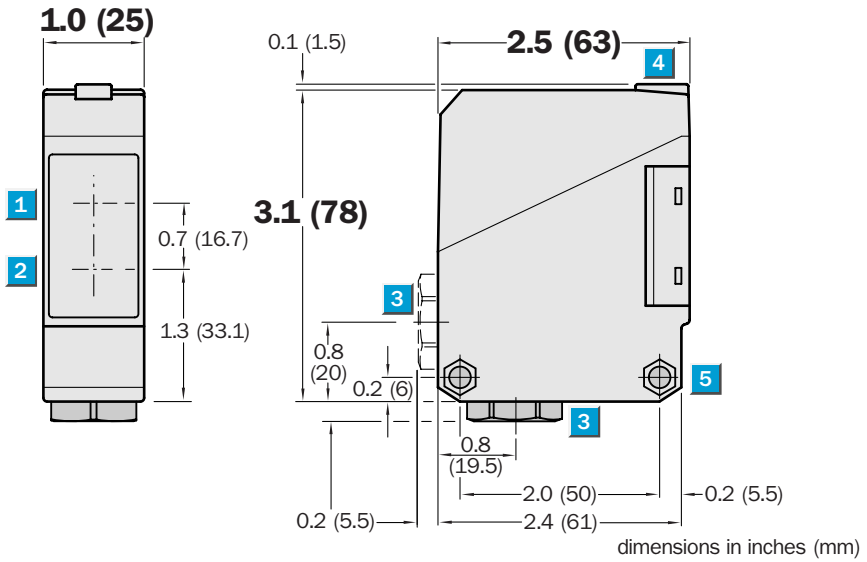
0.3...49.2 (0.01...15 m)
sensing range

Highlights

- Rugged plastic housing
- Polarizing filters prevent false readings on reflective surfaces
- Terminal chamber for connection flexibility
- Sensitivity adjustment
- Wide range supply voltage
- Adjustable time delays
- Reflector included

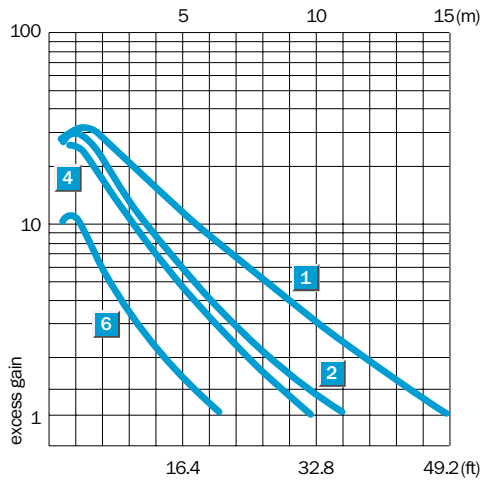
WL 260

Dimensional Drawing



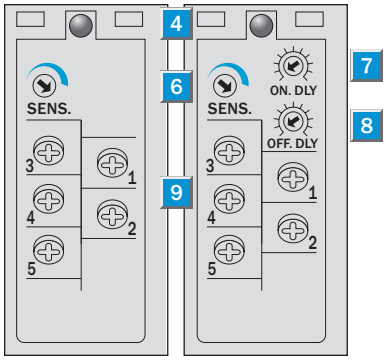
dimensions in inches (mm)

Excess Gain



Adjustments

WL 260-S270	WL 260-R270



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 1/2" terminal chamber PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear
4 LED signal strength indicator, red
5 Through hole Ø 5.2 mm on both sides for M5 hex nut
6 Sensitivity adjustment
7 Time control ON-delay t_{ON}
8 Time control OFF-delay t_{OFF}
9 Terminals

Reflector Type		Sensing Range
1	PL 80 A	0.01...15.0 m
2	P 250	0.01...11.0 m
3	PL 50 A, PL 40 A	0.01...12.5 m
4	PL 30 A, PL 31 A	0.01...9.7 m
5	PL 20 A	0.01...7.8 m
6	Reflective tape diamond grade	0.01...6.5 m

Order Information	
Type	**Part no.**
WL 260-S270	6 020 767
WL 260-R270	6 020 768

Accessories	page
Mounting brackets*	924, 935
Reflector P 250*	936

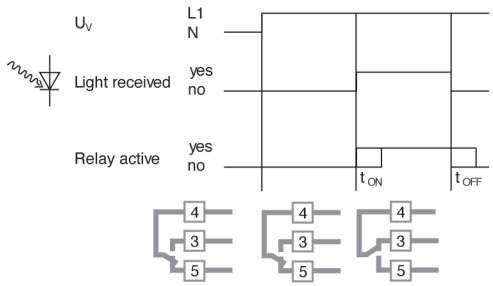
* included with delivery

Technical Data	WL 260-	S270	R270
Sensing range	0.3...36.1 ft (0.01...11 m)/P 250 (included)		
	0.3...49.2 ft (0.01...15 m)/PL 80 A		
Sensitivity	Adjustable, potentiometer 270°		
Light source[1], **light type**	LED, visible red light, polarized		
Light spot diameter	Approx. 11.8 in at 32.8 ft (300 mm at 10 m)		
Angle of divergence	Approx. 1.7°		
Supply voltage V_S[2]	12...240 V DC		
	24...240 V AC		
Power consumption	≤ 5 VA		
Switching output	Relay, SPDT, electrically isolated		
Switching current I_A max.[3]	3 A/240 V AC; 3 A/30 V DC		
Operation mode	Light switching		
Response time	≤ 20 ms		
Max. switching frequency[4]	25 Hz		
Time delays			
ON delay t_{ON}	0.1…10 s, can be connected separately		
OFF delay t_{OFF}	0.1…10 s, can be connected separately		
Connection type	Terminal chamber		
CE noise radiation	Level EN 50081-1		
	("Residential standard")		
VDE protection class[5]	□		
Circuit protection[6]	A, C		
Enclosure rating	IP 67		
Ambient temperature T_A	Operation -13...131°F (-25...55°C)		
	Storage -40...158°F (-40...70°C)		
Approximate weight	4.2 oz (120 g)		
Housing material	Glass fiber reinforced ABS		

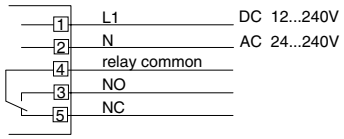
1) Average service life 100,000 h at T_A = 25°C
2) ± 10%
3) Provide suitable spark suppression for inductive or capacitive loads
4) With light/dark ratio 1:1
5) Reference voltage 250 V UC
6) A = V_s connections reverse-polarity protected
C = Interference suppression

Time Delays

t = 0.1–10 s



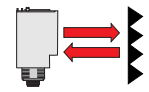
Connection Diagram



SICK

WL 2000

Reflex/Retro-Reflective Sensors



0...59 ft (0...18 m)

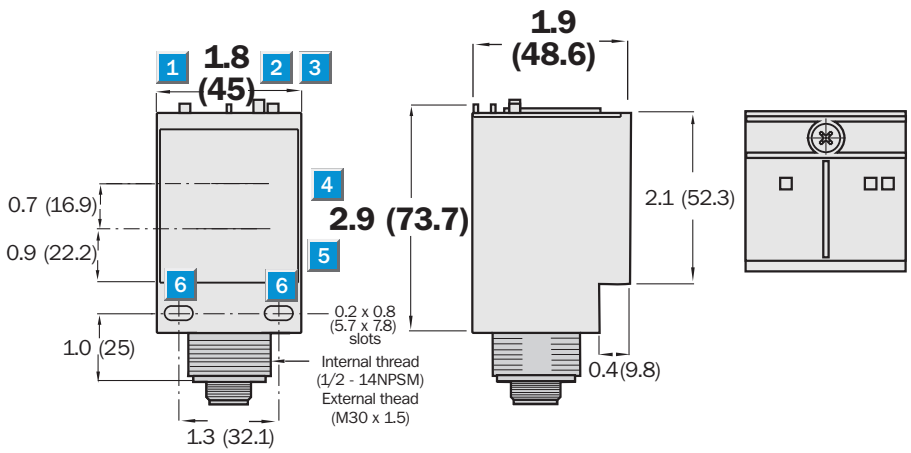
sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Wide range supply voltage
- Signal strength indicator
- Relay output, SPDT
- Polarizing filters prevent false readings on reflective surfaces
- Red light for easy alignment
- Cable or Mini quick disconnect versions

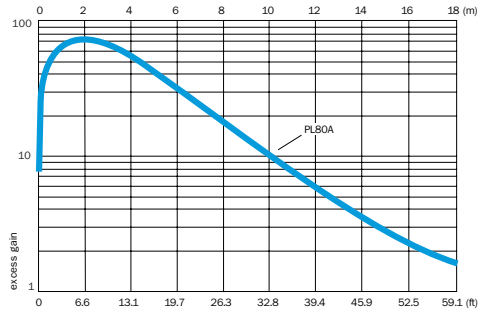
WI 2000

Dimensional Drawing



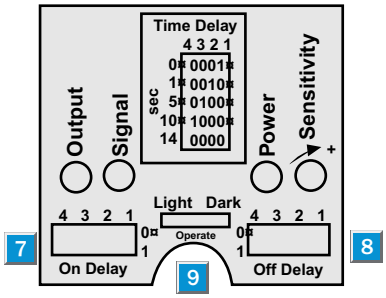
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 LED power indicator (green)
2 LED signal strength indicator (red)
3 LED output indicator (yellow)
4 Center of optical axis, sender
5 Center of optical axis, receiver
6 Mounting through-hole Ø 0.2 x 0.8 mm,
7 ON delay selector
8 OFF delay selector
9 Light/dark switching selector

	Reflector Type	Sensing Range
1	PL 80 A	1...15 m
2	PL 50 A	0...11 m
3	PL 40 A	0...11 m
4	PL 30 A	0...8 m
5	PL 20 A	0...8 m
6	Reflective tape diamond grade	0...8 m

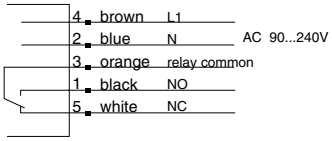
Order Information	
Type	**Part no.**
WL 2000-R1302	7 023 050
WL 2000-R1312	7 023 051
WL 2000-R1322	7 023 052
WL 2000-R5300	7 023 053
WL 2000-R5310	7 023 054
WL 2000-R5320	7 023 055

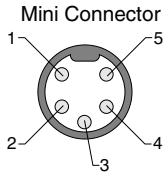
Accessories	page
Cables and connectors	911
Reflectors	936
Mounting brackets	927

Technical Data	WL 2000-	R1302	R1312	R1322	R5300	R5310	R5320
Sensing range, adjustable	0...59 ft (0...18 m)	■	■	■	■	■	■
Light source[1], **light type**	LED, red light, 660 nm, polarized	■	■	■	■	■	■
Light spot diameter	Approx. 12.5 in at 45.9 ft (320 mm at 14 m)	■	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■	■
Supply voltage V_S	24...240 V AC/DC	■	■	■	■	■	■
Current consumption[4]	≤ 6 W	■	■	■	■	■	■
Switching outputs	Relay, SPDT isolated	■	■	■	■	■	■
Switching voltage (Max.)	265 V	■	■	■	■	■	■
Switching current (Max.)	3 A	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[5]	≤ 10 ms	■	■	■	■	■	■
Max. switching frequency[6]	10 Hz	■	■	■	■	■	■
Time delay settings	0, 1, 5, 10 or 14 s		■		■	■	■
OFF delay			■			■	
ON/OFF delay				■			■
Connection types	Cable, 2 m, PVC	■	■	■			
	Plug, mini 5-pin				■	■	■
VDE protection class[8]	□	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

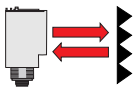




wire colors refer to standard cable, not included with quick disconnect models

WL 2000

Reflex/Retro-Reflective Sensors-Solid State



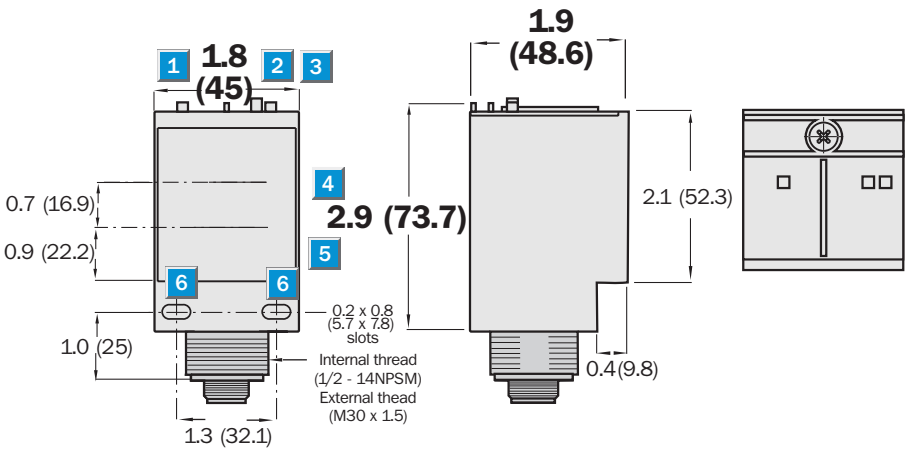
0...59 ft (0...18 m)
sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Wide range supply voltage
- Signal strength indicator
- Crosstalk immunity
- Polarizing filters prevent false readings on reflective surfaces
- Red light for easy alignment
- Cable or quick disconnect versions

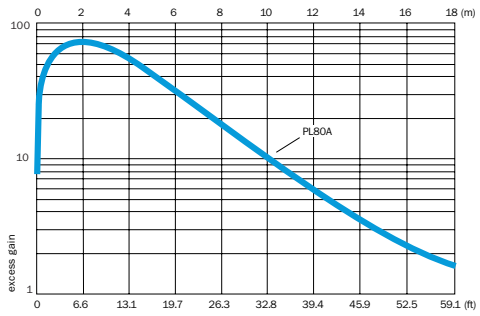
WL 2000

Dimensional Drawing



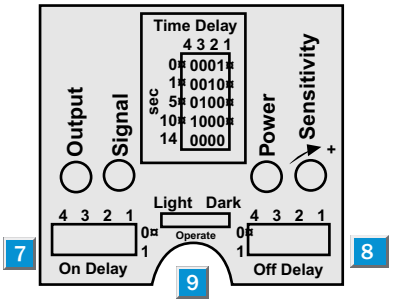
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1. LED power indicator (green)
2. LED signal strength indicator (red)
3. LED output indicator (yellow)
4. Center of optical axis, sender
5. Center of optical axis, receiver
6. Mounting through-hole Ø 0.2 x 0.8 mm,
7. ON delay selector
8. OFF delay selector
9. Light/dark switching selector

Reflector Type		Sensing Range
1	PL 80 A	1...15 m
2	PL 50 A	0...11 m
3	PL 40 A	0...11 m
4	PL 30 A	0...8 m
5	PL 20 A	0...8 m
6	Reflective tape diamond grade	0...8 m

Order Information	
Type	**Part no.**
WL 2000-M1302	7 023 402
WL 2000-M1312	7 023 401
WL 2000-M1322	7 023 400
WL 2000-M4300	7 023 411
WL 2000-M4310	7 023 410
WL 2000-M4320	7 023 409
WL 2000-M9300	7 023 414
WL 2000-M9310	7 023 413
WL 2000-M9320	7 023 412

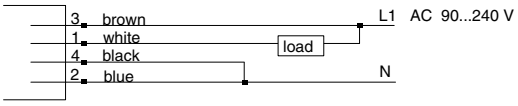
Accessories	page
Cables and connectors	910, 911
Reflectors	936
Mounting brackets	927

Technical Data	WL 2000-	M1302	M1312	M1322	M4300	M4310	M4320	M9300	M9310	M9320
Sensing range, adjustable	0...59 ft (0...18 m)	■	■	■	■	■	■	■	■	■
Light source[1], light type	LED, red light, 660 nm, polarized	■	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 12.5 in at 45.9 ft (320 mm at 14 m)	■	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■	■	■	■	■
Supply voltage V_S	90...240 V UC	■	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 6 W	■	■	■	■	■	■	■	■	■
Switching outputs	FET	■	■	■	■	■	■	■	■	■
Switching voltage (Max.)	240 V AC	■	■	■	■	■	■	■	■	■
Switching current (Max.)	150 mA	■	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■	■	■
Response time[5]	≤ 2 ms	■	■	■	■	■	■	■	■	■
Max. switching frequency[6]	250 Hz	■	■	■	■	■	■	■	■	■
Time delay settings	0, 1, 5, 10 or 14 s		■	■		■	■		■	■
OFF delay			■			■			■	
ON/OFF delay				■			■			■
Connection types	Cable, 2 m, PVC	■	■	■						
	Plug, mini 4-pin				■	■	■			
	Plug, micro 4-pin							■	■	■
VDE protection class[8]	□	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■	■	■	■

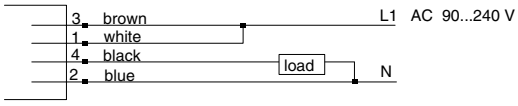
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

Mini / Cable Versions

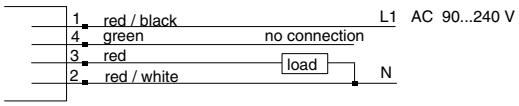


-OR-

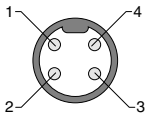


wire colors refer to standard cable, not included with quick disconnect models

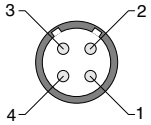
Micro Versions



Mini Connector



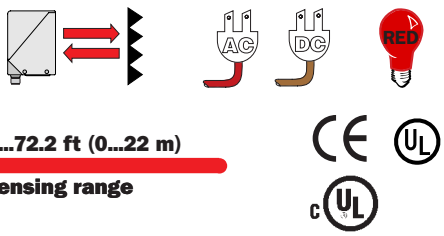
Micro Connector



SICK

WL 24-2

Reflex/Retro-Reflective Sensors



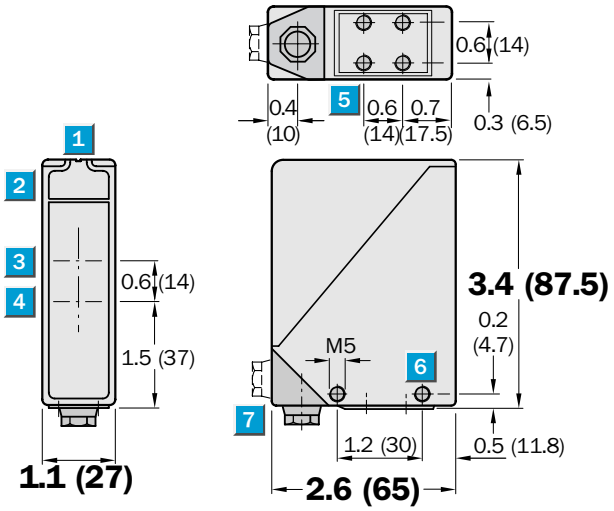
0...72.2 ft (0...22 m)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Cable connections swivel 90° for easy installation
- Adjustable sensing range
- Wide range supply voltage
- Crosstalk immunity
- Models available with integrated lens heater
- Optional dust shield, snow shield and cooling plates available

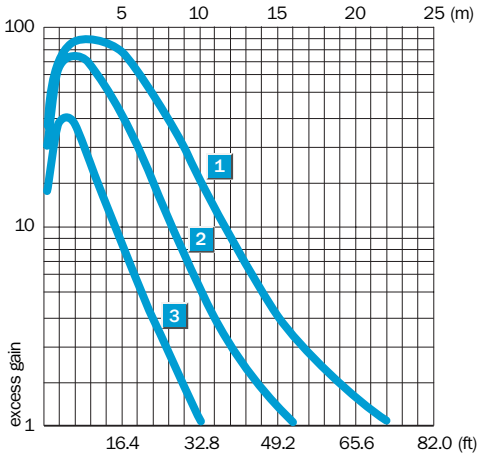
WL 24-2

Dimensional Drawing



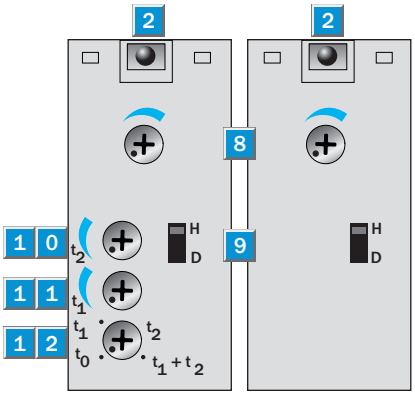
dimensions in inches (mm)

Excess Gain



Adjustments

WL 24-2R240	WL 24-2R230
WL 24-2R538	



1	Alignment sight
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	M5 threaded mounting hole, 6 mm deep
6	M5 threaded mounting hole, through-hole
7	PG terminal chamber rotatable by 90°
8	Sensitivity adjustment
9	Light/dark selector
10	Time control t_2 = OFF-delay
11	Time control t_1 = ON-delay
12	Time delay selector switch

Reflector Type		Sensing Range
1	PL 80 A	0...22.0 m
2	PL 50 A	0...16.0 m
3	PL 40 A	0...16.0 m
4	PL 30 A	0...10.0 m
5	PL 20 A	0...10.0 m

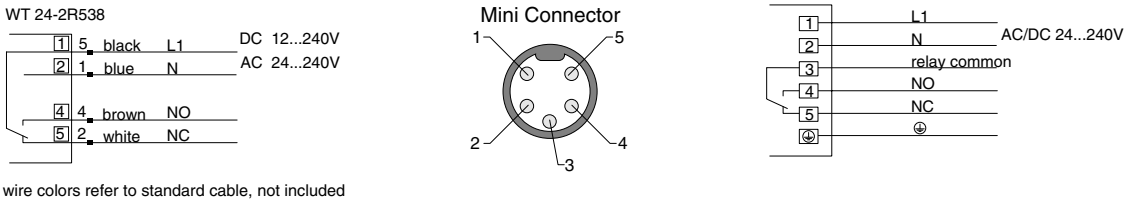
Order Information	
WL 24-2R230	1 017 858
WL 24-2R240	1 017 857
WL 24-2R538	1 018 313

Accessories	page
Cables and connectors	911
Mounting brackets	923, 935
Reflectors	936
Special Accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

Technical Data	WL 24-2-	R230	R240	R538
Sensing range	0...72.2 ft (0...22 m)/on PL 80 A	■	■	■
Sensitivity	Adjustable	■	■	■
Light source[1], **light type**	LED, red light, polarized	■	■	■
Light spot diameter	Approx. 9.8 in at 49.2 ft (250 mm at 15 m)	■	■	■
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]	■	■	■
Power consumption without heating	< 2 VA	■		■
Power consumption with heating	< 3 VA		■	
Switching output	Relay, SPDT, electrically isolated[4]	■	■	■
Wet contact	Relay, SPDT			■
Max. switching voltage	250 V AC/120 V DC	■	■	■
Max. switching current	4 A/240 V AC, 4 A/24 V DC	■	■	■
Max. switching capacity	AC: 1000 VA/DC: 100 W	■	■	■
Response time[5]	≤ 10 ms	■	■	■
Max. switching frequency[6]	10 Hz	■	■	■
Time delay	Adjustable, 0.5…10 sec		■	
Connection types	PG 9 terminal chamber	■	■	
	Plug, mini 5-pin			■
VDE protection class[7]	⧈	■	■	■
Circuit protection[8]	A, C	■	■	■
Enclosure rating	IP 67	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■
Front lens heating			■	
Polarizing filter		■	■	■
Housing material	Die cast zinc	■	■	■

1) Average service life 100,000 h at T_U = 25°C
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 250 V UC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



WL 34

Reflex/Retro-Reflective Sensors

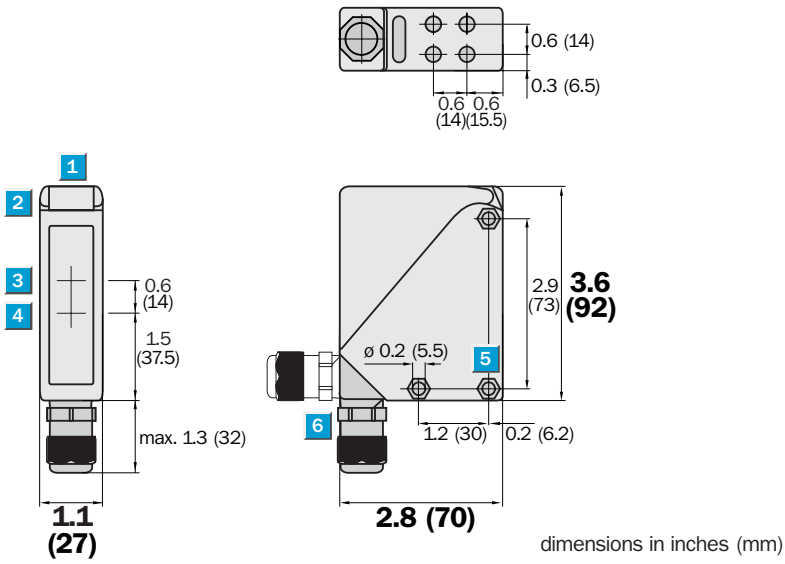
0...72.2 ft (0...22 m)
sensing range

Highlights

- Sturdy plastic housing
- Signal strength indicator
- Selectable time delays
- Wide range supply voltage
- Red light for easy alignment
- Terminal chamber for connection flexibility
- Cable connections swivel 90° for easy installation

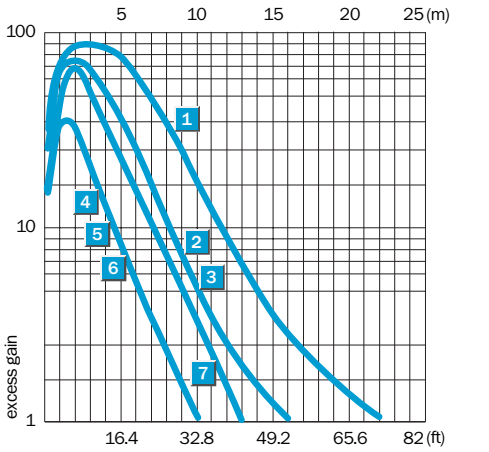
WL 34

Dimensional Drawing



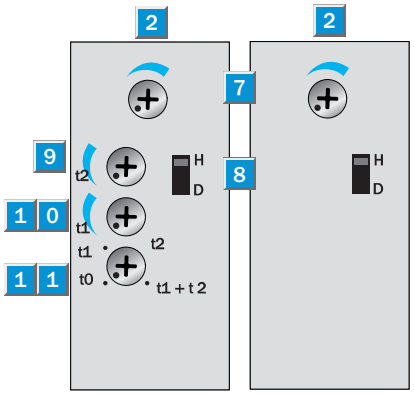
dimensions in inches (mm)

Excess Gain



Adjustments

WL 34-R240	WL 34-R230



1	Alignment sight
2	LED signal strength indicator
3	Center of optical axis, sender
4	Center of optical axis, receiver
5	Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
6	M16 screw fixing rotatable by 90°
7	Sensitivity control
8	Light/dark selector
9	Time control t_2 = OFF-delay
10	Time control t_1 = ON-delay
11	Time delay selector switch

Reflector Type	Sensing Range
1 PL 80 A	1...22.0 m
2 PL 50 A	0...16.0 m
3 PL 40 A	0...16.0 m
4 PL 30 A	0...10.0 m
5 PL 20 A	0...10.0 m
6 Reflective tape diamond grade	0...10.0 m

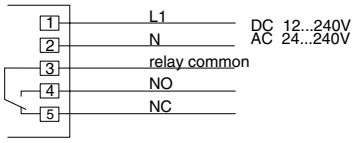
Order Information	
Type	**Part no.**
WL 34-R230	1 019 249
WL 34-R240	1 019 250

Accessories	page
Reflectors	936
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

Technical Data	WL 34-	R230	R240							
Sensing range	0...72.2 ft (0...22 m)/on PL 80 A	■	■							
Sensitivity	Adjustable	■	■							
Light source[1], light type	LED, red light, polarized	■	■							
Light spot diameter	Approx. 9.8 in at 49.2 ft (250 mm at 15 m)	■	■							
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]	■	■							
Power consumption	< 2 VA	■	■							
Switching output	Relay, SPDT, electrically isolated[4]	■	■							
Max. switching voltage	250 V AC/120 V DC	■	■							
Max. switching current	4 A/240 V AC, 4 A/100 VA DC	■	■							
Max. switching capacity	1000 VA AC/100 W DC	■	■							
Response time[5]	≤ 10 ms	■	■							
Max. switching frequency[6]	10 Hz	■	■							
Time delay	Adjustable, 0.5 to 10 s		■							
Connection type	M16 terminal chamber	■	■							
VDE protection class[7]	□	■	■							
Circuit protection[8]	A, C	■	■							
Enclosure rating	IP 67	■	■							
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■							
	Storage -40...167°F (-40...75°C)	■	■							
Approximate weight	4.9 oz (140 g)	■	■							
Polarizing filter		■	■							
Housing material	Glass fiber reinforced ABS	■	■							

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) Signal flight time for ohmic loads
6) With light/dark ratio 1:1
7) Withstand voltage 250 V UC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



WL 36

Reflex/Retro-Reflective Sensors

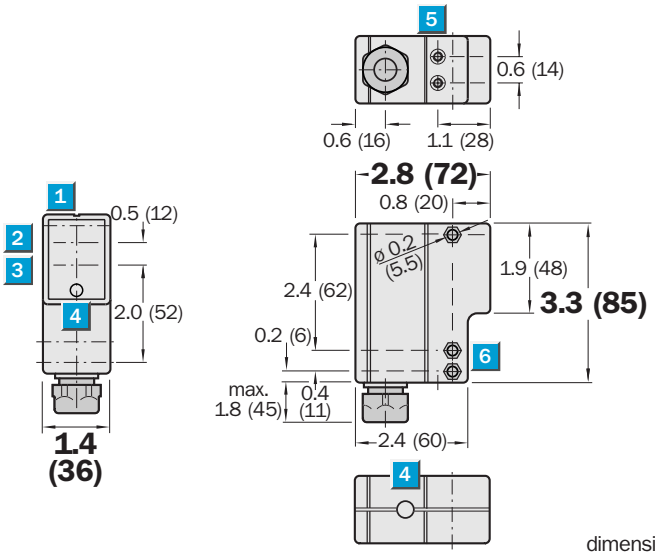
0...72.2 ft (0...22 m)
sensing range

Highlights

- Rugged plastic housing
- Visible red light for easy alignment
- Wide range supply voltage
- Selectable time delays
- High output current
- Sensitivity adjustment
- Signal strength indicator
- Polarizing filters prevent false readings on reflective surfaces

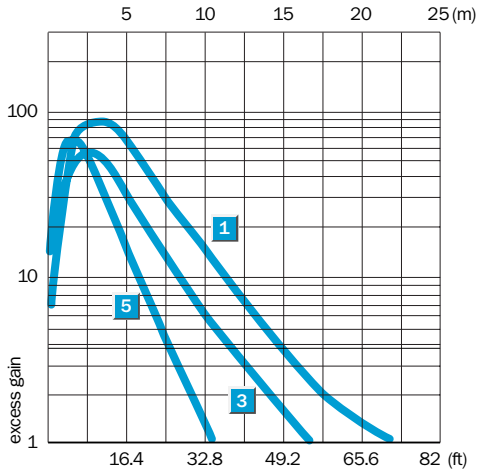
WL 36

Dimensional Drawing



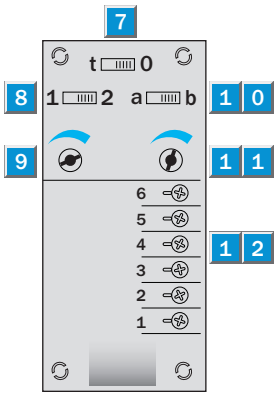
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Alignment sight
2 Center of optical axis, receiver
3 Center of optical axis, sender
4 LED signal strength indicator
5 M5 threaded mounting hole – 5.5 mm deep
6 Mounting holes
recesses on both sides for M5 hex nuts
7 ON/OFF timer switch
t = Time ON, 0 = Time OFF
8 Time delay
1 ON-delay
2 OFF-delay
9 Time control 0.5 to 12 s
10 Light/dark selector
a = Light switching, b = Dark switching
11 Sensitivity adjustment
12 Terminal connections

Reflector Type		Sensing Range
1	PL 80 A	0.1...22.0 m
2	P 975	0.3...12.0 m
3	PL 50 A	0.1...18.0 m
4	PL 40 A	0.1...16.0 m
5	PL 30 A	0.1...16.0 m
6	PL 20 A	0.1...11.0 m
7	Reflective tape diamond grade	0.25...3.0 m

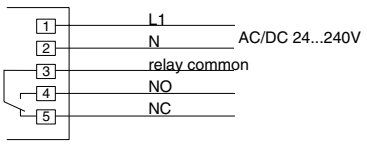
Order Information	
Type	**Part no.**
WL 36-R230	1 005 387
WL 36-R730	1 008 849
WL 36-R930	1 008 507

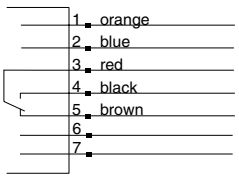
Accessories	page
Cables and connectors	915
Mounting brackets	924, 935
Reflectors	936
Attachable heated cover	959

Technical Data	WL 36-	R230	R730	R930
Sensing range	0...72.2 ft (0...22 m)/PL 80 A	■	■	■
Sensitivity	Adjustable	■	■	■
Light source[1], **light type**	LED, red light, polarized	■	■	■
Light spot diameter	Approx. 2.0 in at 9.8 ft (50 mm at 3 m)	■	■	■
Supply voltage V_S	24...240 V UC (+ 10%/– 25%)	■	■	■
Power consumption	< 2 VA	■	■	■
Switching output	Relay, SPDT, electrically isolated[2]	■	■	■
Max. switching voltage	AC: 250 V / DC: 120 V	■	■	■
Max. switching current	4 A / 240 V AC or 24 V DC	■	■	■
Max. switching capacity	AC: 1000 VA / DC: 100 W	■	■	■
Response time	≤ 20 ms	■	■	■
Max. switching frequency[3]	10/s	■	■	■
Light/dark switching	Switch-selectable	■	■	■
Connection types	PG 11 terminal chamber	■		
	Plug, square 7-pin		■	
	1/2" NPSM terminal chamber			■
VDE protection class[4]	⧈	■	■	■
Circuit protection[5]	A, C	■	■	■
Enclosure rating	IP 67	■		■
	IP 65		■	
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■
Approximate weight	5.8 oz (165 g)	■	■	■
Polarizing filter		■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■

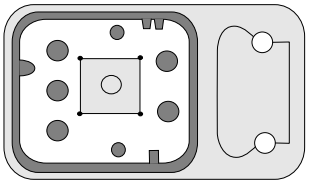
1) Average service life 100,000 h at T_A = 25°C
2) Provide suitable spark suppression for inductive or capacitive loads
3) With light/dark ratio 1:1
4) Reference voltage 250 V AC
5) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram





wire colors refer to standard cable, not included



SICK

WL 45

Reflex/Retro-Reflective Sensors

0...180.4 ft (0...55 m)

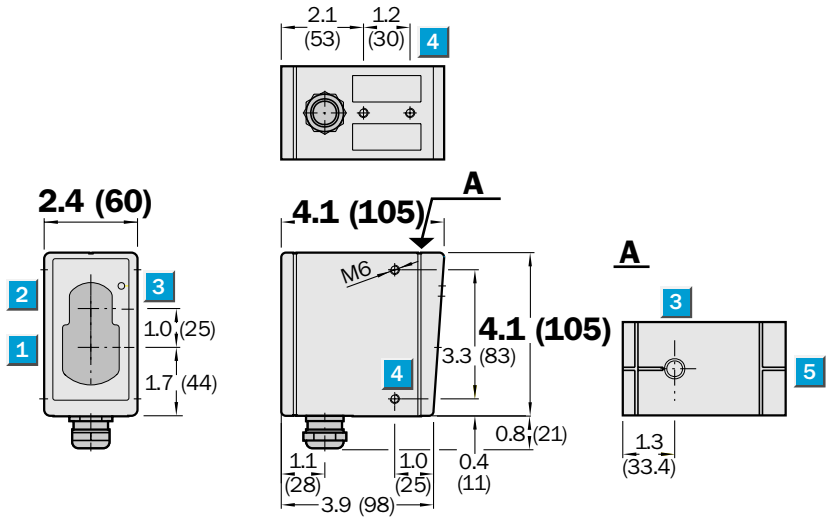
sensing range

Highlights

- Rugged metal housing
- Red light for easy alignment
- Sensitivity adjustment
- Wide range supply voltage
- High output current
- Signal strength indicator
- Alarm output and test input
- Polarizing filters prevent false readings on reflective surfaces
- Models available with integrated lens heater

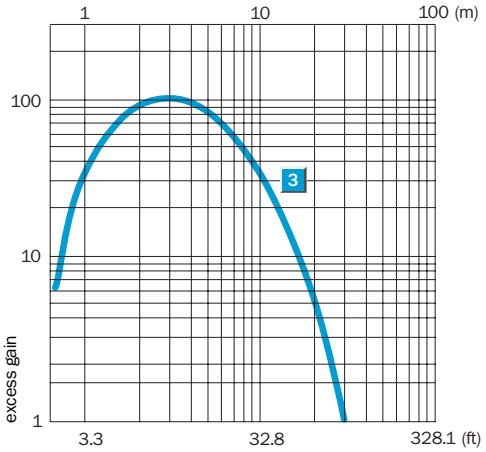
WL 45

Dimensional Drawing



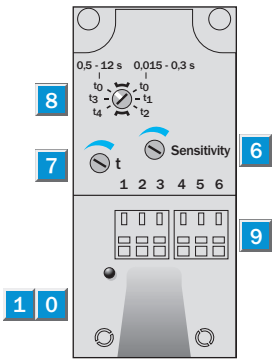
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 LED signal strength indicator
4 M6 threaded mounting hole – 8 mm deep
5 Alignment sight
6 Sensitivity adjustment
7 Time adjustment
8 Time delay selector switch
left: light switching, right: dark switching
9 Terminal strip
10 Status indicator

Switch-selectable Time Delay

0.5 – 12 s

t_0 without time delay
t_1 ON-delay when object enters detection zone
t_2 OFF-delay when object leaves detection zone

Reflector Type		Sensing Range
1	OP 60 –∞	1...55.0 m
2	4 x PL 80	0...35.0 m
3	PL 80 A	0...30.0 m
4	P 975	0.1...18.0 m
5	PL 50	0...14.0 m
6	PL 30	0...11.0 m
7	Reflective tape diamond grade	0.3...10.0 m

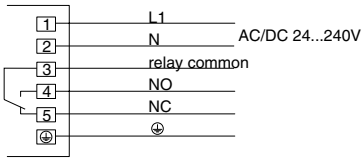
Order Information	
Type	**Part no.**
WL 45-R250	1 008 841
WL 45-R260	1 008 562
WL 45-R950	1 010 561
WL 45-R960	1 010 562

Accessories	page
Mounting brackets	935
Reflectors	936
Cooling plates	958
Dust shield	955
Weather hood	955

Technical Data	WL 45-	R250	R260	R950	R960
Sensing range	0...180.4 ft (0...55 m)/OP 60	■	■	■	■
Sensitivity	Adjustable	■	■	■	■
Light source[1], light type	LED, visible red light, polarized	■	■	■	■
Light spot diameter	Approx. 9 in at 52.5 ft (230 mm at 16 m)	■	■	■	■
Supply voltage V_S	24...240 V UC (+ 10%, – 25%)	■	■	■	■
Power consumption	≤ 3 VA		■		■
	≤ 6 VA, front lens heating	■		■	
Switching outputs	Relay, SPDT, isolated[2]	■	■	■	■
Max. switching voltage	AC: 250 V / DC: 120 V	■	■	■	■
Switching current	4 A / 240 V AC or 24 V DC	■	■	■	■
Max. switching capacity	AC: 1000 VA / DC: 1000 W	■	■	■	■
Response time	≤ 20 ms	■	■	■	■
Max. switching frequency[3]	10/s	■	■	■	■
Connection type	PG 13.5 terminal chamber	■	■		
	1/2" NPSM terminal chamber			■	■
VDE protection class	⏚	■	■	■	■
Circuit protection[4]	A, C	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A[5]	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	1.8 lb (800 g)	■	■	■	■
Front lens heating		■		■	
Polarizing filter		■	■	■	■
Housing material	Metal	■	■	■	■

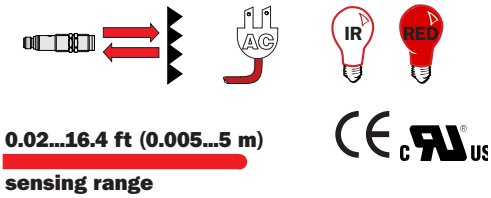
1) Average service life 100,000 h at $T_A = 25°C$
2) Provide suitable spark suppression for inductive or capacitive loads
3) With light/dark ratio 1:1
4) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
5) Up to 140°C with cooling plates (see Accessories)

Connection Diagram



VL 18

Reflex/Retro-Reflective Sensors



0.02...16.4 ft (0.005...5 m)
sensing range

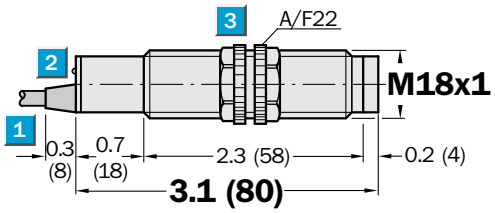
Highlights

- Rugged plastic housing
- Wide range supply voltage
- High output current
- Cable or M12 quick disconnect versions
- Easy mounting with included nuts
- Standard 18 mm size

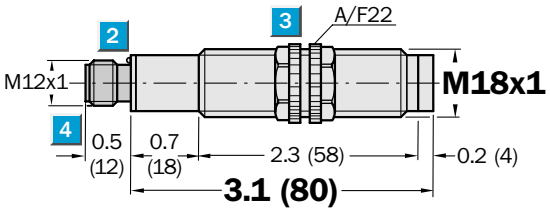
VL 18

Dimensional Drawing

VL 18-2T2132
VL 18-2T2162



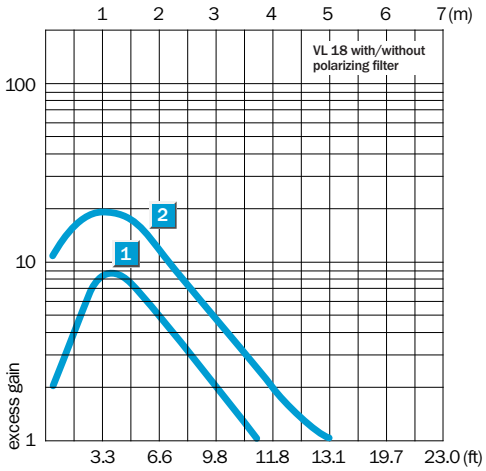
VL 18-2T2430
VL 18-2T2460



dimensions in inches (mm)

1 Connecting cable
2 Signal strength indicator
3 Fastening nuts, width across 22 mm, (included)
4 Plug, M12 4-pin

Excess Gain



Polarizing Filter	Reflector Type	Sensing Range
1 yes	P 975	0.01...3.5 m
2 no	P 975	0.01...5.0 m

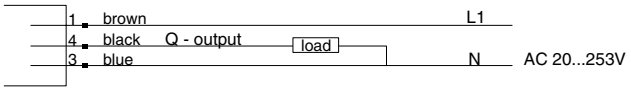
Order Information	
Type	**Part no.**
VL 18-2T2162	6 011 377
VL 18-2T2460	6 011 379
VL 18-2T2132	6 011 376
VL 18-2T2430	6 011 378

Accessories	page
Cables and connectors	909
Mounting brackets	925, 926
Reflectors	936

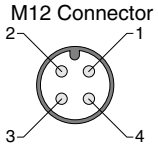
Technical Data	VL 18-2T-	2162	2460	2132	2430
Housing	M18, straight	■	■	■	■
Sensing range	0.02...11.5 ft (0.005 ... 3.5 m)/P 975	■	■		
Light source[1], light type	LED, red light, polarized	■	■		
Sensing range	0.02...16.4 ft (0.005 ... 5.0 m)/P 975			■	■
max. typical/on reflector					
Light source[1], light type	LED, infrared light, without polarizing filter			■	■
Light spot diameter	Approx. 1.2 in at 118.1 in (30 mm at 300 cm)	■	■	■	■
Angle of divergence	Approx. 6°	■	■	■	■
Supply voltage V_S[2]	20 ... 253 V AC/50 ... 60 Hz	■	■	■	■
Current consumption[3]	≤ 30 mA	■	■	■	■
Switching output	Triac	■	■	■	■
Switching current I_A max.	5 to 300 mA	■	■	■	■
voltage drop	3 V max. (U = 250 V AC)	■	■	■	■
max. switching current	6 A/10 ms; f = 10 Hz	■	■	■	■
leakage current	max. 1.5 mA (V_S = 250 V AC)	■	■	■	■
Switching voltage	V_S	■	■	■	■
Operation mode	Dark switching	■	■	■	■
Response time[4]	≤ 20 ms	■	■	■	■
Max. switching frequency[5]	25 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[6]; 3 x 0.34 mm², Ø 4.7 mm	■		■	
	Plug, M12 4-pin		■		■
VDE protection class[7]	⧈	■	■	■	■
Circuit protection[8]	C	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A	-13...158°F (-25...70°C)	■	■	■	■
Approximate weight	3.4 oz (95 g)	■		■	
	1.1 oz (30 g)		■		■
Housing material	PBT/PC	■	■	■	■

1) Average service life 100,000 h at T_U =25°C
2) Limit values
3) Without load
4) With resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0°C
7) Reference voltage 250 V AC
8) C = Interference suppression

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.



Theory of Operation...Clear Material Sensors

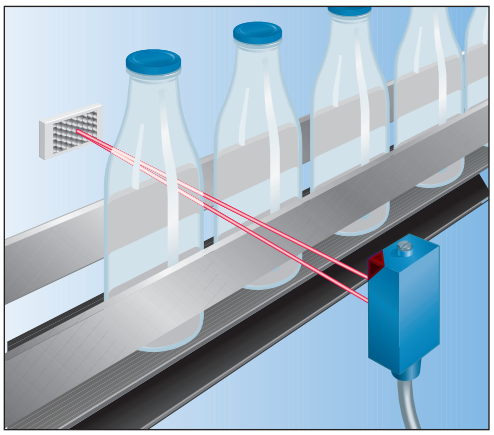
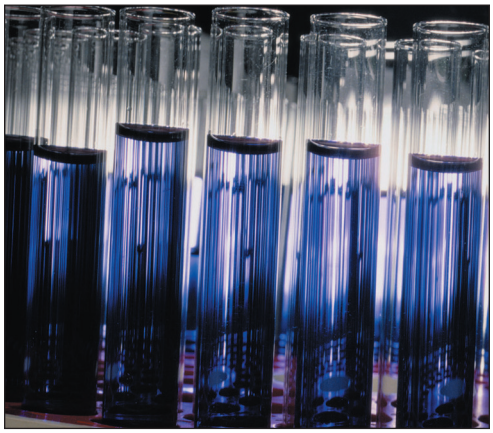
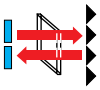


Fig. 1 Clear material sensing





About Clear Material Sensors

Clear material sensors require only a small amount of the light beam to be broken. The design of the device has a very stabilized and constant light output and a very stabilized receiving and switching threshold element. In addition to clear objects, this type of device can be used to detect small objects, including objects smaller than the effective light beam.

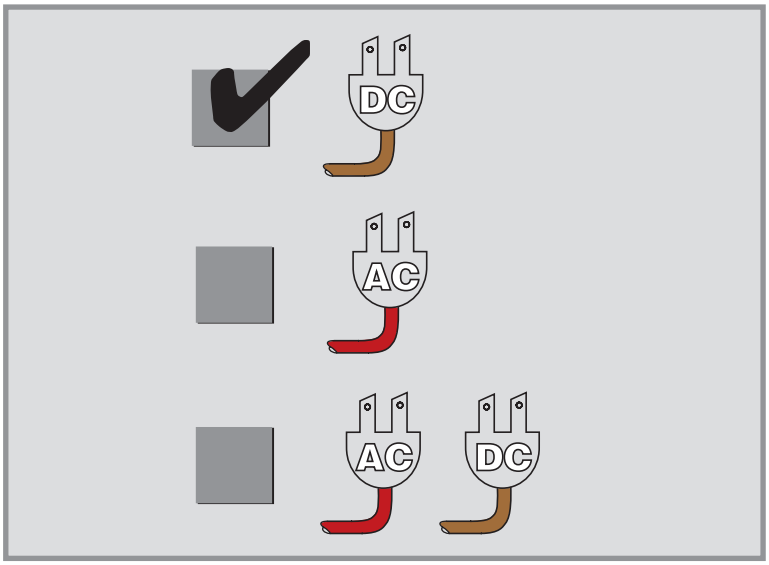
In the past, steady contamination of the sensors caused by leaked products, dust, mist or splash-water had a major detrimental effect on the reliability of detection because the reflector signal, attenuated by the dirt deposits, increasingly approximated the switching threshold which often very quickly led to sensor failure. In contrast, the "glass detection method", employed in the WL 12 G, provides an extremely high degree of detection and switching reliability. This method basically involves maintaining the difference in level between the reflector and switching signal. The switching threshold is adjusted to the unbroken light beam between the sensor and reflector. Various operating modes can be selected depending on the anticipated signal attenuation.

The switching threshold is evaluated by a microprocessor and continually adapted to any contamination – whereby the difference between the reflector signal and switching threshold is maintained electronically. There is, therefore, no dilution of the difference between the reflector signal (weakened by contamination) and the previously taught-in switching threshold, thus preventing detection problems.

Consequently, the device only requires maintenance in the case of severe contamination resulting in the system limit of the sensor being reached. This is considerably later than with conventional sensors. After cleaning, the original signal level and threshold value are automatically restored.

Clear material sensors can be used for filling systems, presence verification, jam detection, monitoring the flow of bottles and bottle counting. They are reliable, easy-to-install, low-maintenance sensors that stand up to use in washdown conditions.

Clear Material Sensors



WT 4-2

Clear Material Sensors

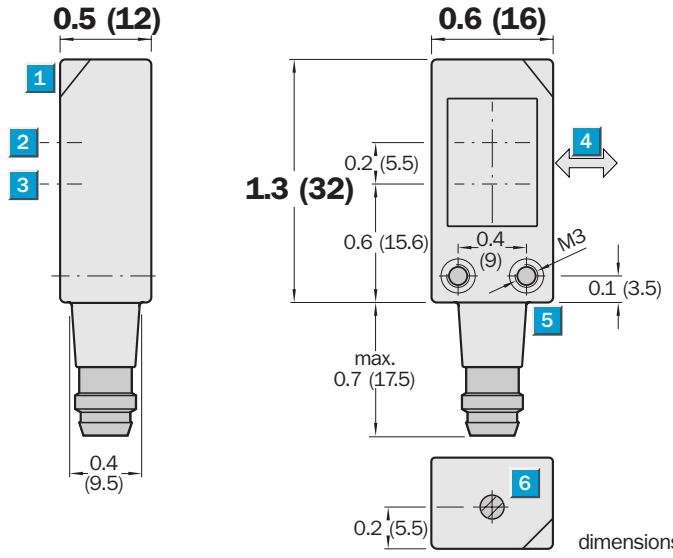
0.2...1.4 in (5...35 mm)
sensing range

Highlights

- Rugged plastic housing
- Adjustable background suppression
- Ultra-sensitivity for detection of clear objects or small parts
- Crosstalk immunity
- Outputs short circuit protected
- Power supply reverse polarity protected
- Cable or M8 quick disconnect

WT 4-2

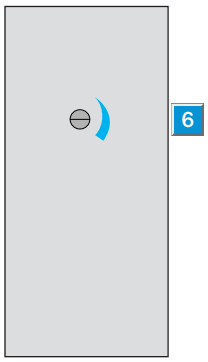
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 LED signal strength indicator
2 Optical axis, receiver
3 Optical axis, sender
4 Standard direction of the material being scanned
5 M3 threaded mounting hole
6 Scanning distance adjustment

Order Information

Type	Part no.
WT 4-2P133S17	1 016 947
WT 4-2P431S18	1 016 962
WT 4-2N132S22	1 018 458
WT 4-2N132S19	1 018 048

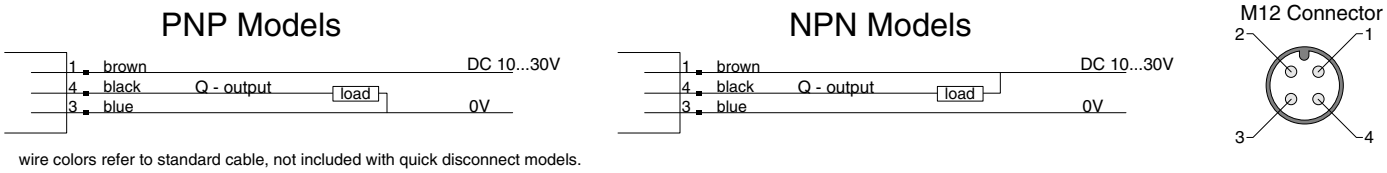
Accessories

	page
Cables and connectors	909
Mounting brackets	932, 935

Technical Data	WT 4-2-	P133 S17	P431 S18	N132 S22	N132 S19
Detection of transparent objects		■	■	■	■
Attenuation along light beam		■	■	■	■
Attenuation difference		■	■	■	■
Sensitivity		■	■	■	■
Sensing range	0.2...1.4 in (5...35 mm)		■		■
	fixed at 0.9 in (22 mm)	■		■	
Light source[1], **light type**	LED, red light	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{ss}	■	■	■	■
Current consumption[4]	≤ 20 mA (no load)	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light switching	■	■	■	■
Response time[5]	≤ 3.3 ms	■	■	■	■
Max. switching frequency[6]	150 Hz	■	■	■	■
Connection types	Cable, 2 m			■	■
	Cable, 3 m	■			
	Plug, M12 4-pin, cable, 100 mm		■		
VDE protection class[8]	⏀	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	1.4 oz (20 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

SICK

WL 150

Clear Material Sensors

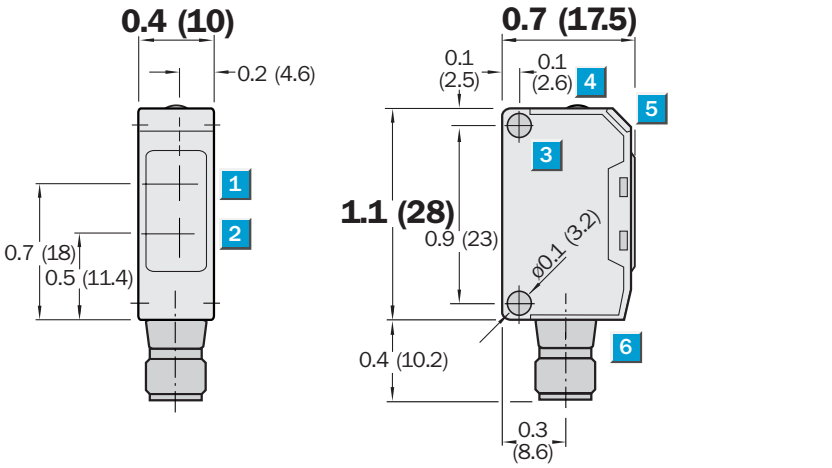
0.3...2.2 ft (0.01...0.7 m)
sensing range

Highlights

- Rugged plastic housing
- Signal strength indicator
- Sensitivity adjustment
- Ideal for detecting glass, transparent films or small parts
- Cable or M8 quick disconnect versions available

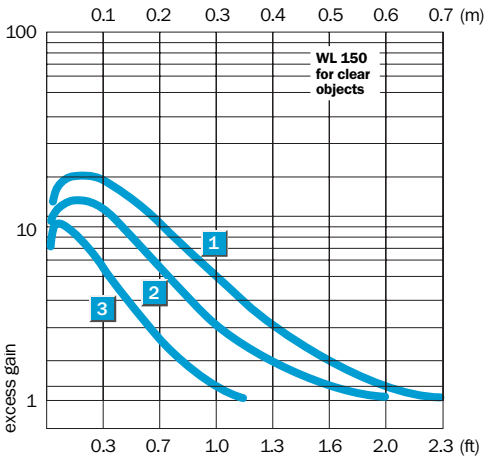
WL 250

Dimensional Drawing



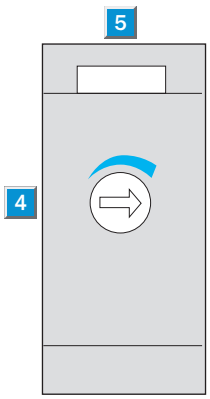
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Mounting hole Ø 3.2 mm
4	Sensitivity adjustment 270°
5	LED indicator, red
6	M8 plug or cable

Reflector Type		Sensing Range
1	PL 80 A	0.01…0.7 m
2	P 250	0.01…0.6 m
3	PL 20 A	0.01…0.35 m

Order Information	
Type	**Part no.**
WL 150-P122	6 020 686
WL 150-P420	6 020 688
WL 150-N122	6 020 683
WL 150-N420	6 020 685

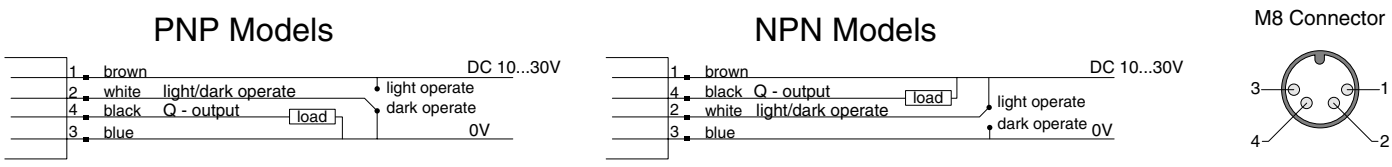
Accessories	page
Cables and connectors	908
Mounting brackets*	919
Reflectors**	936

* included with delivery
** reflector PL 20 A included with delivery

Technical Data	WL 150-	P122	P420	N122	N420
Detection of transparent objects		■	■	■	■
Attenuation along light beam	min. 20%	■	■	■	■
Attenuation difference along light beam	min. 15%	■	■	■	■
Attenuation difference of object	min. 7.5%	■	■	■	■
Sensitivity, adjustable	Potentiometer, 270°	■	■	■	■
Sensing range	0.3...1.1 ft (0.01...0.35 m)/PL 20 A (included)	■	■	■	■
	0.3...2.2 ft (0.01...0.7 m)/PL 80 A	■	■	■	■
	Reflective tape: not suitable				
Light source[1], light type	LED, red light, polarized	■	■	■	■
Light spot diameter	Approx. 1.6 in at 11.8 ft (40 mm at 300 mm)	■	■	■	■
Angle of divergence	Approx. 7.5°	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■
Ripple[3]	± 10%	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Max. output current I_A	100 mA	■	■	■	■
Operation mode[5]	Light/dark switching via control wire	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[6]	≤ 0.5 ms	■	■	■	■
Max. switching frequency[7]	1000 Hz	■	■	■	■
Connection types	Cable, PVC, 2 m[8]; 4 x 0.18 mm², Ø 3.5 mm	■		■	
Plug, M8 4-pin			■		■
VDE protection class[9]	⧈	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■		■	
Approximate weight	1.6 oz (44 g)		■		■
	0.3 oz (7 g)	■		■	
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Control cable open:
NPN: light-switching
PNP: dark-switching
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference impulse suppression
D = Outputs overcurrent and short-circuit protected

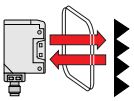
Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

WL 170

Clear Material Sensors

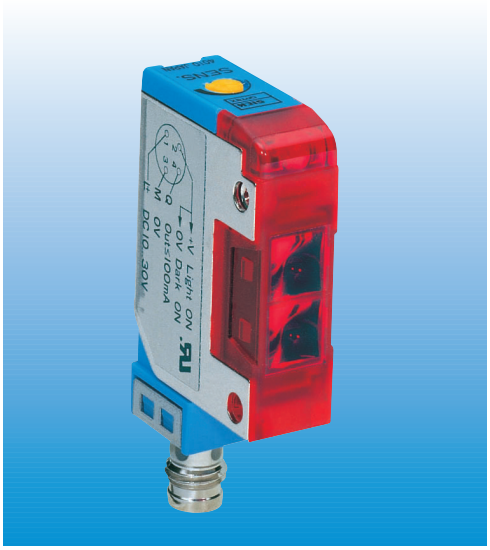



0.3...2.6 ft (0.1...0.8 m)
sensing range

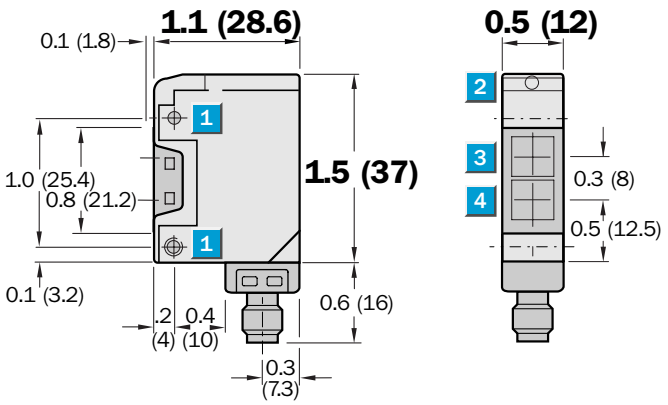
Highlights

- Ideal for the detection of glass, transparent objects or small parts
- Rugged stainless steel/plastic housing
- Sensitivity adjustment
- Red light for easy alignment
- Ultra sensitivity for detection of glass, transparent objects or small parts
- Easy mounting with included brackets

WL 170

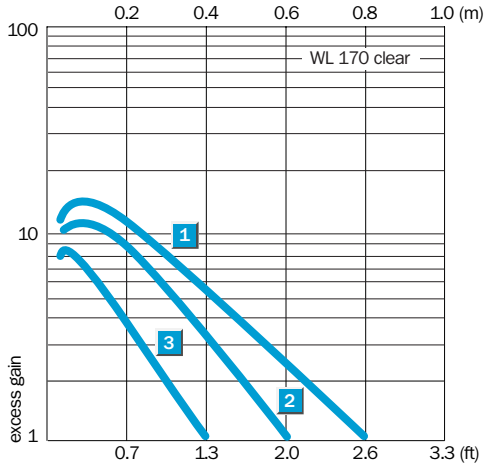


Dimensional Drawing



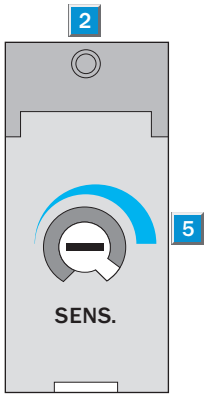
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Mounting holes Ø 3 mm with integrated M3 thread
2 LED signal strength indicator, red
3 Center of optical axis, receiver
4 Center of optical axis, sender
5 Sensitivity control (potentiometer, 270°)

Reflector Type		Sensing Range
1	PL 80 A	0.1...0.8 m
2	P 250	0.1...0.6 m
3	PL 20 A	0.1...0.4 m

Order Information	
Type	**Part no.**
WL 170-P122	6 010 185
WL 170-P420	6 010 186
WL 170-N122	6 010 187
WL 170-N420	6 010 188

Accessories	page
Cables and connectors	908
Mounting brackets*	919
Reflectors**	936

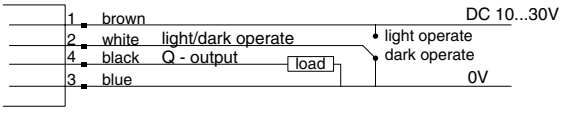
* included with delivery
** Reflector P 250 included with delivery

Technical Data	WL 170-	P122	P420	N122	N420					
Detection of transparent objects		■	■	■	■					
Attenuation along light beam	min. 20%	■	■	■	■					
Attenuation difference	min. 15%	■	■	■	■					
Sensitivity	Potentiometer, 270° (adjustable)	■	■	■	■					
Sensing range	0.3...2.0 ft (0.1...0.6 m)/P 250 (included)	■	■	■	■					
	0.3...2.6 ft (0.1...0.8 m)/PL 80 A	■	■	■	■					
	Reflective tape: not suitable									
Light source[1], **light type**	LED, red light, polarized	■	■	■	■					
Light spot size	Approx. 1.2 in at 1.6 ft (30 mm at 0.5 m)	■	■	■	■					
Angle of divergence	Focused: Ø approx. 0.2 in (5 mm)	■	■	■	■					
	where SR = 3.5 in (90 mm)									
Supply voltage V_S	10...30 V DC[3]	■	■	■	■					
Ripple[3]	± 10%	■	■	■	■					
Current consumption[4]	≤ 30 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light/dark switch. via control wire	■	■	■	■					
	+ V_S = light switching	■	■	■	■					
	0 V = dark switching	■	■	■	■					
Response time[5]	≤ 0.7 ms	■	■	■	■					
Max. switching frequency[6]	700 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[7]; 4 x 0.18 mm², Ø 3.8 mm	■		■						
	Plug, M8 4-pin		■		■					
VDE protection class[8]	⊡	■	■	■	■					
Circuit protection[9]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	0.9 oz (25 g)	■		■						
	2.3 oz (66 g)		■		■					
Housing material	Stainless steel/ABS	■	■	■	■					

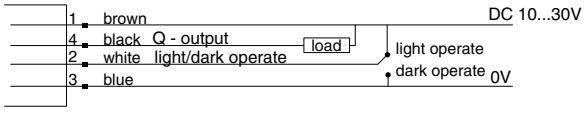
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

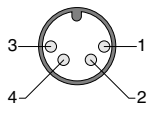
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models

SICK

WL 4G-2

Clear Material Sensors

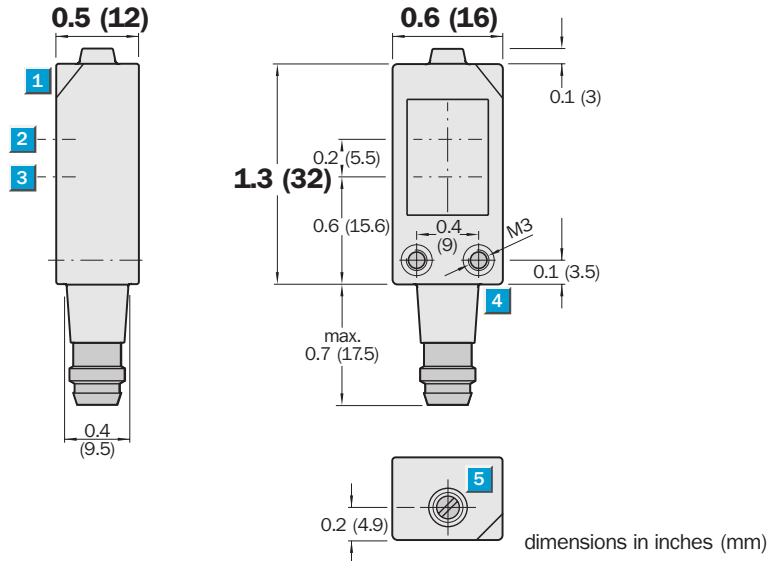
0...5.2 ft (0...1.6 m)
sensing range

Highlights

- Rugged plastic housing
- Immune to ambient light
- Crosstalk suppression
- Signal strength indicator
- Fast response time
- Small package size
- Ultra-sensitivity for detection of glass and transparent objects
- Polarizing filters prevent false readings on shiny objects

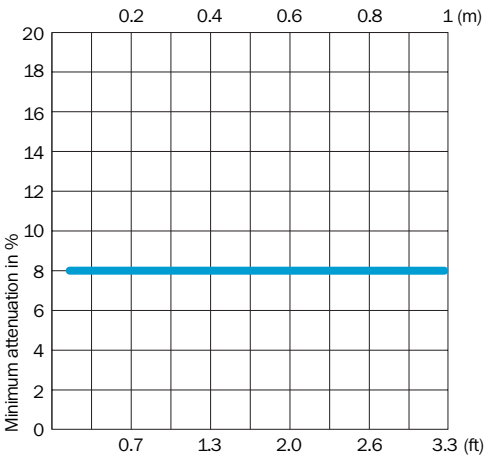
WL 4G-2

Dimensional Drawing



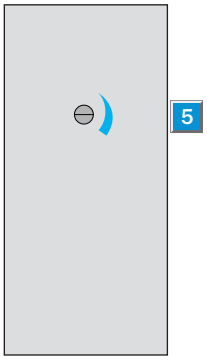
dimensions in inches (mm)

Attenuation Curve



Adjustments

All types



1 LED signal strength indicator
2 Optical axis, receiver
3 Optical axis, sender
4 M3 threaded mounting hole
5 Sensitivity control

Reflector Type		Sensing Range
1	PL 80 A	0.05...1.6 m
2	PL 50 A	0.05...1.0 m
3	PL 40 A	0.05...0.9 m
4	PL 30 A	0.05...0.65 m

Order Information

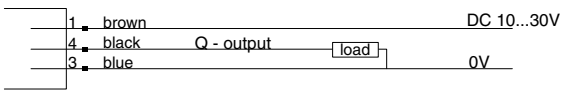
Type	Part no.
WL 4G-2F330	1 016 209
WL 4G-2E330	1 019 304

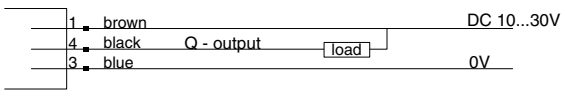
Accessories	page
Cables and connectors	908
Reflectors	936
Mounting brackets	932, 935

Technical Data	WL 4G-2-	F330	E330
Sensing range	0...5.2 ft (0...1.6 m)/PL 80 A	■	■
Sensitivity	Adjustable	■	■
Light source[1], light type	LED, red light, polarized	■	■
Light spot diameter	9.1 in at 4.9 ft (230 mm at 1.5 m)	■	■
Supply voltage V_S	10...30 V DC[2]	■	■
Ripple[3]	5 V_{SS}	■	■
Current consumption[4]	< 20 mA	■	■
Switching outputs	PNP, Q	■	
	NPN, Q		■
Operation mode	Dark switching	■	■
Output current I_A max.	100 mA	■	■
PNP; signal voltage HIGH	V_S – (< 2.5 V)	■	■
PNP; signal voltage LOW	Approx. 0 V	■	■
Response time[5]	< 500 µs	■	■
Max. switching frequency[6]	1000 Hz	■	■
Connection type	Plug, M8 3-pin	■	■
VDE protection class	⏀	■	■
Circuit protection[7]	A, B, C	■	■
Enclosure rating[8]	IP 67/NEMA 6	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■
	Storage -40...167°F (-40...75°C)	■	■
Approximate weight	1.4 oz (20 g)	■	■
Polarizing filter		■	■
Housing material	Glass fiber reinforced ABS	■	■

1) Average service life 100,000 h where T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
8) IP 67: with screw-in cable receptacles
IP 65: with plug-in cable receptacles

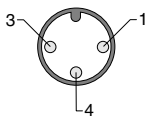
Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models.

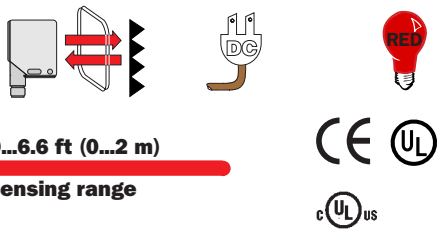
M8 Connector



SICK

WL 12G

Clear Material Sensors



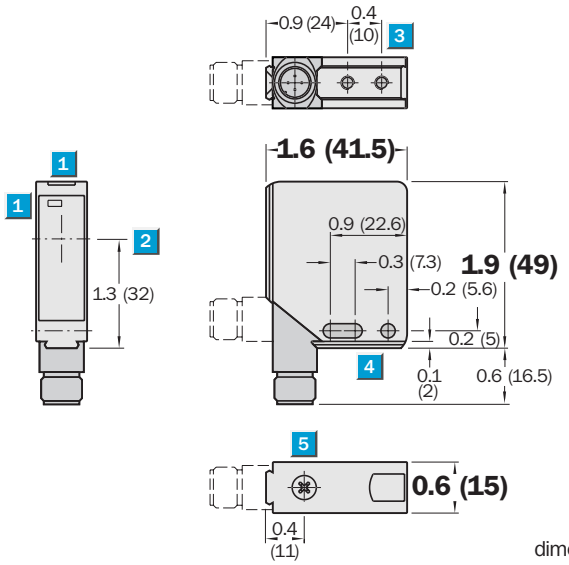
0...6.6 ft (0...2 m)
sensing range

Highlights

- Rugged die cast metal housing
- Ultra-sensitivity for detection of glass, transparent or small parts
- Red light for easy alignment
- Plausibility output
- Automatic sensitivity adjustment for changing conditions
- Immune to ambient light
- Crosstalk suppression

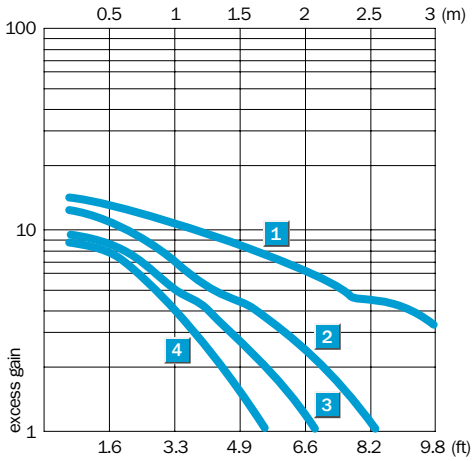
WL 12G

Dimensional Drawing



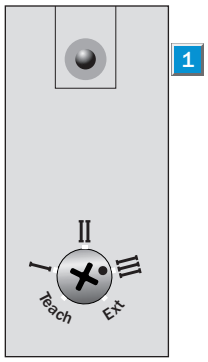
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1. LED signal strength indicator
2. Center of optical axis
3. M4 threaded mounting hole – 4 mm deep
4. Mounting holes Ø 4.2 mm
5. Function selector

Reflector Type		Sensing Range
1	PL 80 A	0...3.0 m
2	PL 40 A	0...2.5 m
3	PL 30 A	0...2.1 m
4	PL 20 A	0...1.6 m

Order Information	
Type	**Part no.**
WL 12G-P530	1 016 289
WL 12G-N530	1 016 309
WL 12G-V530	1 016 310
WL 12G-W530	1 016 311

Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921
Reflectors	936

* 2 pieces included with delivery

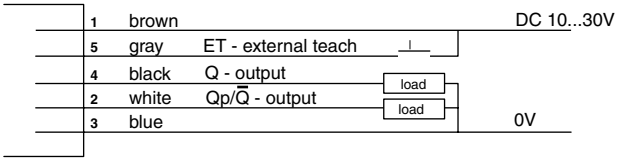
Technical Data	WL 12G-	P530	N530	V530	W530
Sensing range	0...6.6 ft (0...2 m)/PL 80 A	■	■	■	■
Sensitivity	Adjustable	■	■	■	■
Light source[1], light type	LED, red light, polarized	■	■	■	■
Light spot size	Approx. 0.3x0.5 in at 7.9 in (8x13 mm at 200 mm)	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 65 mA	■	■	■	■
Transistor switching outputs	PNP, Q and $\overline{Q}$	■			
	NPN, Q and $\overline{Q}$		■		
	PNP, Q and plausibility output			■	
	NPN, Q and plausibility output				■
Output current I_A max.	100 mA	■	■	■	■
Resp. time[5]/max. switching freq.[6]	≤ 0.5 ms/1000 Hz	■	■	■	■
Operating mode	Light or dark switching via complementary outputs	■	■		
	Light switching			■	■
Plausibility output Q_P				■	■
Reliable detection	Approx. 0 V			■	
	Approx. + V_S				■
incorrect setting	V_S – 2.9 V			■	
or severe pollution	Approx. 1.8 V				■
Teach input ET		■	■	■	■
Teach-in	≥ 10 V to + V_S	■	■	■	■
Normal operation	< 2 V or open input	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■
VDE protection class[7]	□	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...140°F (-25...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■	■	■	■
Polarizing filter		■	■	■	■
Housing material	Die cast zinc	■	■	■	■

Operating Range Setting		Set via rotary switch on device or via ET cable (+V_S to ET)
Mode I : 50 ms[9]	**Mode II : 150 ms[9]**	**Mode III : 250 ms[9]**
Switches at signal attenuation > 10%	Switches at signal attenuation > 18%	Switches at signal attenuation > 40%
Clean PET bottles	Clear-glass bottles	Colored glass or non-transparent objects

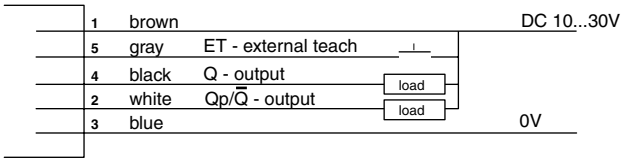
1) Average service life 100,000 h at T_A =25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression
9) Pulse duration via ET (control cable), duration set via rotary switch approx. 2 s

Connection Diagram

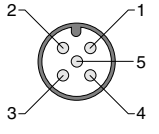
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included with quick disconnect models
*Qp plausability output ON V/W models, Q output on P/N models

SICK

WL 12-2

Clear Material Sensors

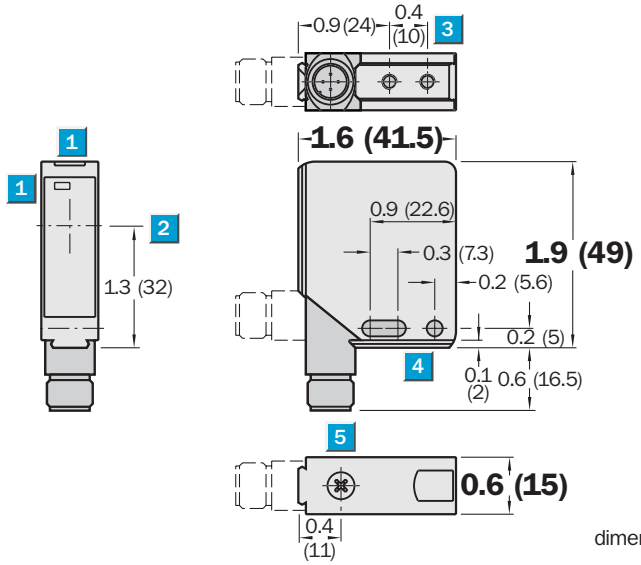
0...13.1 ft (0...4 m)
sensing range

Highlights

- Rugged die cast metal housing
- Ultra-sensitivity for detection of glass or transparent objects
- Red light for easy alignment
- Insensitive to ambient light
- Crosstalk immunity
- Sensitivity adjustment
- Polarizing filters prevent false readings on shiny objects

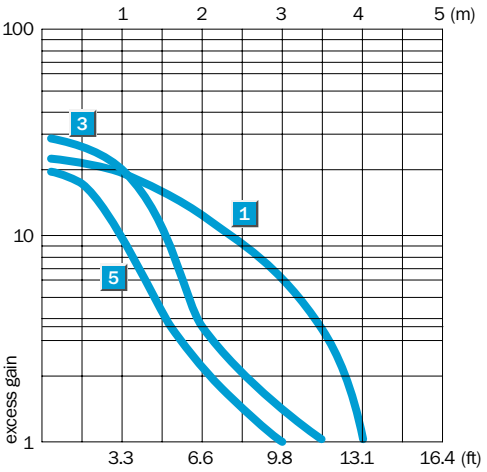
WL 12-2

Dimensional Drawing



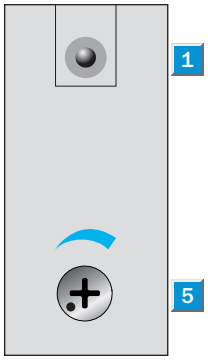
dimensions in inches (mm)

Excess Gain



Adjustments

WL 12-2B560



1. LED signal strength indicator
2. Center of optical axis
3. M4 threaded mounting hole – 4 mm deep
4. Mounting holes Ø 4.2 mm
5. Sensitivity adjustment

Reflector Type		Sensing Range
1	PL 80 A	0...4.0 m
2	P 975	0...3.0 m
3	PL 50 A	0...3.5 m
4	PL 40 A	0...3.5 m
5	PL 30 A	0...3.0 m
6	PL 20 A	0...2.0 m
7	Reflective tape	0...0.8 m

Order Information	
Type	**Part no.**
WL 12-2B560	1 016 080

Accessories	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921
Reflectors	936

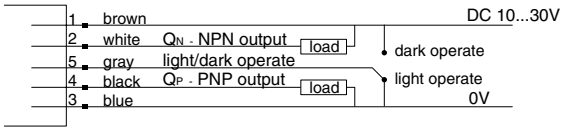
* 2 pieces included with delivery

Technical Data	WL 12-	2B560
Sensing range	0...13.1 ft (0...4 m)/PL 80 A	
Sensitivity	Adjustable	
Light source[1], **light type**	LED, red light, polarized	
Light spot diameter	Approx. 1.2 in at 4.9 ft (30 mm at 1.5 m)	
Supply voltage V_S	10...30 V DC[2]	
Ripple[3]	≤ 5 V_{SS}	
Current consumption[4]	≤ 30 mA	
Switching outputs	Transistor outputs Q_P and Q_N	
Output current I_A max.	100 mA	
Response time[5]	≤ 330 µs	
Max. switching frequency[6]	1500 Hz	
Operating mode	Light or dark switching	
Control wire L/D	0 V or open-circuited ➤ light switching	
Control wire L/D	V_S ➤ dark switching	
Connection type	Plug, M12 5-pin	
VDE protection class[7]	⧈	
Circuit protection[8]	A, B, C	
Enclosure rating	IP 67/NEMA 6	
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	
	Storage -40...167°F (-40...75°C)	
Approximate weight	4.2 oz (120 g)	
Polarizing filter		
Housing material	Die cast zinc	

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q_P and Q_N short-circuit protected
C = Interference pulse suppression

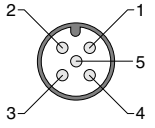
Connection Diagram

All Models



wire colors refer to standard cable, not included

M12 Connector



SICK

Theory of Operation...Through Beam Sensors

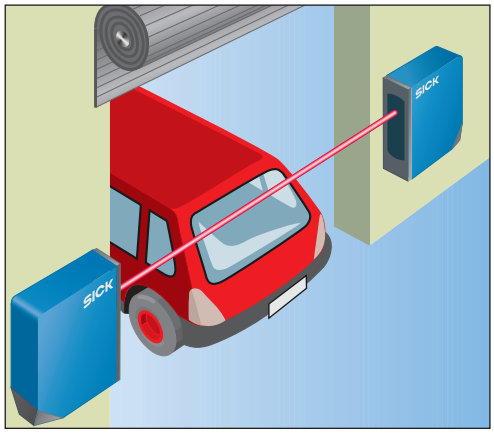


Fig. 1 Photoelectric through beam sensor application example

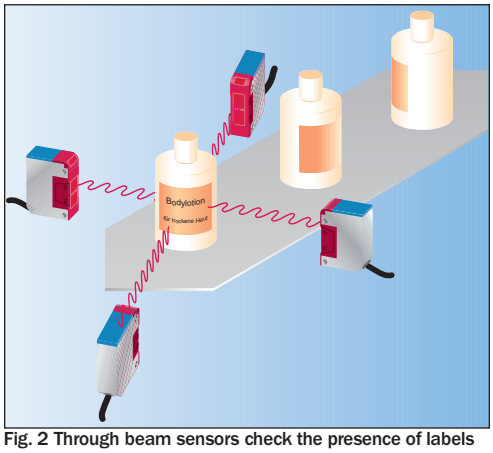


Fig. 2 Through beam sensors check the presence of labels on transparent objects.

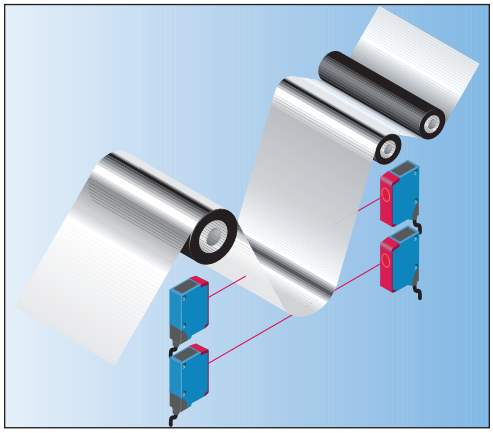


Fig. 3 Tension monitoring of film

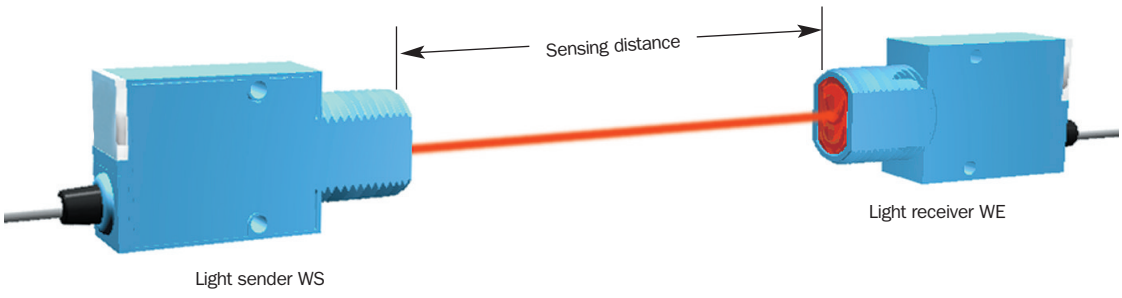


Fig. 4 Photoelectric through beam sensor

About Through Beam Sensors

Each photoelectric through beam sensor consists of two devices: a light sender (designated by an "S," as in the WS 1000) and light receiver (designated by an "E," as in the WE 1000), and switches when an object passes through the light beam (Fig. 1, 4).

Because the sender and receiver are separate, through beam sensors allow for large sensing distances or high excess gain while maintaining a high resolution. The focus ranges can be set very precisely. They are ideal for use in harsh application environments. Through beam sensors are the best choice to sense reflective objects.

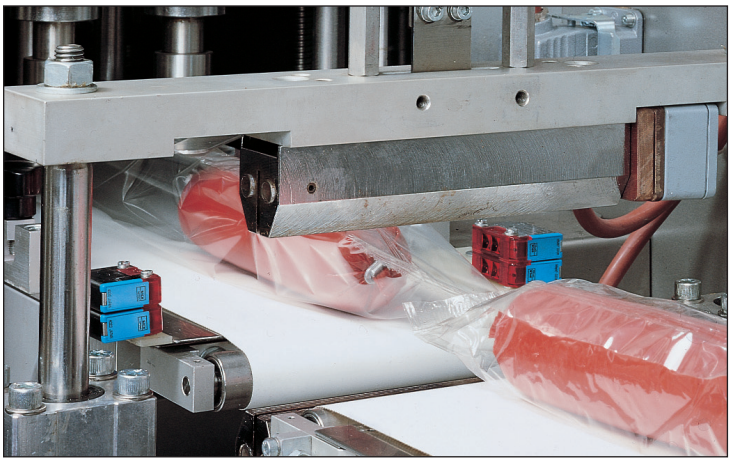


Fig. 5 Control of system timing on bag sealing machine

Fig. 6 Height verification of beer crates

Fig. 7 Monitoring tear off on a paper web

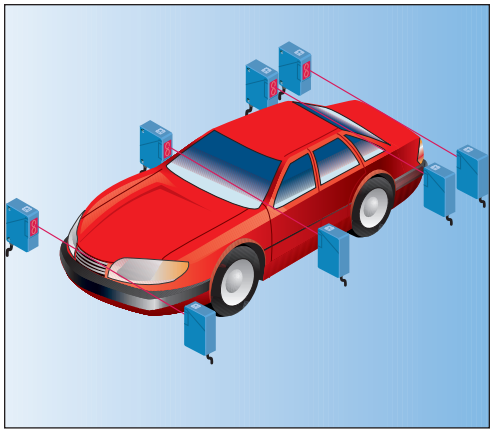


Fig. 8 Detects outline of vehicle bodies on assembly lines

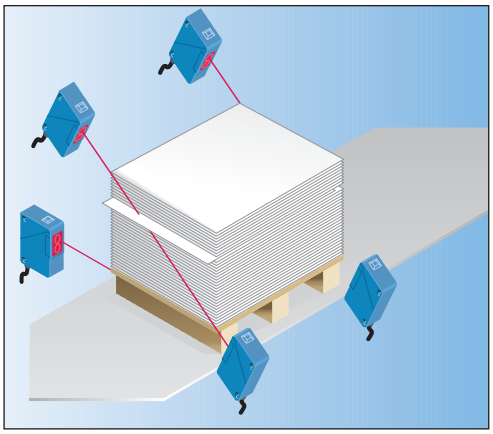


Fig. 9 Monitoring contours in palletization systems

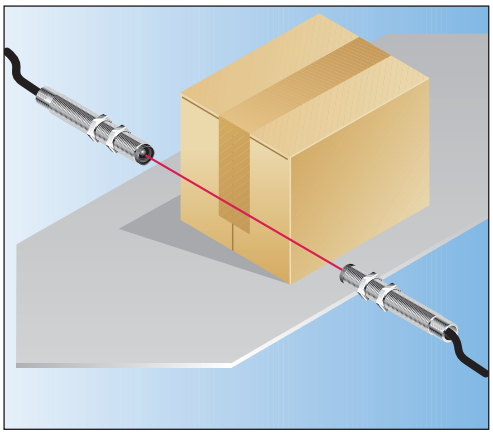


Fig. 10 Detects objects on conveyor belts

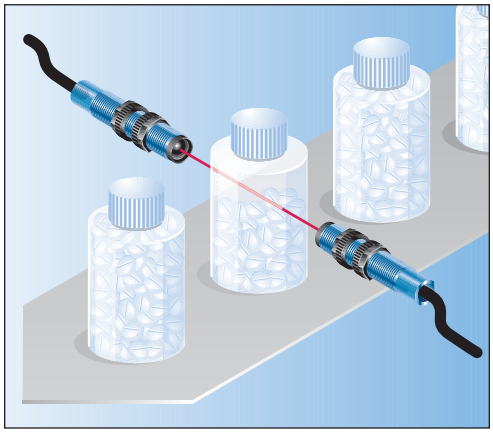
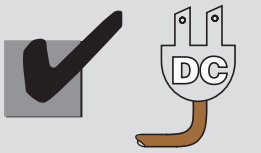
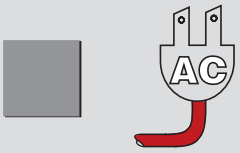


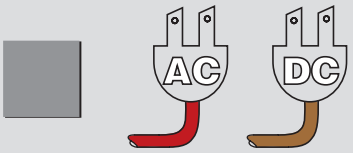
Fig. 11 Fill level control/verification

Through Beam Sensors

Through Beam Sensors

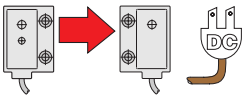






SS/SE 130

Through Beam Sensors



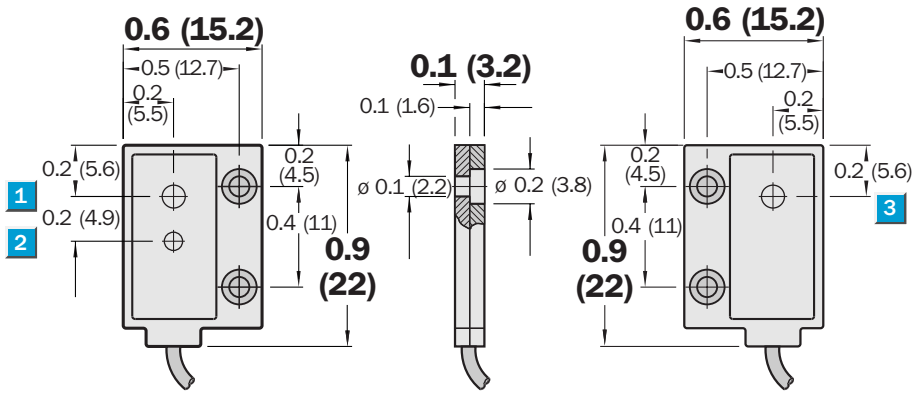
0...1.1 ft (0...0.35 m)
sensing range

Highlights

- Ultra-miniature housing
- Large sensing range
- Red light and LED signal strength indicator for easy alignment
- Extremely flexible connection cable

SS/SE 130

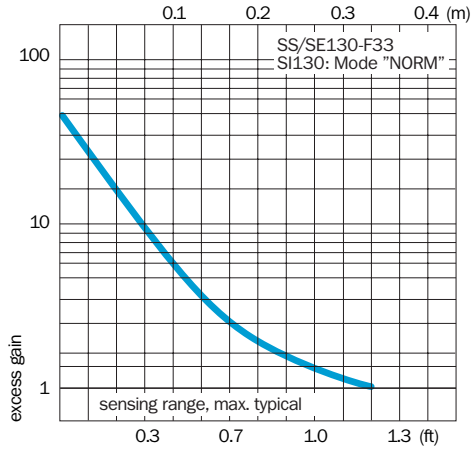
Dimensional Drawing



dimensions in inches (mm)

1 Center of optical axis, sender
2 LED indicator, red (sender only)
SS 130: active. Light reception by
SE 130 receiver ≥ switching threshold
3 Center of optical axis, receiver

Excess Gain



Sensing range, max. typical

Order Information	
Type	**Part no.**
SS/SE 130-F33	6 011 080

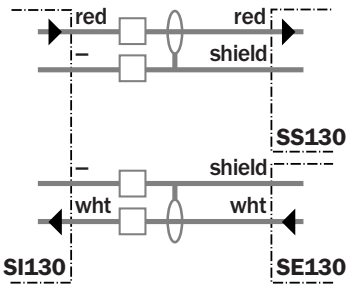
Accessories	page
Mounting brackets*	918
SI 130	394

* included with delivery

Technical Data	SS/SE 130-	F33								
"Flat" housing (F)										
Sensing range, max. typical	1.1 ft (0.35 m)									
Light source[1], **light type**	LED, red light									
Light spot size	Approx. 7.9 in at 1.1 ft (200 mm at 0.3 m)									
Angle of dispersion, sender	Approx. 36°									
Angle of dispersion, receiver	Approx. 20°									
Power supply and evaluation unit	ST 130 only functional in combination									
	with separate interpreter (SI 130),									
	see page 394									
Supply voltage V_S	See SI 130, page 394									
Switching outputs	See SI 130, page 394									
Output current I_A max.	See SI 130, page 394									
Light receiver, switching mode	See SI 130, page 394									
Response time[2]	See SI 130, page 394									
Max. switching frequency[3]	See SI 130, page 394									
Connection type	PVC cable, 2 m[4] (screened),									
	(cannot be extended)									
VDE protection class	⧫									
Circuit protection[5]	A									
Enclosure rating	IP 66									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Approximate weight with cable 2 m	Sender: 0.4 oz (11 g)/									
	Receiver: 0.4 oz (11 g)									
Housing material	Housing: ABS/optics: PC									

1) Average service life 100,000 h at $T_A = +25$ °C
2) Signal transit time with resistive load
3) With light/dark ratio 1:1
4) Do not bend below 0 °C
5) A = V_S connections reverse-polarity protected

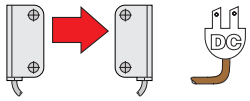
Connection Diagram



SICK

SS/SE 130

Through Beam Sensors



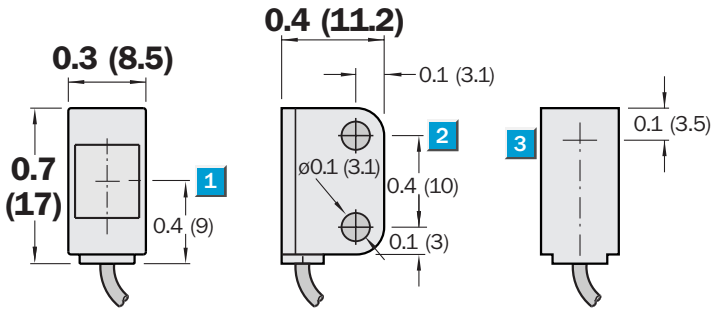
0...7.2 ft (0...2.2 m)
sensing range

Highlights

- Ultra-miniature housing
- Large sensing range
- Red light and LED signal strength indicator for easy alignment
- Extremely flexible connection cable

SS/SE 130

Dimensional Drawing

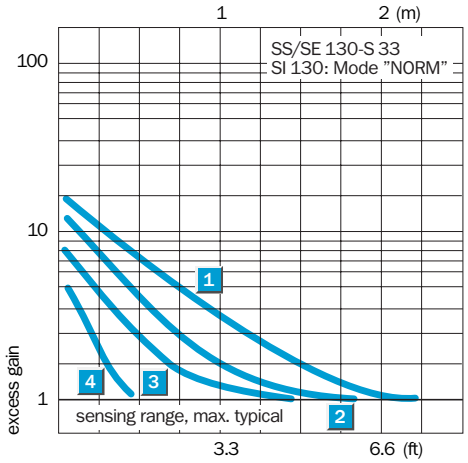


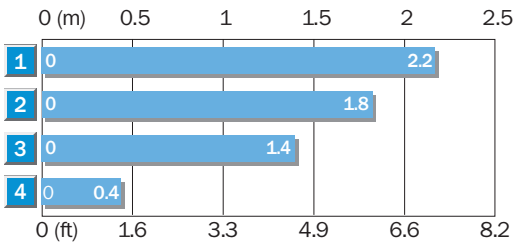
dimensions in inches (mm)

1 Center of optical axis
2 Mounting hole Ø3.1 mm
3 LED indicator, red (sender only)
SS 130: active. Light reception by SE 130 receiver ≥ switching threshold

Mounting bracket BEF-130 ST for SS/SE 130-S 33, see accessories (included).

Excess Gain





Sensing range, max. typical

1	Without mask
2	With mask, 2 mm wide
3	With mask, 1 mm wide
4	With mask, 0.5 mm wide

Order information

Type	Part no.
SS/SE 130-S33	6 011 079

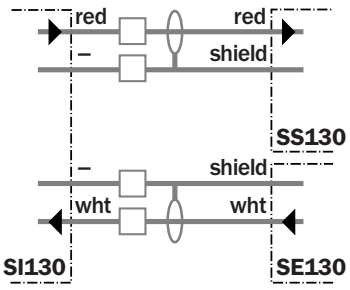
Accessories	page
Mounting brackets*	918
Slotted masks	951
SI 130	394

* included with delivery

Technical Data	SS/SE 130-	S33
"Slim" housing (S)		
Sensing range, max. typical	7.2 ft (2.2 m)	
Operating range with mask,		
width 0.08 in (2.0 mm)	3.3 ft (1.0 m)	
Operating range with mask,		
width 0.04 in (1.0 mm)	2.3 ft (0.7 m)	
Operating range with mask,		
width 0.02 in (0.5 mm)	1.0 ft (0.3 m)	
Light source[1], **light type**	LED, red light	
Light spot size	approx. 180 mm at 1.5 m	
Angle of dispersion, sender	approx. 7°	
Angle of dispersion, receiver	approx. 18°	
Supply voltage V_S	See SI 130, page 394	
Switching outputs	See SI 130, page 394	
Output current I_A max.	See SI 130, page 394	
Light receiver, switching mode	See SI 130, page 394	
Response time[2]	See SI 130, page 394	
Max. switching frequency[3]	See SI 130, page 394	
Connection type	PVC cable[4], 2 m (screened),	
	(cannot be extended)	
VDE protection class	⏀	
Circuit protection[5]	A	
Enclosure rating	IP 66	
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	
	Storage -40...158°F (-40...70°C)	
Approximate weight with cable (2 m)	Sender: 0.4 oz (11 g)	
	Receiver: 0.4 oz (11 g)	
Housing material	Housing: ABS/optics: PC	

1) Average service life 100,000 h at $T_A = +25$ °C
2) Signal transit time with resistive load
3) With light/dark ratio 1:1
4) Do not bend below 0 °C
5) A = V_S connections reverse-polarity protected

Connection Diagram



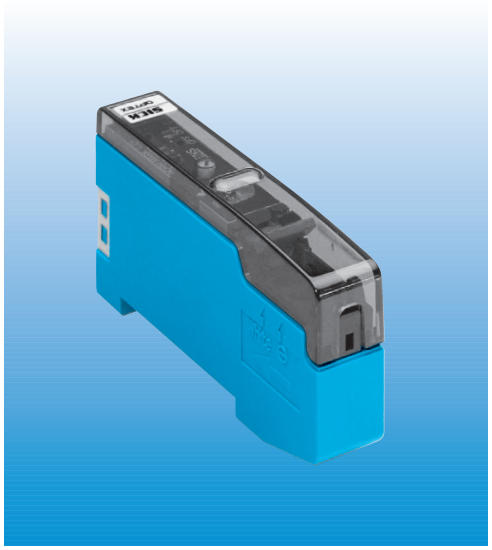
SI 130

Through Beam Sensors

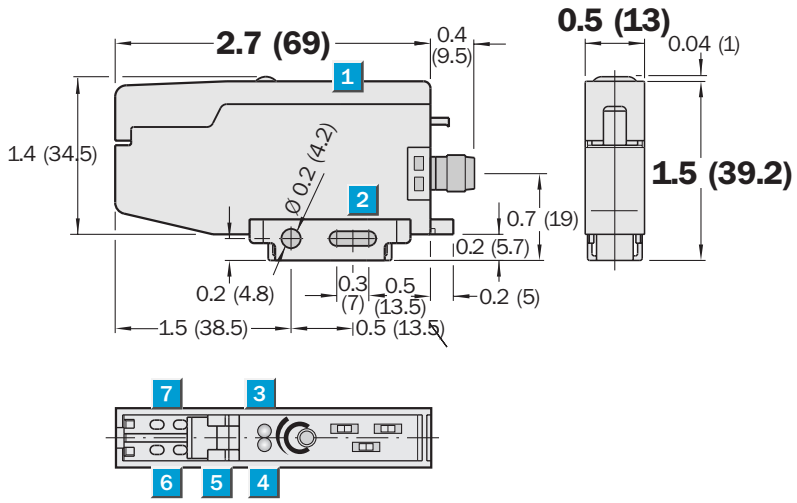
Highlights

- Basic unit for all S 130 sensors
- Simple connection of sensors
- DIN rail mounted
- Selectable off delay
- Selectable light or dark switching

SI 130

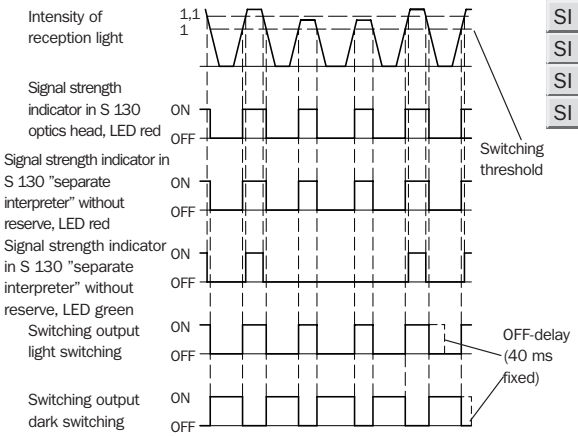


Dimensional Drawing



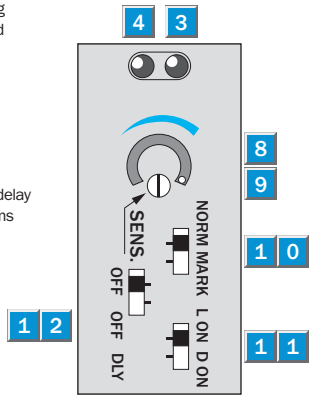
dimensions in inches (mm)

S 130 Function Diagram



Adjustments

SI 130-P12
SI 130-N12
SI 130-P40
SI 130-N40



1 Protective hood
2 BF-WLL 160 mounting bracket (included)
3 LED signal strength indicator, red
(lights up when switching threshold is exceeded)
4 LED signal strength indicator, green
(lights up with reception reserve > 10%)
5 For releasing/locking connection wires of S 130 photoelectric switches/photoelectric proximity switches
6 Sender terminals (red), screen (–)
7 Receiver terminals (white), screen (–)
8 Sensitivity scale (270°)
9 Sensitivity control (2 revolutions)
10 Selector switch for "NORM"/"MARK" detection
(t = 0.5 ms/t ≤ 0.2 ms)
11 Selector switch for light- ("L.ON")/ dark- ("D.ON") switching
12 Selector switch for OFF-delay "OFF"/ "OFF DLY", 40 ms fixed

Order information

Type	Part no.
SI 130-P12	6 011 089
SI 130-P40	6 011 090
SI 130-N12	6 011 087
SI 130-N40	6 011 088

Accessories	page
Cables and connectors	908
Mounting brackets*	918

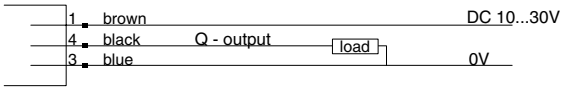
* included with delivery

Technical Data	SI 130-	P12	P40	N12	N40					
Power supply and evaluation unit	S 130 photoelectric switch series	■	■	■	■					
	in ultra-miniature housing,									
	see pages 390 to 393									
Operating mode										
"NORM" mode	All S 130 optics heads in	■	■	■	■					
	photoelectric switch mode									
"MARK" mode	Optics heads ST 130-S 13,	■	■	■	■					
	ST 130-S 19, ST 130-S 23,									
	ST 130-S 29 in									
	contrast scanner mode									
Sensitivity, adjustable	Potentiometer, 2 turns	■	■	■	■					
	with sensitivity scale 270°									
Time delay										
OFF-delay t_{OFF}	40 ms fixed, selectable via sliding switch	■	■	■	■					
Supply voltage V_S	10...30 V DC [1]	■	■	■	■					
Ripple[2]	± 10%	■	■	■	■					
Current consumption[3]	≤ 35 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Light receiver, switching mode	Light/dark switching	■	■	■	■					
	selectable via sliding switch									
Response time[4]/										
Max. switching frequency[5]										
"NORM" mode	≤ 0.5 ms/1000/s	■	■	■	■					
"MARK" mode	≤ 0.2 ms/2500/s	■	■	■	■					
Connection types	Cable, PVC, 2 m[6]	■		■						
	Plug, M 8 4-pin		■		■					
VDE protection class	⏀	■	■	■	■					
Circuit protection[7]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 50	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	2.5 oz (70 g)	■		■						
	1.1 oz (30 g)		■		■					
Housing material	ABS	■	■	■	■					

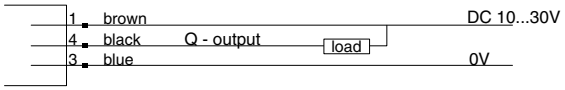
1) Limit values
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0 °C
7) A = V_S connections reverse-polarity protected
= Inputs/outputs reverse-polarity protected
C = Interference pulse suppression
B D = Outputs overcurrent and short-circuit protected

Connection Diagram

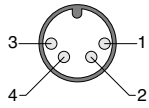
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models.

SICK

WS/WE 2S

Through Beam Sensors

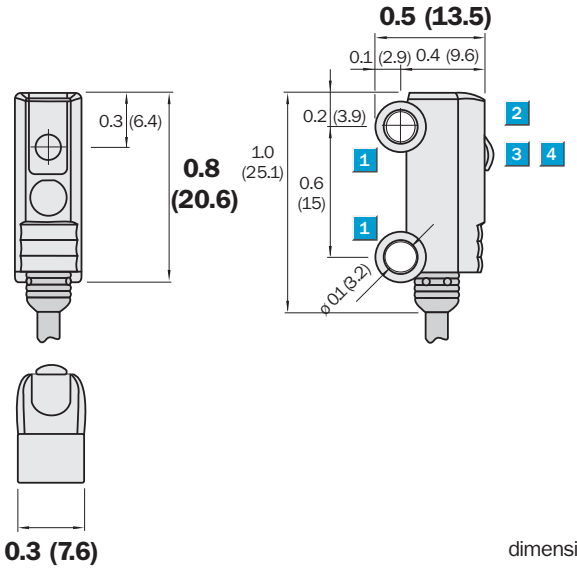
0...3.9 ft (0...1.2 m)
sensing range

Highlights

- Excellent size to performance ratio
- Sturdy housing with metal sleeves for M3 bolts
- Red light for easy alignment
- Small, precise light spot

WS/WE 2S

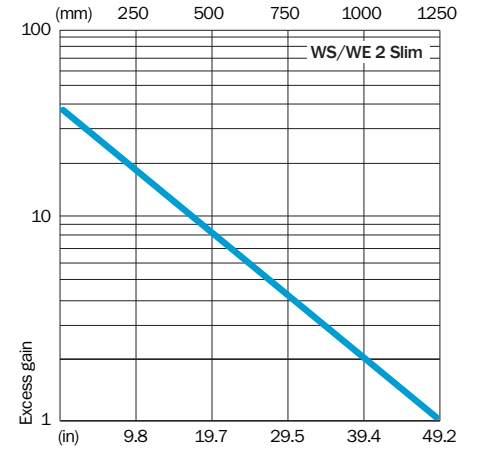
Dimensional Drawing

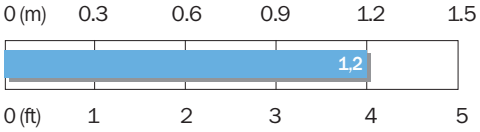


dimensions in inches (mm)

1 Mounting hole Ø 3.2 mm
2 LED signal strength indicator
3 Optical axis, receiver
4 Optical axis, sender

Excess Gain





Order Information	
Type	**Part no.**
WS/WE 2S-F113	1 022 668
WS/WE 2S-E113	1 022 669
WS/WE 2S-F213	1 023 650

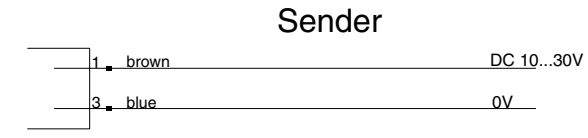
Accessories	page
Cables and connectors	908
Mounting systems	932
Mounting set of screws[1]	

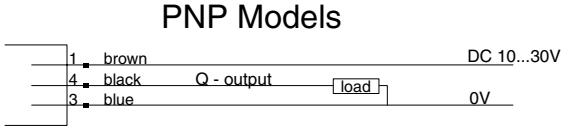
[1] Included with delivery

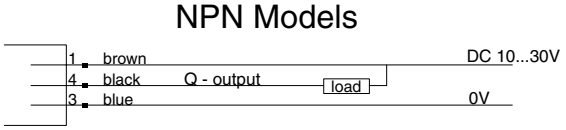
Technical Data	WS/WE 2S-	F113	E113	F213						
Sensing range, typ. max.	0...3.9 ft (0...1.2 m)	■	■	■						
Light source[1], light type	Pin-point LED, red light	■	■	■						
Light spot diameter	0.4 in at 3.9 in (10 mm at 100 mm)	■	■	■						
Supply voltage V_S	10 ... 30 V DC[2]	■	■	■						
Ripple[3]	< 5 V_{PP}	■	■	■						
Current consumption[4]	< 10 mA (WE), < 20 mA (WS)	■	■	■						
Switching outputs	PNP, Q	■		■						
	NPN, Q		■							
	Dark switching	■	■	■						
Output current I_A max.	< 50 mA	■	■	■						
Response time[5]	< 2.5 ms	■	■	■						
Max. switching frequency[6]	200/s	■	■	■						
Connection types	Cable[7], 2 m	■	■							
	Plug, M8 3-pin, 200 mm cable			■						
VDE protection class[8]	⏀	■	■	■						
Circuit protection[9]	A, B, C	■	■	■						
Enclosure rating	IP 67	■	■	■						
Ambient temperature	Operation -4...122°F (-20...50°C)	■	■	■						
	Storage -40...167°F (-40...75°C)	■	■	■						
Approximate weight	1.3 oz (36 g)	■	■							
	1.4 oz (40 g)			■						
Housing material	ABS, PMMA	■	■	■						

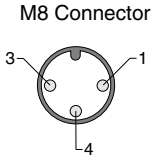
1) Average service life 75.000 h at $T_A = +25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) 2 m, PVC, 2.4 mm Ø, do not bend below 0°C
8) Reference voltage 50 V
9) A = V_S-connections reverse-polarity protected
B = Output Q and $\overline{Q}$ reverse-polarity protected
C = Interference pulse suppression

Connection Diagram









wire colors refer to standard cable, not included with quick disconnect models.

WS/WE 4-2 Teflon

Through Beam Sensors

0...9.8 ft (0...3 m)
sensing range

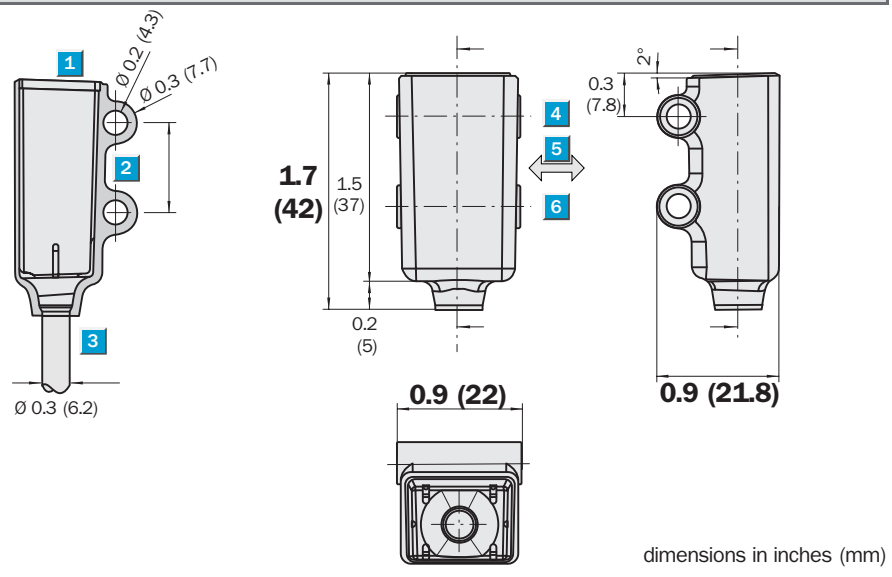
CE

Highlights

- Robust Teflon housing for use in moist and aggressive environments
- Meets SEMI and FDA standards
- Crosstalk immunity
- Fast response time
- Red light for easy alignment
- Test input

WS/WE 4-2 Teflon

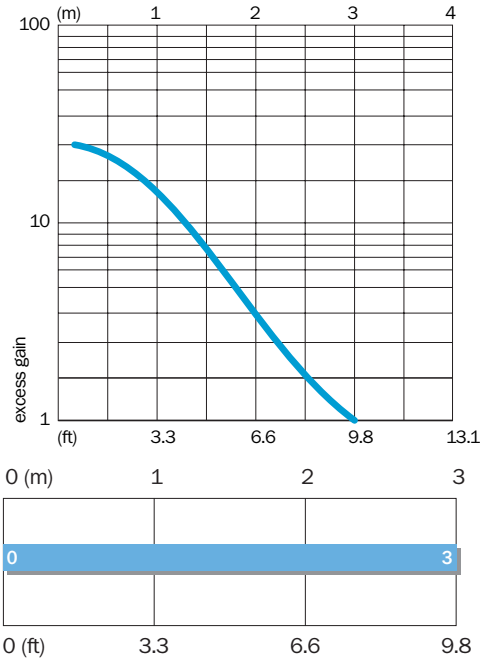
Dimensional Drawing



dimensions in inches (mm)

1 LED signal
2 Mounting hole Ø 4.3 mm
3 Cable, 2 m, Ø 4.5 mm,
1.0 m Teflon coated, Ø 6.2 mm
4 Optical axis, receiver
5 Optical axis, sender

Excess Gain



Order Information

Type	Part no.
WS/WE 4-2FT01	1 023 764
WS/WE 4-2ET01	1 023 765
WS/WE 4-2PT01	1 023 636

Accessories

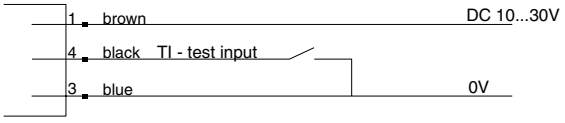
	page
Mounting brackets	932, 935

Technical Data	WS/WE 4-2-	F T01	E T01	P T01
Sensing range, max. typical	0...9.8 ft (0...3 m)	■	■	■
Light source[1], **light type**	LED, red light	■	■	■
Light spot diameter	13.4 in at 6.6 ft (340 mm at 2 m)	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■
Ripple[3]	5 V_{PP}	■	■	■
Current consumption[4]	< 50 mA	■	■	■
sender	< 20 mA	■	■	■
receiver	< 30 mA	■	■	■
Switching outputs	PNP, Q	■		■
	NPN, Q		■	
Switching mode	Dark switching	■	■	
	Light switching			■
Output current I_A max.	< 100 mA	■	■	■
PNP; output voltage HIGH	V_S – (< 2.5 V)	■		■
PNP; output voltage LOW	Approx. 0 V	■		■
NPN; output voltage HIGH	Approx. V_S		■	
NPN; output voltage LOW	< 1.5 V		■	
Response time[5]	< 500 µs	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■
Test input "TE" Sender OFF	TE to 0 V	■	■	■
Connection type	Cable[7], 2 m	■	■	■
Minimum bend radius of Teflon cable	R > 1.2 in (30 mm)	■	■	■
VDE protection class	⏀	■	■	■
SEMI standards	SEMI E49.2-0298	■	■	■
	SEMI F57-0301	■	■	■
FDA regulations	21 CFR 177.1550	■	■	■
	21 CFR 175.300	■	■	■
	21 CFR 175.105	■	■	■
	21 CFR 176.170	■	■	■
	21 CFR 176.180	■	■	■
Circuit protection[8]	A, B, C	■	■	■
Enclosure rating	IP 68/NEMA 6	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■
Approximate weight	5.6 oz (160 g)	■	■	■
Housing material	Glass fiber reinforced ABS plastic	■	■	■
Sensor coating	DuPont, PFA 940 HP plus	■	■	■
Cable coating	DuPont, PFA 440 HP	■	■	■

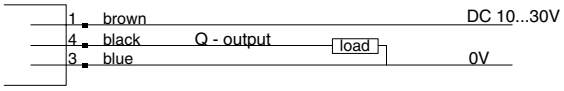
1) Average service life 100,000 h where $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

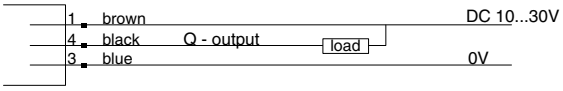
Sender, All Models



PNP Models



NPN Models



wire colors refer to standard cable, not included with quick disconnect models.

SICK

WS/WE 4-2

Through Beam Sensors

0...13.1 ft (0...4 m)
sensing range

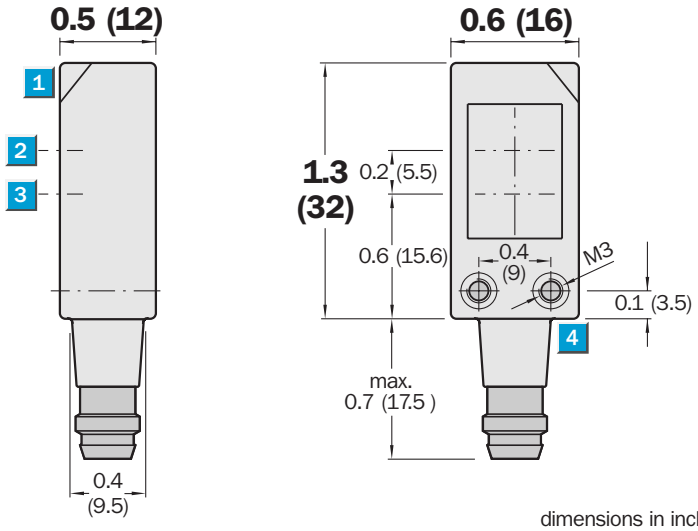
CE

Highlights

- Rugged plastic housing
- Insensitive to ambient light
- Red light for easy alignment
- Test input
- Fast response time
- Small package size
- Cable or M8 quick disconnect versions

WS/WE 4-2

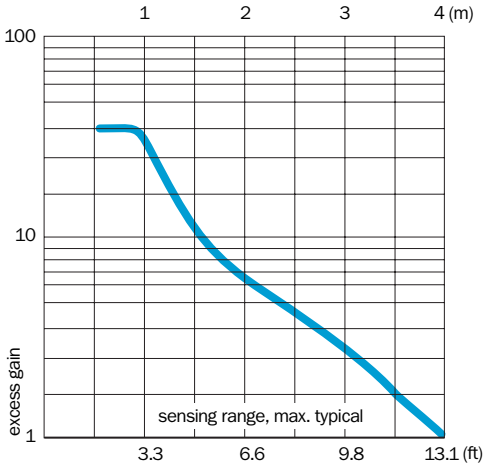
Dimensional Drawing

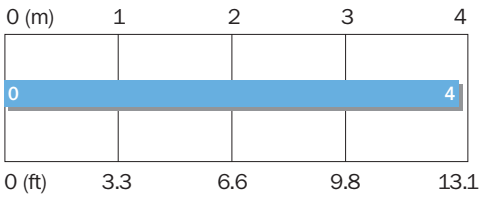


dimensions in inches (mm)

1 LED signal strength indicator
2 Optical axis, receiver
3 Optical axis, sender
4 M3 threaded mounting hole

Excess Gain





Order Information

Type	Part no.
WS/WE 4-2F132	1 015 780
WS/WE 4-2F330	1 015 776
WS/WE 4-2F331	1 015 772
WS/WE 4-2E132	1 015 782
WS/WE 4-2E330	1 015 778
WS/WE 4-2E331	1 015 774
WS/WE 4-2P132	1 015 779
WS/WE 4-2P330	1 015 775
WS/WE 4-2P331	1 015 771
WS/WE 4-2N132	1 015 781
WS/WE 4-2N330	1 015 777
WS/WE 4-331	1 015 773

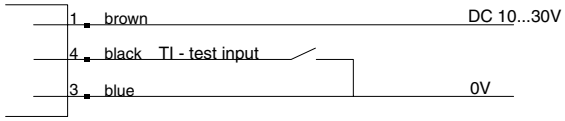
Accessories	page
Cables and connectors	908
Mounting brackets	932, 935

Technical Data	WS/WE 4-2- (dark switching)	F132	F330	F331	E132	E330	E331
	WS/WE 4-2- (light switching)	P132	P330	P331	N132	N330	N331
Sensing range	0...13.1 ft (0...4 m)	■	■	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■	■	■
Light spot diameter	Approx. 13.4 in at 6.6 ft (340 mm at 2 m)	■	■	■	■	■	■
Angle of divergence	Approx. 12°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	5 V_{SS}	■	■	■	■	■	■
Current consumption[4]	< 50 mA	■	■	■	■	■	■
sender	< 20 mA	■	■	■	■	■	■
receiver	< 30 mA	■	■	■	■	■	■
Switching outputs	PNP, Q	■	■	■			
	NPN, Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.5 V)	■	■	■			
PNP; signal voltage LOW	Approx. 0 V	■	■	■			
NPN; signal voltage HIGH	Approx. V_S				■	■	■
NPN; signal voltage LOW	< 1.5 V				■	■	■
Response time[5]	< 500 µs	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■
Test input "TE" Sender OFF	TE to 0 V	■	■	■	■	■	■
Connection types	Cable[7], 2 m	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 3-pin, cable[7], 100 mm			■			■
VDE protection class	⏀	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating[9]	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	1.4 oz (20 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

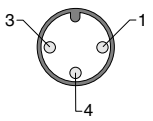
1) Average service life 100,000 h where T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
8) IP 67: with screw-in cable receptacles
IP 65: with plug-in cable receptacles

Connection Diagram

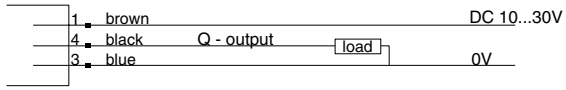
Sender, All Models



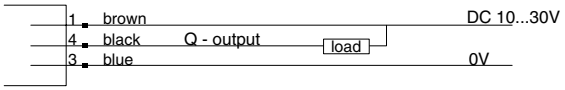
M8 Connector



PNP Models



NPN Models

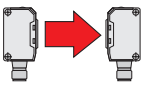


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WS/WE 150

Through Beam Sensors



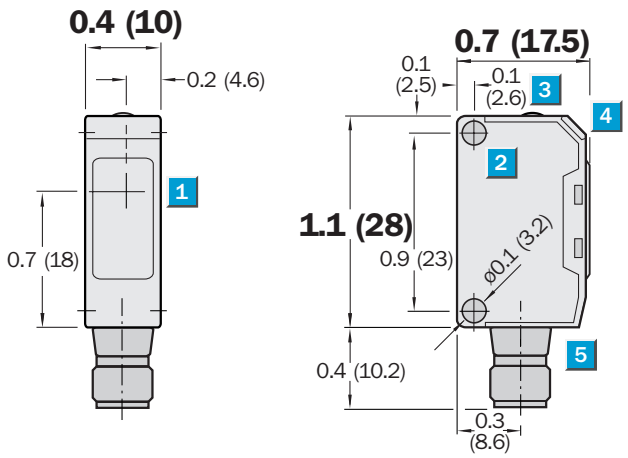

0...14.4 ft (0...4.4 m)
sensing range

Highlights

- Rugged plastic housing
- Sensitivity adjustment
- Signal strength indicator
- Red light for easy alignment
- Cable or M8 quick disconnect versions
- Easy mounting with included bracket
- Optional slotted masks available

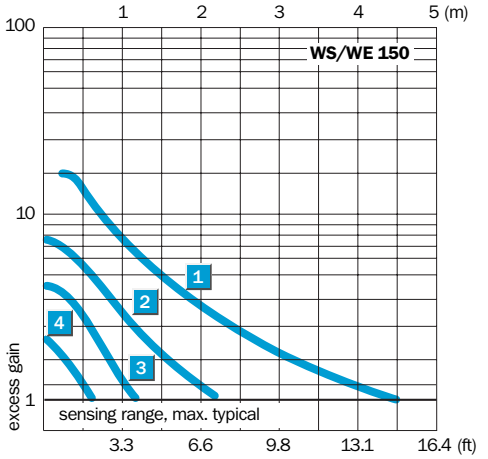
WS/WE 150

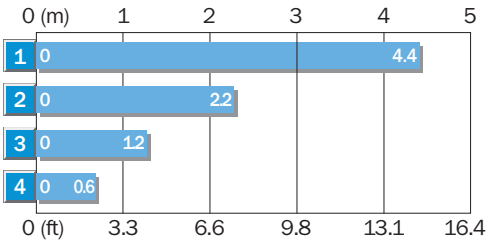
Dimensional Drawing



dimensions in inches (mm)

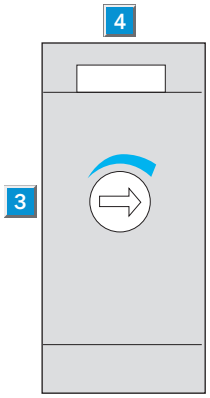
Excess Gain





Adjustments

All types



1 Center of optical axis, sender (WS)
Center of optical axis, receiver (WE)
2 Mounting holes Ø 3.2 mm
3 Sensitivity adjustment 270° (WE only)
4 LED indicator, red (WE only)
5 M8 plug or cable

Reduction in Sensing Range With Slotted Masks

1	Without slotted mask
2	Mask aperture width 2.0 mm
3	Mask aperture width 1.0 mm
4	Mask aperture width 0.5 mm

Order Information

Type	Part no.[11]
WS/WE 150-P132	6 011 030
WS/WE 150-P430	6 011 032
WS/WE 150-N132	6 011 027
WS/WE 150-N430	6 011 029

Accessories

	page
Cables and connectors	908
Mounting brackets Type A*	919
Slotted masks	951

* included with delivery

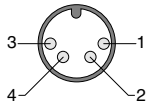
Technical Data		WS/WE 150-	P132	P430	N132	N430
Sensing range		0...14.4 ft (0...4.4 m)	■	■	■	■
Operating range with mask,						
Aperture width 0.08 in (2.0 mm)		6.6 ft (2.0 m)	■	■	■	■
Aperture width 0.04 in (1.0 mm)		3.3 ft (1.0 m)	■	■	■	■
Aperture width 0.02 in (0.5 mm)		1.6 ft (0.5 m)	■	■	■	■
Sensitivity, adjustable		Potentiometer, 270°	■	■	■	■
Light source[1], light type		LED, red light	■	■	■	■
Light spot diameter		Approx. 15.7 in at 13.1 ft (400 mm at 4 mm)	■	■	■	■
Angle of divergence		Approx. 6°	■	■	■	■
Angle of reception		Approx. 15°	■	■	■	■
Supply voltage V_A		10...30 V DC[2]	■	■	■	■
Ripple[3]		± 10%	■	■	■	■
Current consumption[4]	sender	≤ 15 mA	■	■	■	■
	receiver	≤ 20 mA	■	■	■	■
Switching outputs		PNP, open collector: Q	■	■		
		NPN, open collector: Q			■	■
Max. output current I_A		100 mA	■	■	■	■
Operation mode[5]		Light/dark switching via control wire	■	■	■	■
		+ V_S = light switching	■	■	■	■
		0 V = dark switching	■	■	■	■
Response time[6]		≤ 0.5 ms	■	■	■	■
Max. switching frequency[7]		1000 Hz	■	■	■	■
Connection types		Cable, PVC, 2 m[8]	■		■	
		Sender WS, 2 x 0.18 mm², Ø 3.5 mm	■		■	
		Receiver WE, 4 x 0.18 mm², Ø 3.5 mm	■		■	
		Plug, M8 4-pin		■		■
VDE protection class[9]		⧈	■	■	■	■
Circuit protection[10]						
	sender	A, B	■	■	■	■
	receiver	A, B, C, D	■	■	■	■
Enclosure rating		IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A		Operation -13...131°F (-25...55°C)	■	■	■	■
		Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight		Sender: 1.6 oz (44 g), receiver: 1.6 oz (44 g)	■		■	
		Sender: 0.3 oz (7 g), receiver: 0.3 oz (7 g)		■		■
Housing material		Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Control cable open:
NPN: light-switching
PNP: dark-switching
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference impulse suppression
D = Outputs overcurrent and short-circuit protected
11) Part no. includes both sender and receiver

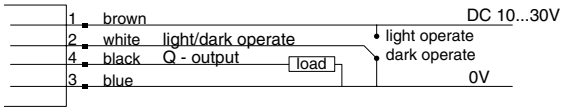
Connection Diagram

Sender

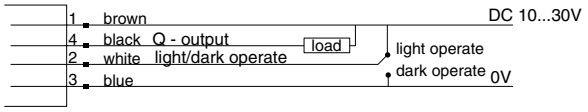
M8 Connector



Receiver, PNP Models



Receiver, NPN Models

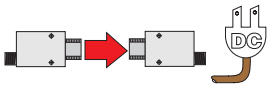


wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 1000

Through Beam Sensors



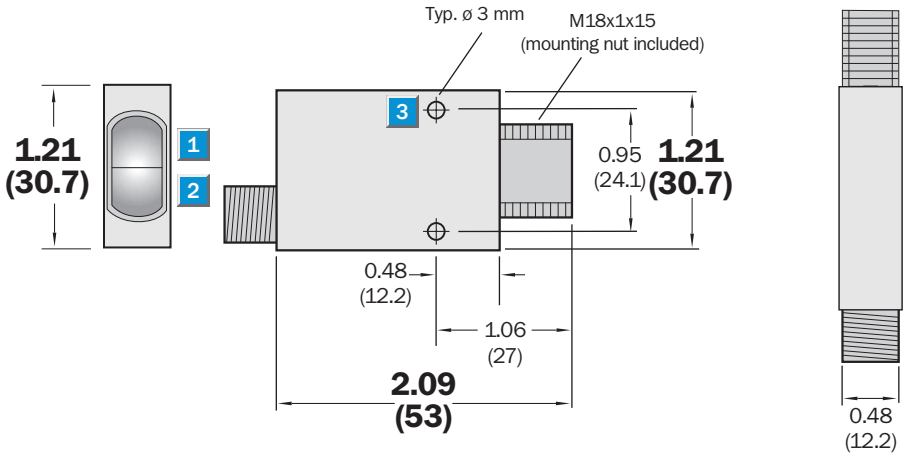
0...16.4 ft (0...5 m)
sensing range

Highlights

- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

WS/WE 1000

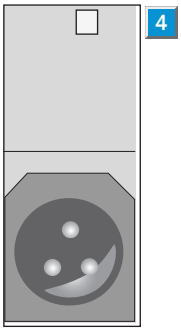
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Order Information

Type	Part no.
WS/WE 1000-P112	7 025 972
WS/WE 1000-P410	7 025 974
WS/WE 1000-P411	7 025 975
WS/WE 1000-N112	7 025 976
WS/WE 1000-N410	7 025 978
WS/WE 1000-N411	7 025 979

Accessories

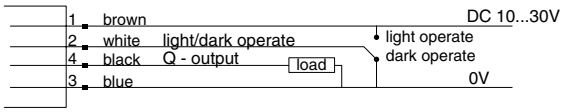
	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data	WS/WE 1000-	P112	P410	P411	N112	N410	N411
Sensing range, max.	0...16.4 ft (0...5 m)	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 15.8 ft at 16.4 ft (0.4 m at 5 m)	■	■	■	■	■	■
Angle of divergence	Approx. 10.5°	■	■	■	■	■	■
Sensitivity adjustable (optional)		■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V peak to peak	■	■	■	■	■	■
Current consumption[3]	Sender ≤ 50 mA	■	■	■	■	■	■
	Receiver ≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP	■	■	■			
	NPN				■	■	■
Max. output current I_A	100 mA	■	■	■	■	■	■
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■
Response time[4]	830 µs	■	■	■	■	■	■
Max. switching frequency[5]	600 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, M12 4-pin		■			■	
	Plug, M12 4-pin, with cable, 150 mm			■			■
VDE protection class[6]	□	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

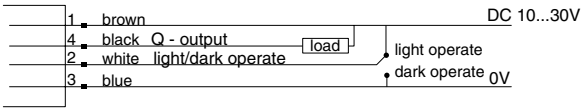
1) Average service life 50,000 h where $T_A = 25°C$
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

PNP Models

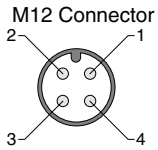


NPN Models

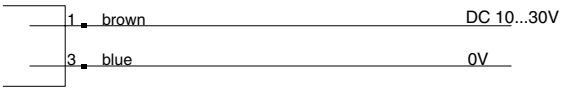


wire colors refer to standard cable, not included with quick disconnect models

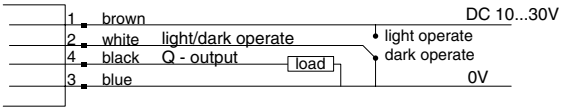
M12 Connector



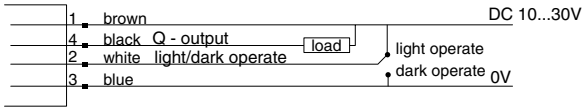
Sender



Receiver, PNP Models



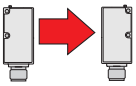
Receiver, NPN Models



wire colors refer to standard cable, not included with quick disconnect models

WS/WE 9-2

Through Beam Sensors



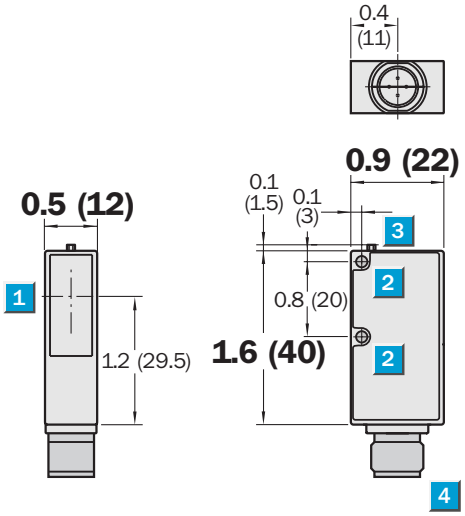

0...22.9 ft (0...7 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- High switching frequency
- Outputs short-circuit protected
- Small, compact housing
- Cable, M8 or M12 quick disconnect versions

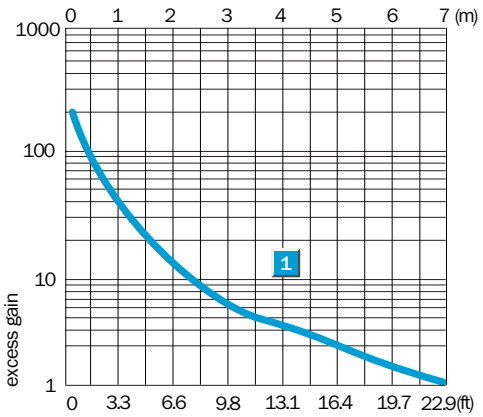
WS/WE 9-2

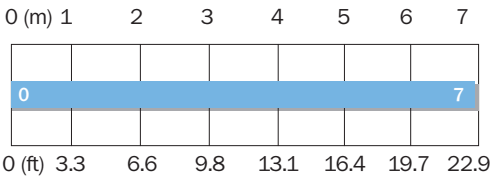
Dimensional Drawing



dimensions in inches (mm)

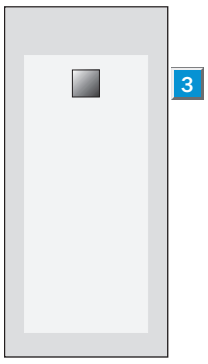
Excess Gain





Adjustments

All types



1 Center of optical axis
2 Mounting hole Ø 3.2 mm
3 LED signal strength indicator
4 Plug, M12 or M8 4-pin,
2 m cable or
120 mm cable with M12 4-pin plug

Order Information

Type	Part no.
WS/WE9-2P130	1 019 259
WS/WE9-2P430	1 019 261
WS/WE9-2N130	1 019 260
WS/WE9-2N430	1 019 262
WS/WE9-2P330	1 019 383
WS/WE9-2P630	1 019 382

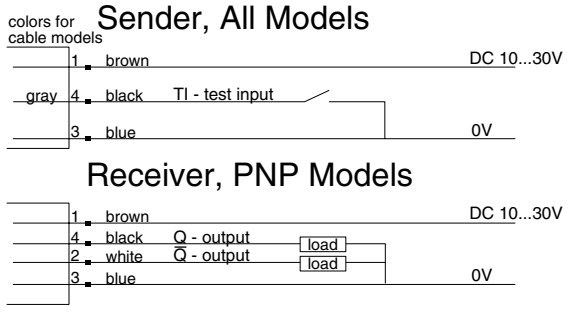
Accessories

	page
Cables and connectors	908, 909
Mounting brackets	933, 935

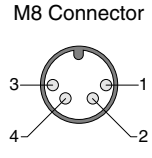
Technical Data	WS/WE 9-2-	P130	P430	N130	N430	P330	P630
Sensing range	0...22.9 ft (0...7 m)	■	■	■	■	■	■
Supply voltage V_S[1]	10...30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V_{PP}	■	■	■	■	■	■
Current consumption[3]	≤ 15 mA (WE); ≤ 60 mA (WS);	■	■	■	■	■	■
Light source	LED, visible red light[4]	■	■	■	■	■	■
Angle of dispersion	15°	■	■	■	■	■	■
Angle of reception	6°	■	■	■	■	■	■
Light spot diameter	39.4 in at 16.4 ft (1000 mm at 5 m)	■	■	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■			■	■
	NPN			■	■		
Signal voltage HIGH	V_S – 2.9 V	■	■			■	■
	V_S			■	■		
Signal voltage LOW[5]	Approx. 0 V	■	■			■	■
	≤ 2.9 V			■	■		
Output current I_A max.	≤ 100 mA	■	■	■	■	■	■
Response time[6]	≤ 2.5 µs	■	■	■	■	■	■
Switching frequency max.[7]	200 Hz	■	■	■	■	■	■
Test input TE	V_S or unswitched, sender active	■	■	■	■	■	■
	0 V, sender inactive	■	■	■	■	■	■
Connection types	Cable, 2 m	■		■			
	Plug, M12 4-pin, with cable, 120 mm						■
	Plug, M12 4-pin		■		■		
	Plug, M8 4-pin					■	
VDE protection class[8]	⧈	■	■	■	■		■
	⧋					■	
Enclosure rating	IP 67	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■
Ambient temperature T_A[10]	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■			■
	1.4 oz (20 g)		■		■	■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

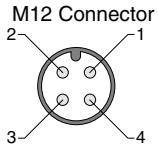
1) Limit values
2) Must be within V_S tolerances
3) Without load
4) Average service life at room temperature 100,000 h at T_A = 25°C
5) At T_A = 25°C and 100 mA output current
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = supply connections reverse polarity protected
B = outputs short-circuit protected
C = interference suppression
10) Do not bend below 0°C

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models

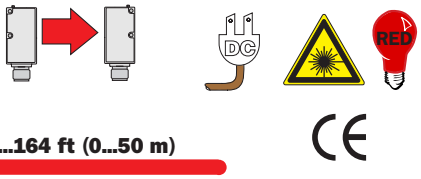




SICK

WS/WE 9L

Through Beam Sensors



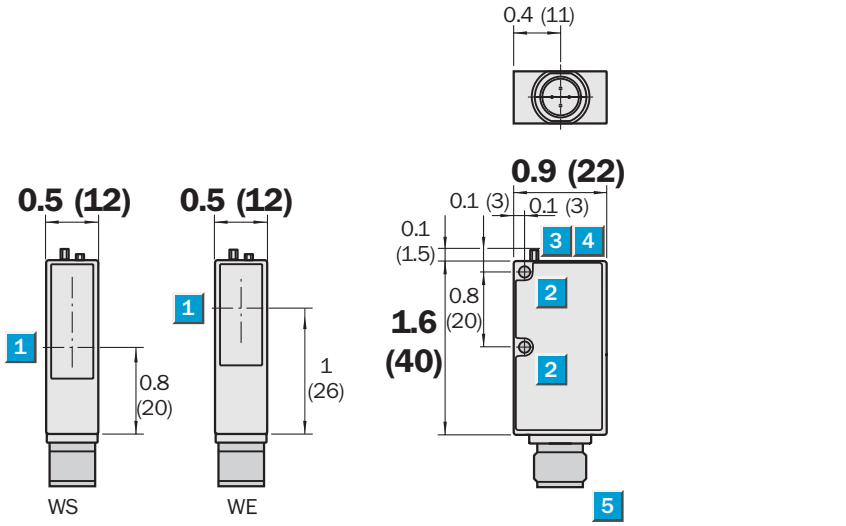
0...164 ft (0...50 m)
sensing range

Highlights

- Class 2 laser, red light
- Teach-in sensitivity adjustment
- 1000 Hz switching frequency
- Compact ABS plastic housing
- Fast response time
- Small light spot for precise switching

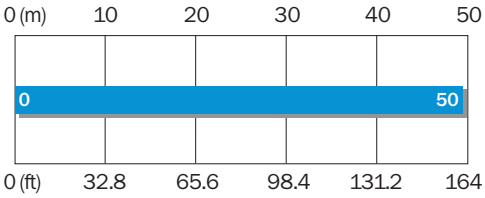
WS/WE 9L

Dimensional Drawing



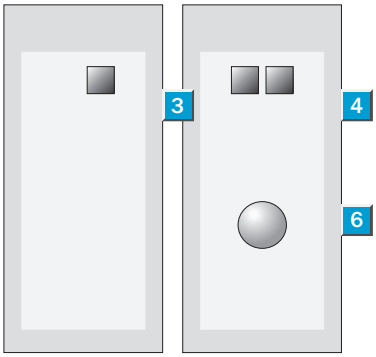
dimensions in inches (mm)

Sensing Range



Adjustments

All types



Sender WS | Receiver WE

1 Center of optical axis
2 Mounting hole Ø 3.2 mm
3 Power indicator green, WS in operation
4 LED signal strength indicator yellow
5 Plug, M12 or M8 4-pin
6 Teach-in button

Order Information

Type	Part no.
WS/WE 9L-P330	1 023 993
WS/WE 9L-P430	1 023 992
WS/WE 9L-N330	1 023 995
WS/WE 9L-N430	1 023 994

Accessories

	page
Cables and connectors	908, 909
Mounting brackets	933, 935

Technical Data	WS/WE 9L-	P330	P430	N330	N430
Sensing range, max. typ.	0...164 ft (0...50 m)	■	■	■	■
Supply voltage V_S	10...30 V DC[1]	■	■	■	■
Ripple[2]	< 5 V_{PP}	■	■	■	■
Current consumption[3]	< 25 mA (WE), < 35 mA (WS)	■	■	■	■
Light source[4], light type	Laser, red light, Class II	■	■	■	■
Light spot size	< 0.019 in at 19.7 in (< 0.5 mm at 500 mm)	■	■	■	■
Switching outputs Q and $\overline{Q}$	PNP	■	■		
	NPN			■	■
PNP; signal voltage HIGH	V_S – 2 V	■	■		
PNP; signal voltage LOW	Approx. 0 V	■	■		
NPN; signal voltage HIGH	V_S			■	■
NPN; signal voltage LOW[5]	V_S – 2 V			■	■
Output current I_A max.	< 100 mA	■	■	■	■
Response time[6]	< 0.6 ms	■	■	■	■
Max. switching frequency[7]	1000/s	■	■	■	■
Connection types	Plug, M12 4-pin		■		■
	Plug, M8 4-pin	■		■	
VDE protection class[8]	⊡ (plug M12)		■		■
	⏀ (plug M8)	■		■	
Enclosure rating	IP 67	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Ambient temperature T_A[10]	Operation 14...122°F (-10...50°C)	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■
Approximate weight	0.7 oz (20 g)	■	■	■	■
Housing material	ABS plastic	■	■	■	■

1) Limit values
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Average service life 50,000 h at T_A = 25°C
5) At T_A = 25°C and 100 mA output current
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs reverse-polarity protected
C = Interference pulse suppression
10) Do not stack devices

Teach-in Function

Standard

1. Align the sender and receiver with each other. Yellow and green LEDs are on.
2. Press Teach-in button for >2 sec. Green LED momentarily turns off. Teach-in is initiated. Yellow and green LEDs both flash.
3. The reference level is stored permanently when the button is released. Switching threshold is set to standard sensitivity.

Precise

1. Align the sender and receiver with each other. Yellow and green LEDs are on.
2. Press Teach-in button for >5 sec. Green LED momentarily turns off. Teach-in is initiated. Yellow and green LEDs both flash.
3. The reference level is stored permanently when the button is released. Switching threshold is set to precise sensitivity with a lower switching hysteresis, making detection of transparent objects possible.

Laser Protection

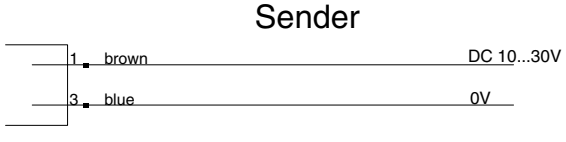
EN 60825-1, Class II
Conforms to 21 CFR 1040

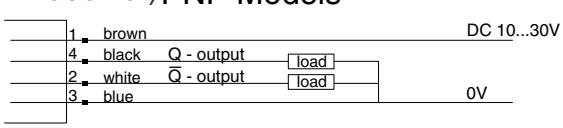
SICK AG
D-79183 Waldkirch
Sebastian - Kneipp - Str. 1
April 2003 / 7279

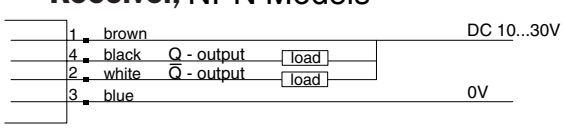
Beam Attenuator

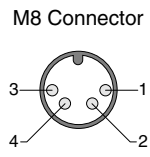
The WS 9L is equipped with an M8 or M12 style quick disconnect. This cable can be quickly and easily be removed in the event that personnel require access to the area where the sensor is mounted.

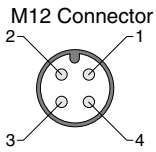
Connection Diagram









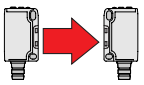


wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 140-2

Through Beam Sensors



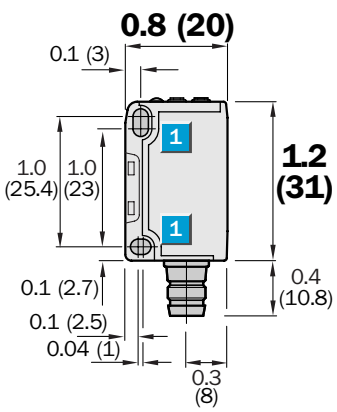

0...49.2 ft (0...15 m)
sensing range

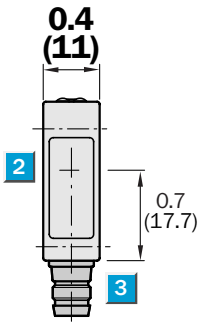
Highlights

- Small, compact housing
- Slotted masks for detecting small parts or for positioning jobs
- Adjustable sensitivity
- Signal strength indicator
- Cable or quick disconnect versions available
- Polarizing filters provide crosstalk immunity

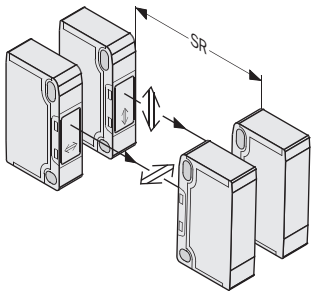
WS/WE 140

Dimensional Drawing



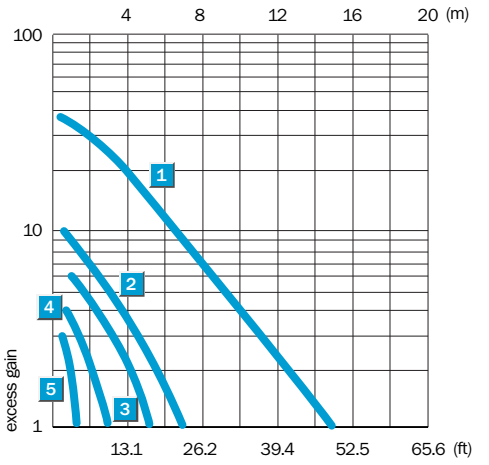


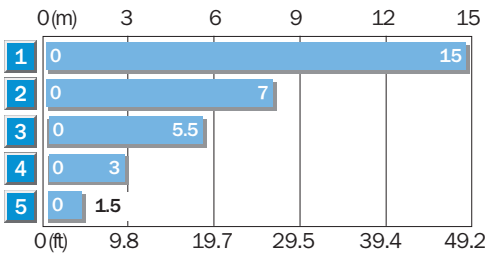
WS/WE 140 mounting in pairs
No mutual interference thanks to use of polarizing filter tip adapters BL-140-POLF
e.g., Pair 1: BL-140-POLF with polarizing level
Pair 2: BL-140-POLF with polarizing level



dimensions in inches (mm)

Excess Gain



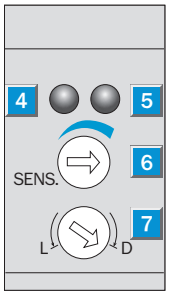


Sensing Range Reduction With Slotted Masks

1	Without masks/polarizing filter
2	With polarizing filter tip adapter
3	With slotted mask, width 2.0 mm
4	With slotted mask, width 1.0 mm
5	With slotted mask, width 0.5 mm

Adjustments

All types



1 Mounting hole Ø 3.2 mm for M3
2 Optics center – WS 140 sender
Optics center – WE 140 receiver
3 M8 plug, 3-/4-pin or connection cable
4 Green LED indicator:light reception with operating reserve > 1.1 (WE 140) and < 1.0
5 Orange LED indicator:switching output active
6 Sensitivity setting (270°, WE 140)
7 Light/dark rotary switch:
L = light switching, D = dark switching (WE 140)

Order Information

Type	Part no.[11)]
WS/WE 140-2P132	6 024 788
WS/WE 140-2P330	6 024 790
WS/WE 140-2P430	6 024 791
WS/WE 140-2N132	6 024 784
WS/WE 140-2N330	6 024 786
WS/WE 140-2N430	6 024 787

Accessories

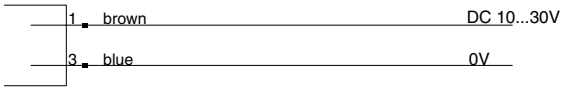
	page
Cables and connectors	908
Mounting brackets	920
Polarizing filter adapters	950
Slotted masks	950

Technical Data		WS/WE 140-2-	P132	P330	P430	N132	N330	N430
Sensing range		0...49.2 ft (0...15 m)						
Range with polarizing filter		16.4 ft (5.0 m)						
Range with mask 0.08 in (2.0 mm)		13.1 ft (4.0 m)						
Range with mask 0.04 in (1.0 mm)		6.6 ft (2.0 m)						
Range with mask 0.02 in (0.5 mm)		3.2 ft (1.0 m)						
Sensitivity, adjustable		Potentiometer, 270°						
Light source[1]		LED, visible red light						
Light spot diameter		25.6 in at 39.4 ft (650 mm at 12 m)						
Angle of divergence, sender		Approx. 3.1°						
Angle of reception, receiver		Approx. 15°						
Supply voltage V_S[2]		10...30 V DC						
Ripple[3]		± 10%						
Current consumption[4] Transm./receiv.		≤ 15 mA/≤ 20 mA						
Switching outputs		PNP, open collector: Q						
		NPN, open collector: Q						
Switching type, (WE 140)		Light/dark switching per rotary switch[5]						
Output current I_A max.		100 mA						
Response time[6]		≤ 0.5 ms						
Max. switching frequency[7]		1000 Hz						
Connection type	WS 140	Cable, PVC, 2 m[8]; 2 x 0.18 mm², Ø 4..0 mm						
	WE 140	Cable, PVC, 2 m[8]; 3 x 0.18 mm², Ø 4.0 mm						
		Plug, M8 3-pin						
		Plug, M8 4-pin						
VDE protection class[9]		⧈						
Enclosure rating		IP 67						
Circuit protection[10]	WS 140	A						
	WE 140	A, B, C, D						
Ambient temperature		Operation -13...131°F (-25...55°C)						
		Storage -40...158°F (-40... 70°C)						
Approximate weight		Sender: 1.9 oz (53 g), receiver: 1.9 oz (53 g)						
		Sender: 0.3 oz (9 g), receiver: 0.3 oz (9 g)						
Housing material		Glass fiber reinforced ABS						

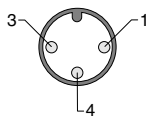
1) Average service life 100,000 h at T_U = 25°C
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) L = light switching, D = dark switching
6) With resistive load
7) With light/dark ratio 1:1
8) Do not bend cable below 0°C
9) Rated voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) The order no. includes transmitter and receiver

Connection Diagram

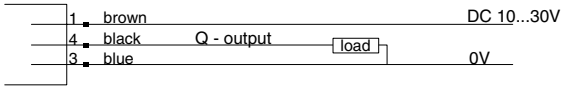
Sender



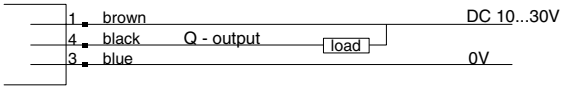
M8 Connector



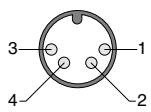
PNP Models



NPN Models



M8 Connector

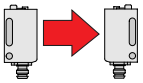


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WS/WE 160

Through Beam Sensors



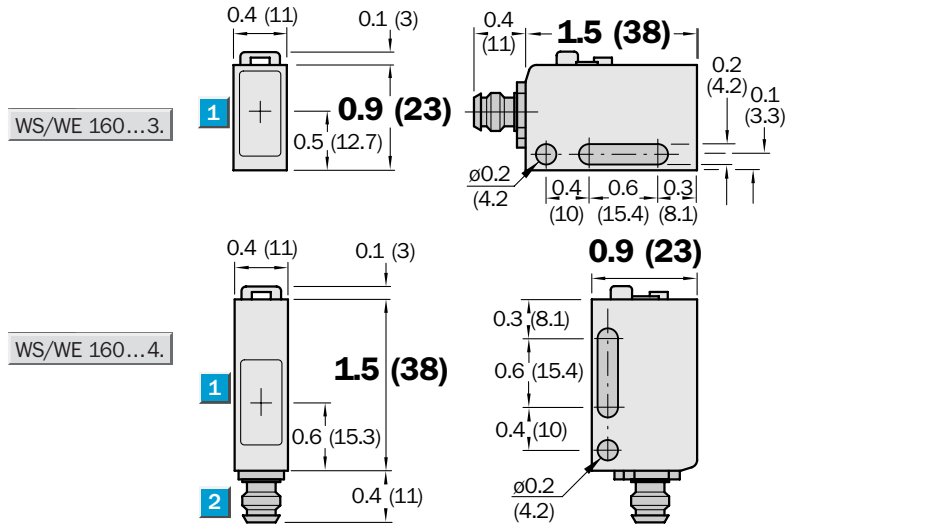

0...45.9 ft (0...14 m)
sensing range

Highlights

- Rugged plastic housing
- Horizontal or vertical housing
- Signal strength indicator
- Sensitivity adjustment
- Easy mounting with included bracket
- Cable or M8 quick disconnect versions

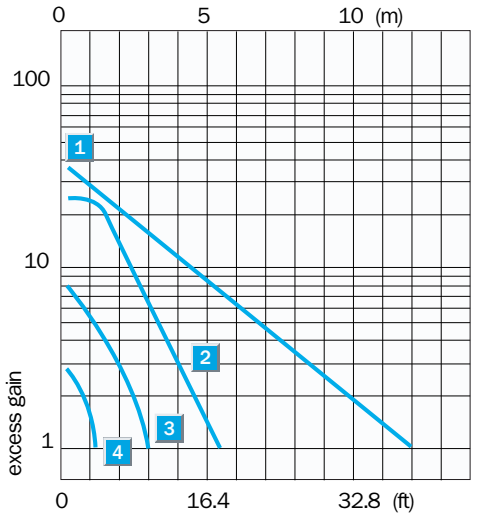
WS/WE 160

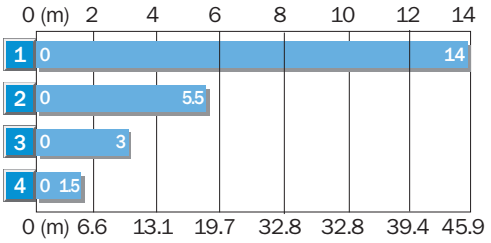
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

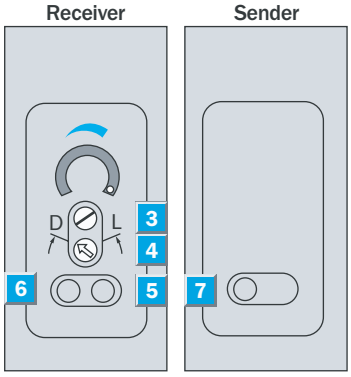




1	Without slotted mask
2	With slotted mask 2 mm, BL-160-SK
3	With slotted mask 1 mm, BL-160-SK
4	With slotted mask 0.5 mm, BL-160-SK

Adjustments

All types



1	Center of optical axis sender/receiver
2	Plug, M8 4-pin or connection cable
3	Sensitivity adjustment
4	Light/dark rotary switch: L = light switching D = dark switching
5	Orange LED indicator (status output)
6	Green LED signal strength indicator (excess gain)
7	Output indicator, red (sender active)

Order Information

Type	Part no.[11]
WS/WE160-F132	6 022 751
WS/WE160-F430	6 022 756
WS/WE160-F142	6 022 753
WS/WE160-F440	6 022 758
WS/WE160-E132	6 022 743
WS/WE160-E430	6 022 748
WS/WE160-E142	6 022 745
WS/WE160-E440	6 022 750

Accessories

	page
Cables and connectors	908
Mounting brackets*	919
Slotted mask	951

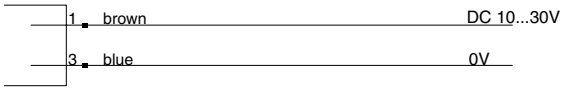
* included with delivery

Technical Data	WS/WE 160-	F132	F430	E132	E430	F142	F440	E142	E440
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Sensing range	0...45.9 ft (0...14 m)	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 59 in at 32.8 ft (1500 mm at 10 m)	■	■	■	■	■	■	■	■
Angle of divergence, sender	Approx. 3.3°	■	■	■	■	■	■	■	■
Angle of reception, receiver	Approx. 15°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	± 10%	■	■	■	■	■	■	■	■
Current consumption[4]	Sender ≤ 20 mA	■	■	■	■	■	■	■	■
	Receiver ≤ 20 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■	■
Response time[5]/max. switching freq.[6]	≤ 0.5 ms / 1000 Hz	■	■	■	■	■	■	■	■
Connection types	Cable, PVC, 2 m[8]	■		■		■		■	
	Sender WS, 2 x 0.2 mm², Ø 4.2 mm	■		■		■		■	
	Receiver WE, 3 x 0.2 mm², Ø 4.2 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Available in Plug, M8 4-pin upon request	■	■	■	■	■	■	■	■
VDE protection class[9]	⧈	■	■	■	■	■	■	■	■
Circuit protection[10]		■	■	■	■	■	■	■	■
sender WS	A, B	■	■	■	■	■	■	■	■
receiver WE	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Approximate weight	Sender/receiver each 2.1 oz (60 g)	■		■		■		■	
	Sender/receiver each 0.7 oz (20 g)		■		■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

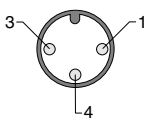
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) TE not with plug model
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected
11) Part no. includes transmitter and receiver

Connection Diagram

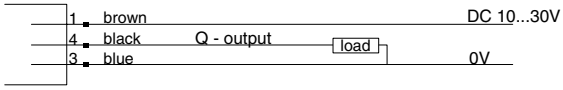
Sender



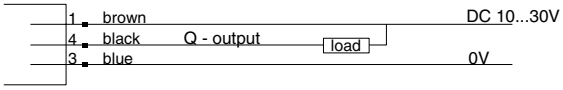
M8 Connector



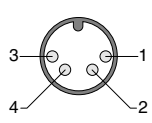
PNP Models



NPN Models



M8 Connector



wire colors refer to standard cable, not included with quick disconnect models.

SICK

WS/WE 170

Through Beam Sensors

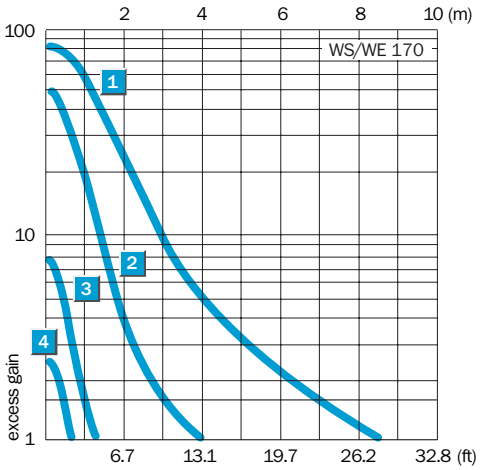
0...27.9 ft (0...8.5 m)
sensing range

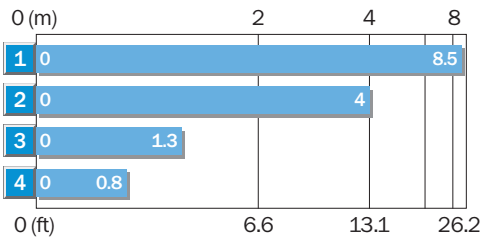
Highlights

- Rugged stainless steel/plastic housing
- Test input
- Red light for easy alignment
- Optional slotted masks
- Optional polarizing filter
- Cable or M8 quick disconnect versions

WS/WE 170

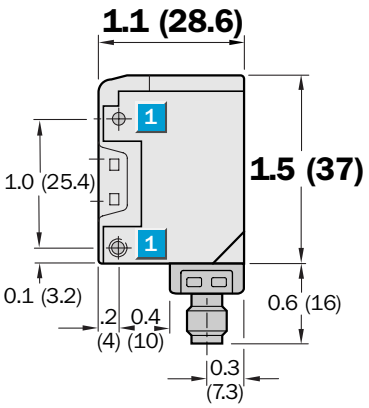
Excess Gain





1	Without attachments
2	With polarizing filter attachment
3	With slotted mask, 1 mm
4	With polarizing filter and slotted mask, 1 mm

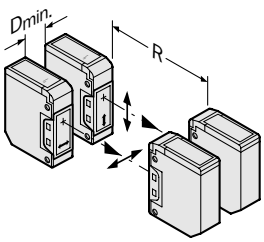
Dimensional Drawing

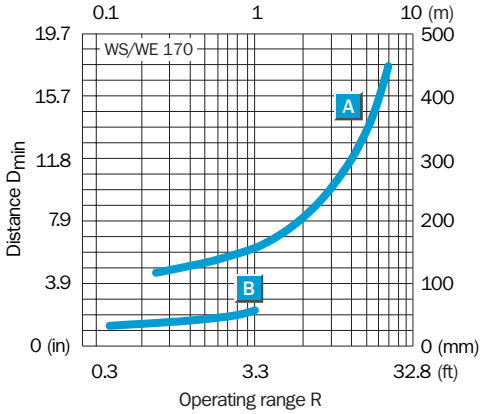


1 Mounting holes Ø 3 mm with integrated M3 thread
2 LED signal strength indicator
3 Center of optical axis, sender (WS) and receiver (WE)

dimensions in inches (mm)

Minimum Distance $D_{min.}$ Between Sides of Two WS/WE 170 Units





Prevention of Interference With Two WS/WE 170 Units

Minimum distance $D_{min.}$ observed for:

A R 0.25 m...7 m: without optical attachments
B R 0.15 m...1 m: with slotted masks BL170-10

No mutual interference if polarizing filters are used

C Polarizing filter attachments BL170-POLF up to R ≤ 3 m only
D Polarizing filter BL170-POLF and slotted masks BL170-10 up to R ≤ 0.5 m

Order Information

Type	Part no.*
WS/WE170-P132	6 010 181
WS/WE170-N132	6 010 183
WS/WE170-P430	6 010 182
WS/WE170-N430	6 010 184

* Part no. includes sender and receiver

Accessories	page
Cables and connectors	908
Mounting brackets*	919
Slotted masks	951
Polarizing filter attachments	951

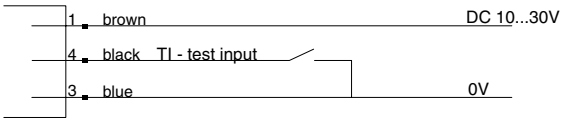
* included with delivery

Technical Data	WS/WE 170-	P132	P430	N132	N430
Sensing range	0...27.9 ft (0...8.5 m)	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■
Light spot size	Approx. 33.5 in at 23 ft (850 mm at 7 m)	■	■	■	■
Angle of divergence, sender	Approx. 7°	■	■	■	■
Angle of reception, receiver	Approx. 20°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	± 10%	■	■	■	■
Current consumption[4] sender	≤ 20 mA	■	■	■	■
receiver	≤ 30 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via control wire	■	■	■	■
	+ V_S = light switching	■	■	■	■
	0 V = dark switching	■	■	■	■
Response time[5]	≤ 1.0 ms	■	■	■	■
Max. switching frequency[6]	500 Hz	■	■	■	■
Test input "TE" sender OFF	PNP, NPN: TE to 0 V	■	■	■	■
Connection types	Cable, PVC, 2 m[7]	■		■	
	Sender WS, 3 x 0.18 mm², Ø 3.8 mm	■		■	
	Receiver WE, 4 x 0.18 mm², Ø 3.8 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[8]	⧈	■	■	■	■
Circuit protection[9]					
sender	A, B	■	■	■	■
receiver	A, B, C, D	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	Sender: 2.3 oz (66 g)	■		■	
	Receiver: 2.3 oz (66 g)	■		■	
	Sender: 0.9 oz (25 g)		■		■
	Receiver: 0.9 oz (25 g)		■		■
Housing material	Stainless steel/glass fiber reinforced ABS	■	■	■	■

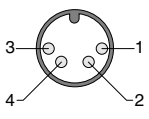
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

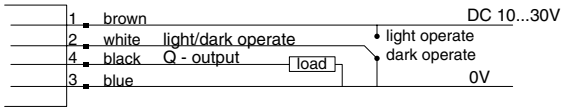
Sender, All Models



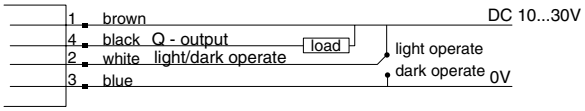
M8 Connector



Receiver, PNP Models



Receiver, NPN Models

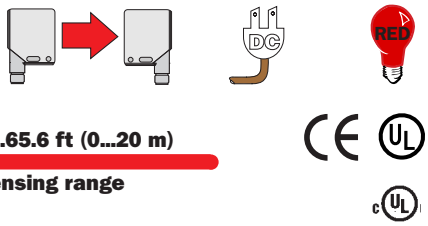


wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 12-2

Through Beam Sensors



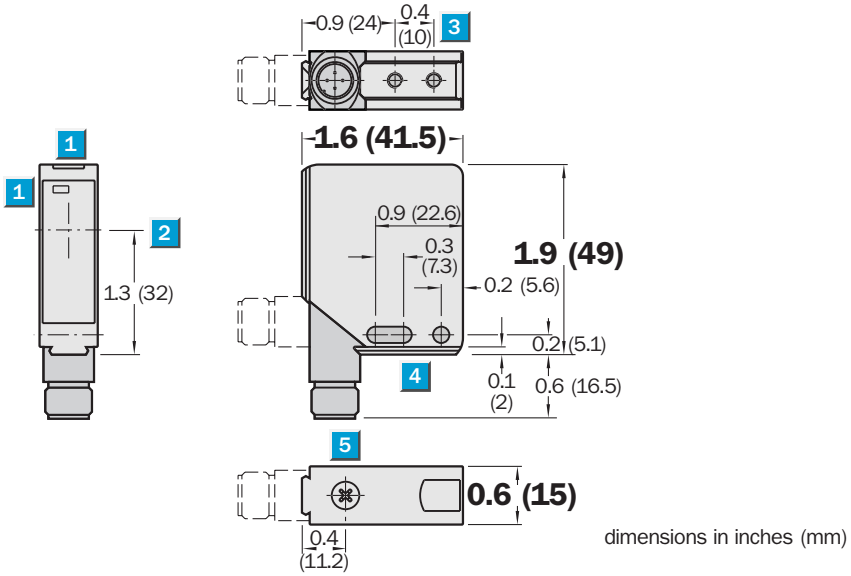
0...65.6 ft (0...20 m)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Insensitive to ambient light
- Sensitivity adjustment
- Signal strength indicator
- Crosstalk immunity
- Test input
- Cable connections swivel 90° for easy installation

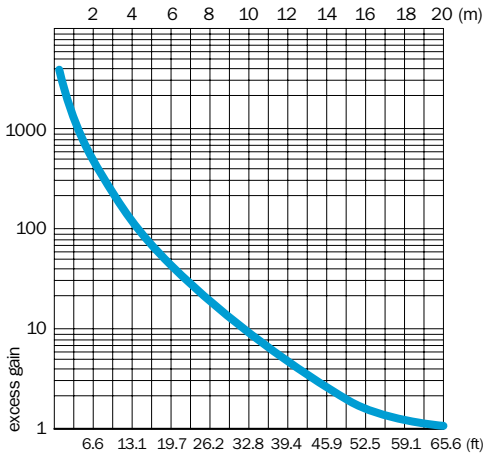
WS/WE 12-2

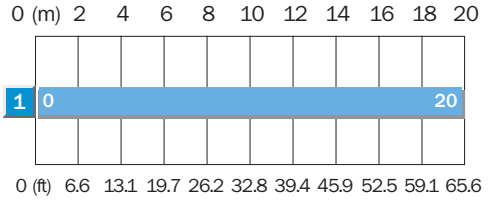
Dimensional Drawing



dimensions in inches (mm)

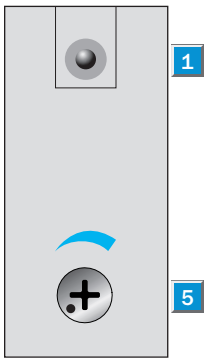
Excess Gain





Adjustments

All types



1 LED signal strength indicator
2 Center of optical axis
3 M4 threaded mounting hole – 4 mm deep
4 Mounting holes Ø 4.2 mm
5 Sensitivity adjustments

Order Information

Type	Part no.
WS/WE 12-2P430	1 016 157
WS/WE 12-2P130	1 016 156
WS/WE 12-2N430	1 016 155
WS/WE 12-2N130	1 016 154

Accessories

	page
Cables and connectors	909
Mounting brackets	922
Clamps*	921
Masks	950

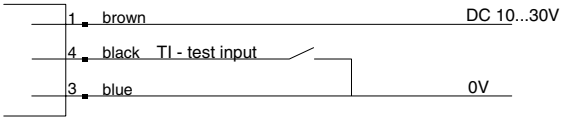
* 2 pieces included with delivery

Technical Data	WS/WE 12-2-	P430	P130	N430	N130
Sensing range	0...65.6 ft (0...20 m)	■	■	■	■
Sensitivity	Adjustable	■	■	■	■
Sensing range with 2 mm mask	0...6.6 ft (0...2 m)	■	■	■	■
Sensing range with 1.5 mm mask	0...4.9 ft (0...1.5 m)	■	■	■	■
Sensing range with 1 mm mask	0...3.3 ft (0...1 m)	■	■	■	■
Sensing range with 0.5 mm mask	0...0.02 in (0...0.5 mm)	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■
Light spot diameter	Approx. 19.7 in at 49.2 ft (500 mm at 15 m)	■	■	■	■
Angle of divergence	Approx. 1.5°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]					
sender	≤ 30 mA	■	■	■	■
receiver	≤ 15 mA	■	■		
receiver	≤ 25 mA			■	■
Switching output	PNP, Q and $\overline{Q}$	■	■		
	NPN, Q and $\overline{Q}$			■	■
Output current I_A max.	100 mA	■	■	■	■
Response time[5]	≤ 330 µs	■	■	■	■
Max. switching frequency[6]	1500 Hz	■	■	■	■
Test input "TE" for light sender					
Sender OFF	TE to 0 V	■	■	■	■
Connection types	Plug, M12 4-pin	■		■	
	Cable[7], 2 m		■		■
VDE protection class[8]	⧈	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■		■	
	7.1 oz (200 g)		■		■
Housing material	Die cast zinc	■	■	■	■

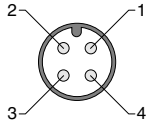
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

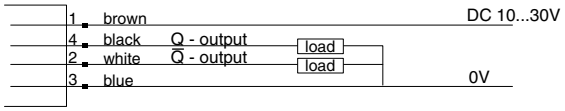
Sender, All Models



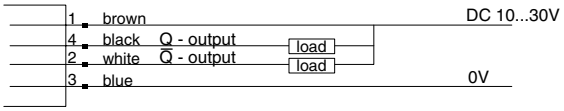
M12 Connector



Receiver, PNP Models



Receiver, NPN Models



wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 12L-2

Through Beam Sensors

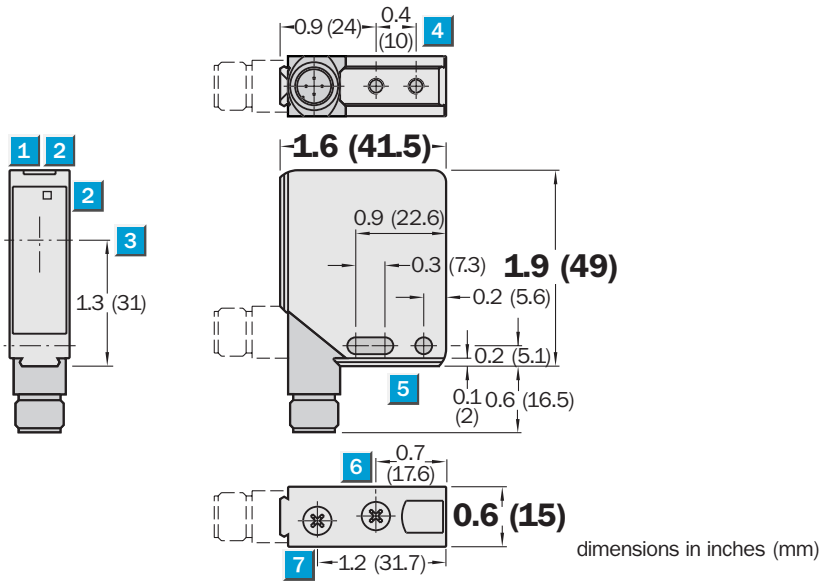
0...262.5 ft (0...80 m)
sensing range

Highlights

- Rugged die cast metal housing
- Long range Class II laser for ultra long range
- Adjustable focus and sensitivity
- 90° rotatable M12 plug
- Test input
- Signal strength indicator
- Red light for easy alignment

WS/WE 12L-2

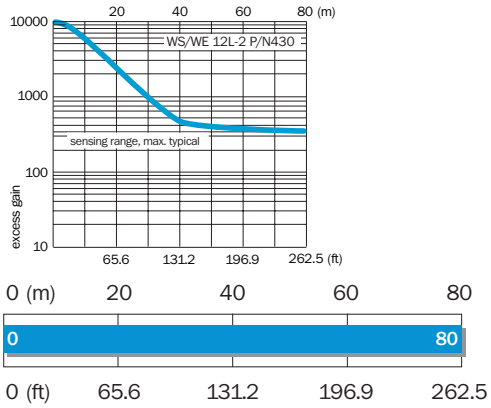
Dimensional Drawing



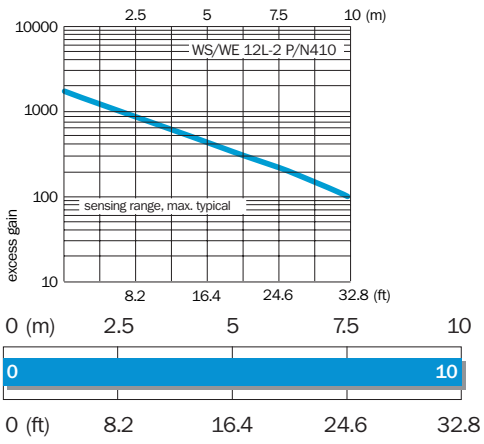
dimensions in inches (mm)

Excess Gain

430 Models



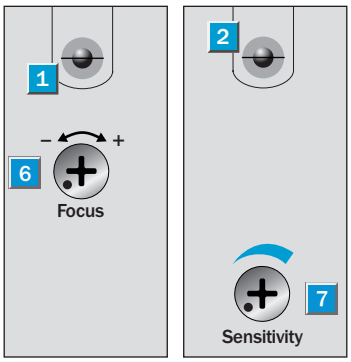
430 Models



Adjustments

All types

Sender WS | Receiver WE



1 LED operating indicator (WS above only)
2 LED output indicator (WE)
3 Center of optical axis
4 M4 threaded mounting hole – 4 mm deep
5 Mounting drill hole Ø 4.2 mm
6 Focal adjustment (WS)
7 Sensitivity adjustment (WE)

Order Information

Type	Part no.
WS/WE 12L-2P430A01	1 018 476
WS/WE 12L-2N430A01	1 018 478
WS/WE 12L-2P410A03	1 023 059
WS/WE 12L-2N410A04	1 023 060

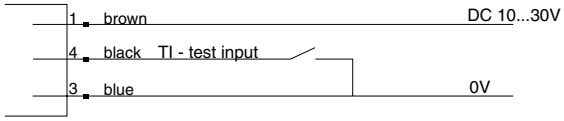
Accessories	page
Cables and connectors	909
Clamps	921
Mounting brackets	922

Technical Data	WS/WE 12L-2-	P430 A01	N430 A01	P410 A03	N410 A04					
Sensing range	0...262.5 ft (0...80 m)	■	■							
	0...32.8 ft (0...10 m)			■	■					
Focus adjustable	11.8 in ...∞ (300 mm...∞)	■	■							
	Fixed parallel light beam			■	■					
Light source[1]	Laser, 650 nm, pulsed	■	■							
Light spot diameter	5.9 in at 197 ft (150 mm at 60 m)	■	■							
	0.04 in at 3.3 ft (1.0 mm at 1 m)			■	■					
Supply voltage V_S	10...30 V DC[2]	■	■	■	■					
Ripple[3]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[4]	WS ≤ 45 mA, WE ≤ 15 mA	■	■	■	■					
Switching outputs Q and $\overline{Q}$	PNP	■		■						
	NPN		■		■					
Signal voltage HIGH	V_S – < 2.9 V, V_S	■	■	■	■					
Signal voltage LOW[5]	Approx. 0 V, ≤ 1.5 V	■	■	■	■					
Output current I_A max.	100 mA	■	■	■	■					
Response time max.[6]	Typ. 200 µs	■	■	■	■					
Max. switching frequency[7]	2.5 kHz	■	■	■	■					
Input "TE" system test	V_S or open: sender active	■	■	■	■					
	0 V: sender inactive	■	■	■	■					
VDE protection class[8]	□	■	■	■	■					
Laser class	2 (IEC 825-1; EN 60825-1:97)	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Circuit protection[9]	A, B, C	■	■	■	■					
Ambient temperature T_A	Operation 14...104°F (-10...50°C)	■	■	■	■					
	Storage -13...167°F (-25...75°C)	■	■	■	■					
Connection type	Plug, M12 4-pin	■	■	■	■					
Approximate weight (WS + WE)	9.2 oz (260 g)	■	■	■	■					
Housing material	Die cast zinc	■	■	■	■					

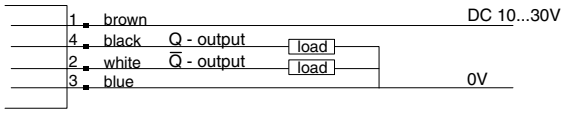
1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) At T_A = 25°C and 100 mA output current
6) Signal transit time with resistive load
7) At light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Outputs protected against short-circuiting
C = Interference pulse suppression

Connection Diagram

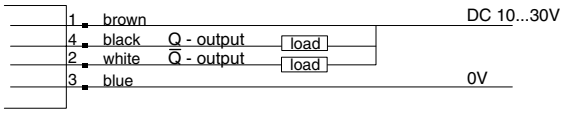
Sender, All Models



PNP Models



NPN Models

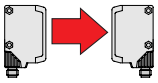


wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 250

Through Beam Sensors



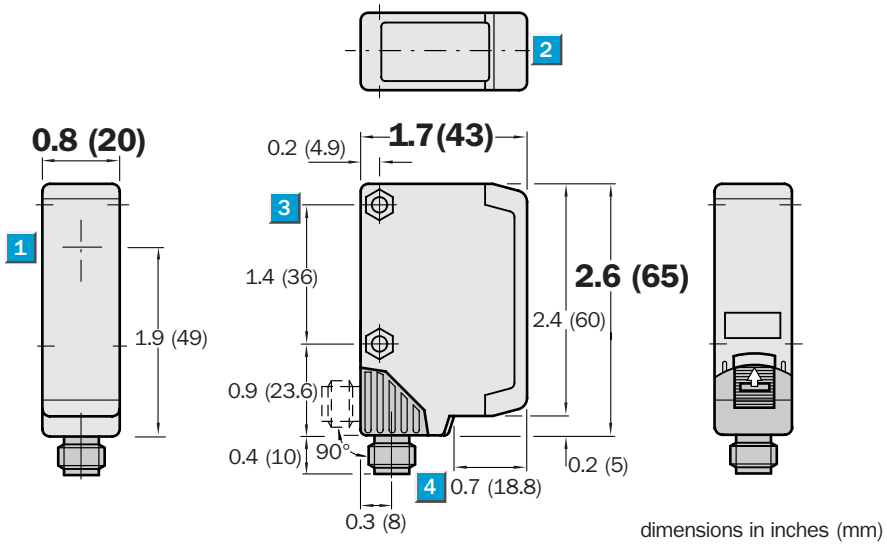

0...82 ft (0...25 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Sensitivity adjustment
- Easy mounting with included bracket
- Cable or M12 quick disconnect versions
- M12 connections swivel 90° for easy installation

WS/WE 250

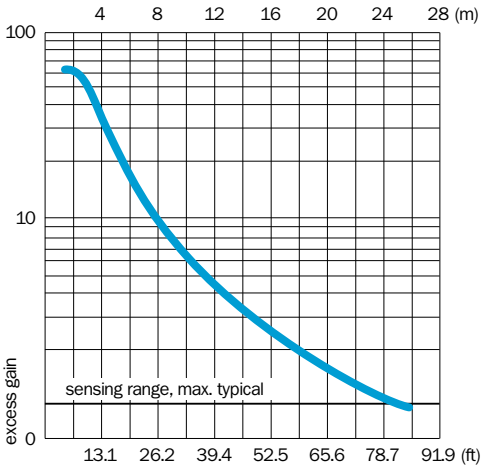
Dimensional Drawing

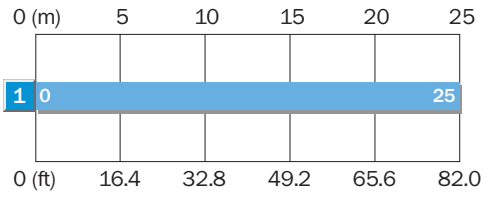


dimensions in inches (mm)

1 Center of optical axis, sender (WS 250), receiver (WE 250)
2 Red LED signal strength indicator (WE 250)
3 Through hole Ø 4.2 mm, for M4 hexagon nut on both sides
4 Cable or M12 plug
plug position rotatable by 90°
V - vertical final position
H - horizontal final position; can be locked with slider

Excess Gain





Order Information	
Type	**Part no.**
WS/WE 250-P142	6 026 266
WS/WE 250-P440	6 026 268
WS/WE 250-N142	6 026 263
WS/WE 250-N440	6 026 265

Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935

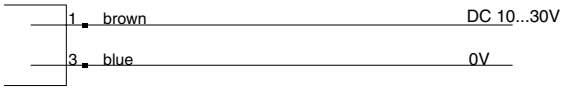
* included with delivery

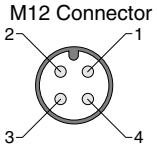
Technical Data	WS/WE 250-	P142	P440	N142	N440					
Sensing range	0...82 ft (0...25 m)	■	■	■	■					
Light source[1], **light type**	LED, red light	■	■	■	■					
Light spot diameter	Approx. 4.9 ft at 65.6 ft (1.5 m at 20 m)	■	■	■	■					
Angle of divergence	Approx. 4°	■	■	■	■					
Angle of reception	Approx. 20°	■	■	■	■					
Supply voltage V_S	10...30 V DC[2]	■	■	■	■					
Ripple[3]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[4]										
sender	≤ 20 mA	■	■	■	■					
receiver	≤ 35 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light/dark switching via control wire:	■	■	■	■					
	+ V_S = light switching	■	■	■	■					
	0 V = dark switching	■	■	■	■					
Response time[5]	≤ 1 ms	■	■	■	■					
Max. switching frequency[6]	500 Hz	■	■	■	■					
Connection types	Cable, PVC[7], 2 m	■		■						
	Sender WS, 3 x 0.18 mm², Ø 3.8 mm	■		■						
	Receiver WE, 4 x 0.18 mm², Ø 3.8 mm	■		■						
	Plug, M12 4-pin, 90° rotatable		■		■					
VDE protection class[8]	□	■	■	■	■					
Circuit protection[9]										
sender	A, B	■	■	■	■					
receiver	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	5.3 oz (150 g)	■		■						
	2.5 oz (70 g)		■		■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

1) Average service life at T_A = 25°C; LED, red light 100,000 h
2) Limit value
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
D = Output overcurrent protected

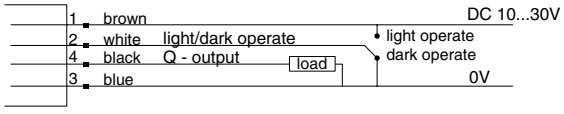
Connection Diagram

Sender

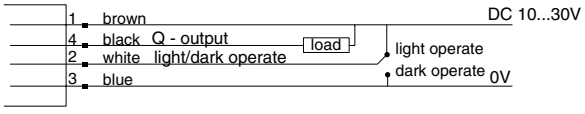




Receiver, PNP Models



Receiver, NPN Models

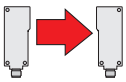


wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 18-2

Through Beam Sensors



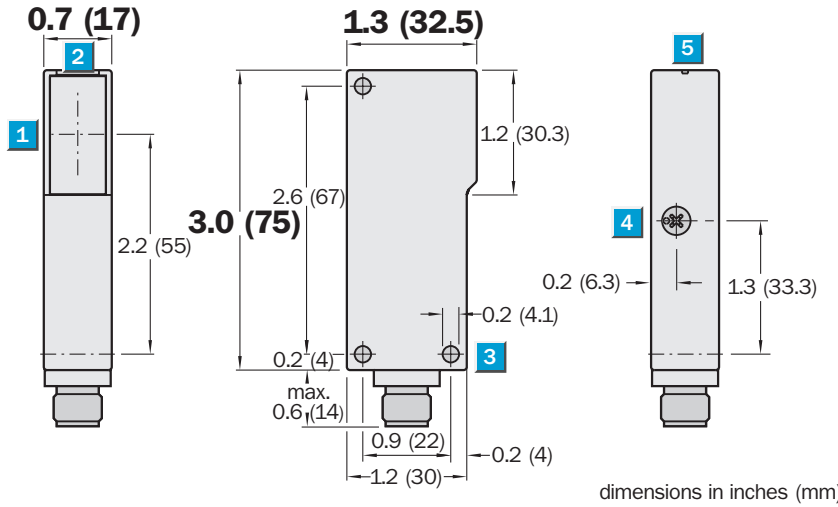

0...65.6 ft (0...20 m)
sensing range

Highlights

- Rugged plastic housing
- Insensitive to ambient light
- Sensitivity adjustment
- Signal strength indicator
- Test input
- Fast response time
- Cable or M12 quick disconnect versions

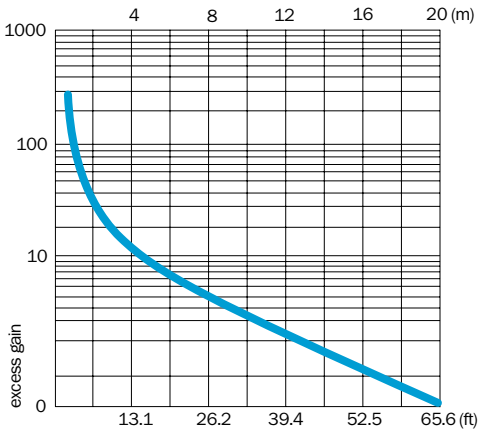
WS/WE 18-2

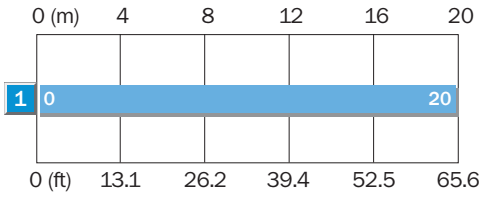
Dimensional Drawing



dimensions in inches (mm)

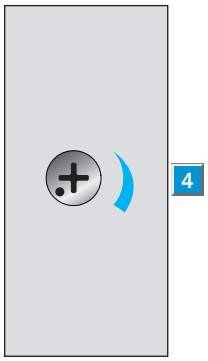
Excess Gain





Adjustments

All types



1 Center of optical axis
2 Operating voltage indicator, green (WS)
LED signal strength indicator, yellow (WE)
3 Mounting hole Ø 4.1 mm
4 Sensitivity adjustment
5 Alignment sight (WE)

Order Information

Type	Part no.
WS/WE 18-2P132	1 012 915
WS/WE 18-2P430	1 012 916
WS/WE 18-2P630	1 012 918
WS/WE 18-2N132	1 012 914
WS/WE 18-2N630	1 012 917

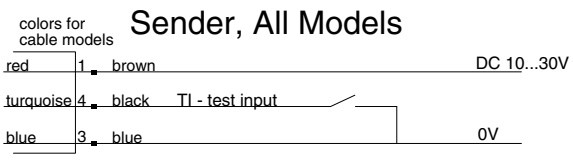
Accessories

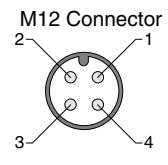
	page
Cables and connectors	909, 914
Mounting brackets	922, 923, 935

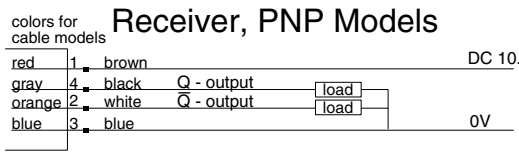
Technical Data	WS/WE 18-2-	P132	P430	P630	N132	N630
Sensing range	0...65.6 ft (0...20 m)	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■	■
Light spot diameter	Approx. 17.7 in at 49.2 ft (450 mm at 15 m)	■	■	■	■	■
Angle of divergence	Approx. 1.5°	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■
Current consumption[4]	< 60 mA	■	■	■	■	■
sender	< 35 mA	■	■	■	■	■
receiver	< 25 mA	■	■	■	■	■
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■		
	NPN, Q and $\overline{Q}$				■	■
Output current I_A max.	100 mA	■	■	■	■	■
PNP; signal voltage HIGH	V_S – (< 2.9 V)	■	■	■		
PNP; signal voltage LOW	Approx. 0 V	■	■	■		
NPN; signal voltage HIGH	Approx. V_S				■	■
NPN; signal voltage LOW	< 1.5 V				■	■
Response time[5]	500 µs	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■
Test input "TE" sender OFF	Test input to 0 V	■	■	■	■	■
Connection type	Cable[7], 2 m	■			■	
	Plug, M12 4-pin		■			
	Plug, square 6-pin			■		■
VDE protection class[8]	□	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■		■	
	IP 65			■		■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■

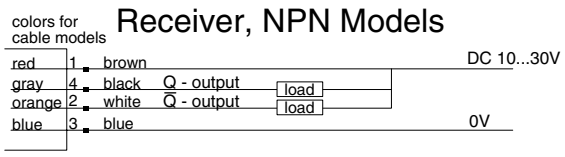
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

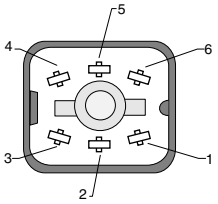
Connection Diagram









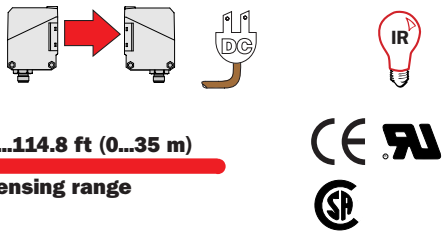


wire colors refer to standard cable, not included with quick disconnect models

SICK

WS/WE 260

Through Beam Sensors



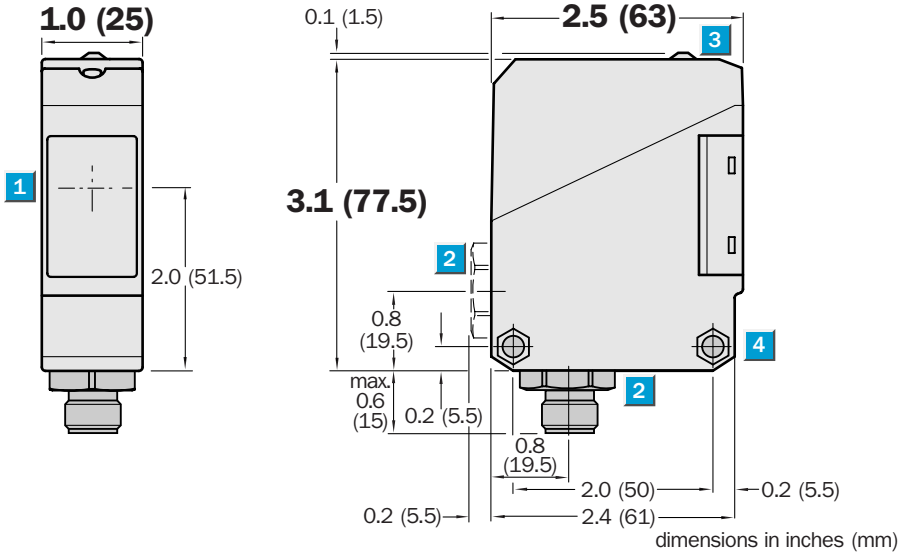
0...114.8 ft (0...35 m)
sensing range

Highlights

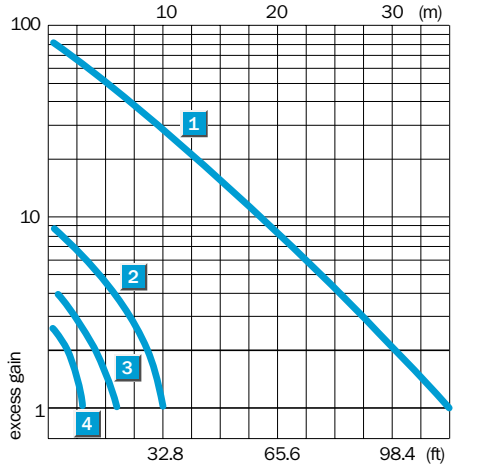
- Rugged plastic housing
- Sensitivity adjustment
- Signal strength indicator
- Test input
- Optional slotted masks
- Terminal chamber for connection flexibility
- Easy mounting with included bracket

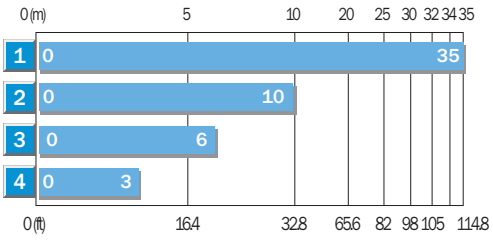
WS/WE 260

Dimensional Drawing



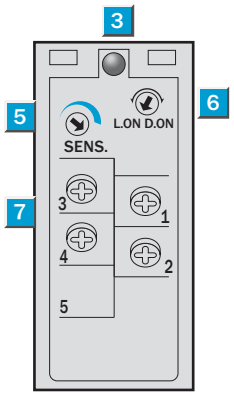
Excess Gain





Adjustments

All types



1 Center of optical axis, sender/receiver
2 Cable entry gland 1/2" PF thread
for cable diameters from 6 to 10 mm
optionally at bottom or rear;
or M12 equipment plug, bottom
3 LED signal strength indicator, orange
WE 260: switching output active
WS 260: sender active
4 Through hole Ø 5.2 mm on both sides
for M5 hex nut
5 Sensitivity adjustment (WE 260)
6 Light/dark rotary switch (WE 260)
L.ON = light switching, D.ON = dark switching
7 Terminals
Terminal 3: WS 260 only
Terminal 4: WE 260 only

Order Information

Type	Part no.
WS/WE 260-F270	6 020 973
WS/WE 260-F470	6 020 974
WS/WE 260-E270	6 020 975
WS/WE 260-E470	6 021 817

Accessories

	page
Cables and connectors M12	909
Mounting brackets*	924
Slotted masks	951

* included with delivery

Sensing Range Reduction With Slotted Masks

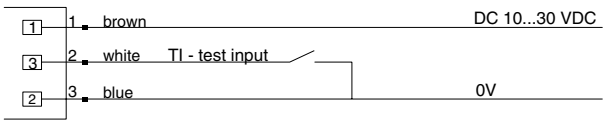
1	Without slotted mask
2	Slot width 5 mm
3	Slot width 2 mm
4	Slot width 1 mm

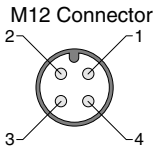
Technical Data	WS/WE 260-	F270	F470	E270	E470
Sensing range	0...114.8 ft (0...35 m)	■	■	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 27.6 in at 98.4 ft (700 mm at 30 m)	■	■	■	■
Angle of divergence	Approx. 1.4°	■	■	■	■
Angle of reception	Approx. 20°	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]					
sender	≤ 20 mA	■	■	■	■
receiver	≤ 35 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■
Response time[5]	≤ 1.5 ms	■	■	■	■
Max. switching frequency[6]	333 Hz	■	■	■	■
Test input "TE" sender off	PNP, NPN: TE to 0 V	■	■	■	■
Connection types	1/2" PF terminal chamber	■		■	
	Plug, M12 4 pin		■		■
VDE protection class[7]	⧈	■	■	■	■
Circuit protection[8]					
sender	A, B	■	■	■	■
receiver	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	4.2 oz (120 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100 000 h at T_A = 25°C
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) With resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_s connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

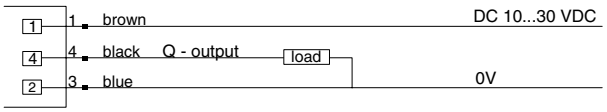
Connection Diagram

Sender

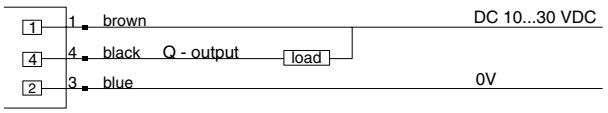




Receiver, PNP Models



Receiver, NPN Models



SICK

WS/WE 27-2

Through Beam Sensors

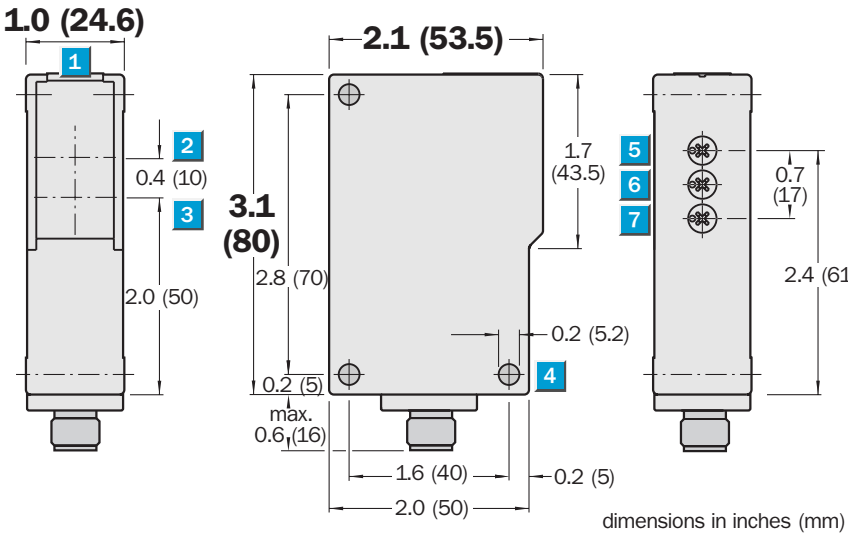
0...114.8 ft (0...35 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Signal strength indicator
- Test input
- Sensitivity adjustment
- Models available with integrated lens heater

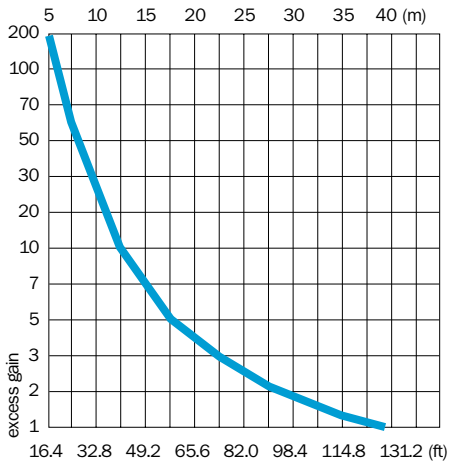
Ws/WE 27-2

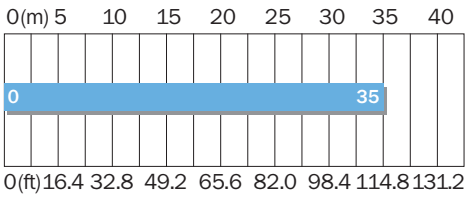
Dimensional Drawing



dimensions in inches (mm)

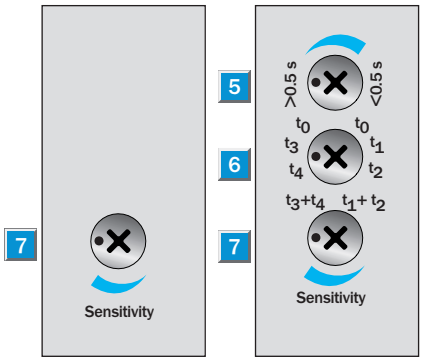
Excess Gain





Adjustments

WS/WE 27-2F430	WS/WE 27-2P630
WS/WE 27-2F450	WS/WE 27-2N630
WS/WE 27-2F730	



1 LED signal strength indicator
2 Optical axis, sender
3 Optical axis, receiver
4 Mounting hole Ø 5.2 mm
5 Time control
6 Time delay selector switch
7 Sensitivity adjustment

Switch-selectable Time Delay

0.5 – 10 s

t_0 Without time delay
t_3 ON-delay from interruption of light path
t_4 OFF-delay from reset of light path
$t_3 + t_4$ ON- and OFF-delay

0.02 – 0.5 s

t_0 Without time delay
t_1 ON-delay from interruption of light path
t_2 OFF-delay from reset of light path
$t_1 + t_2$ ON- and OFF-delay

Order Information

Type	Part no.
WS/WE 27-2F430	1 015 121
WS/WE 27-2F450	1 015 127
WS/WE 27-2P630	1 015 123
WS/WE 27-2N630	1 015 122
WS/WE 27-2F730	1 015 124

Accessories

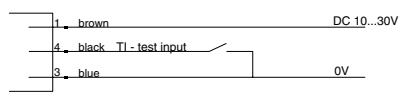
	page
Cables and connectors	909, 914, 915
Mounting brackets	923, 924, 935

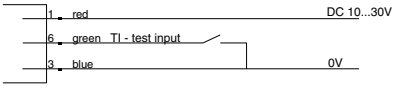
Technical Data	WS/WE 27-2-	F430	F450	P630	N630	F730
Sensing range	0...114.8 ft (0...35 m)	■	■	■	■	■
Sensitivity	Adjustable			■	■	
Light source[1], **light type**	LED, red light	■	■	■	■	■
Light spot diameter	Approx. 47.2 in at 182 ft (1200 mm at 25 m)	■	■	■	■	■
Angle of divergence	3°	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■	■
Current consumption[4]	≤ 25 mA	■	■	■	■	■
	≤ 35 mA, sender without heating	■		■	■	■
	≤ 45 mA, sender with heating		■			
	≤ 25 mA, receiver without heating	■		■	■	■
	≤ 35 mA, receiver with heating		■			
Switching outputs	PNP, Q and $\overline{Q}$	■	■	■		■
	NPN, Q and $\overline{Q}$				■	
Output current I_A max.	100 mA	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■
Selectable delay ranges	0.5...10 s/0.02...0.5 s			■	■	
Alarm output VMA[7]				■	■	
Test input "TE", sender OFF	PNP : Test input to 0 V	■	■	■		■
	NPN : Test input to V_S				■	
Connection types	Plug, 6-pin square			■	■	
	Plug, M12 4-pin	■	■			
	Plug, square 7-pin					■
VDE protection class[8]	⧈	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■
Enclosure rating	IP 65/NEMA 6			■	■	
	IP 67	■	■			■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■	■	■	■	■
Front screen heating			■			
Housing material	Glass fiber reinforced ABS	■	■	■	■	■

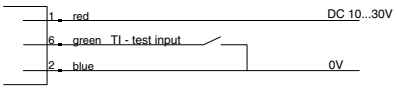
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) NPN: Signal reserve > 50% HIGH
PNP: Signal reserve > 50% LOW
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

Sender

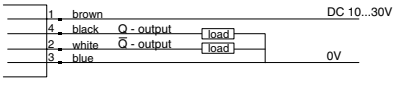




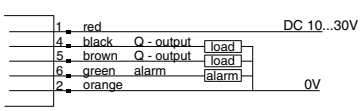


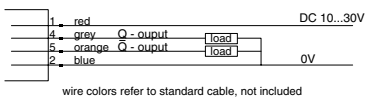
Receiver

PNP Models



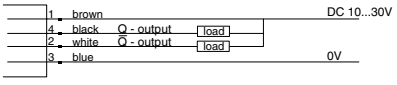
wire colors refer to standard cable, not included with quick disconnect models

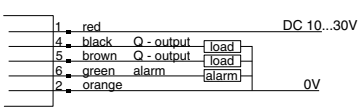




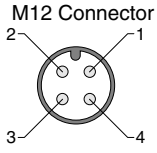
wire colors refer to standard cable, not included

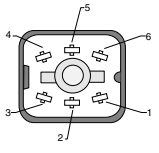
NPN Models

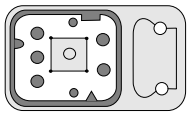




M12 Connector



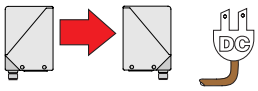




SICK

WS/WE 24-2

Through Beam Sensors



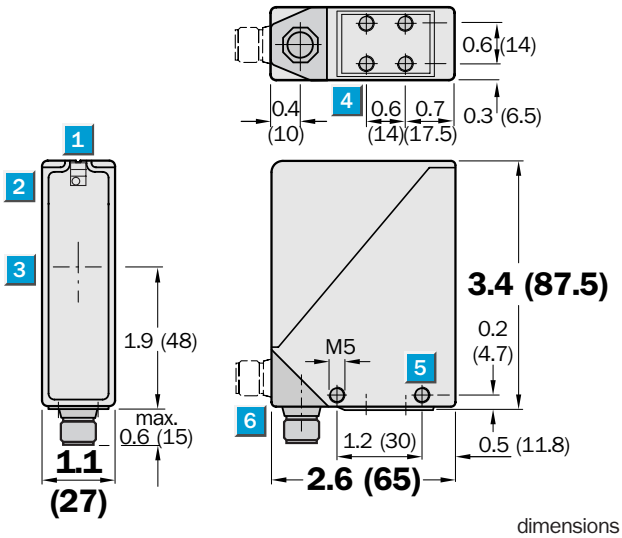
0...196.9 ft (0...60 m)
sensing range

Highlights

- Rugged die cast metal housing
- Adjustable sensing range
- Signal strength indicator
- Alarm output and test input
- Red light for easy alignment
- Optional dust shield, snow shield or cooling plates available
- Models available with integrated lens heater

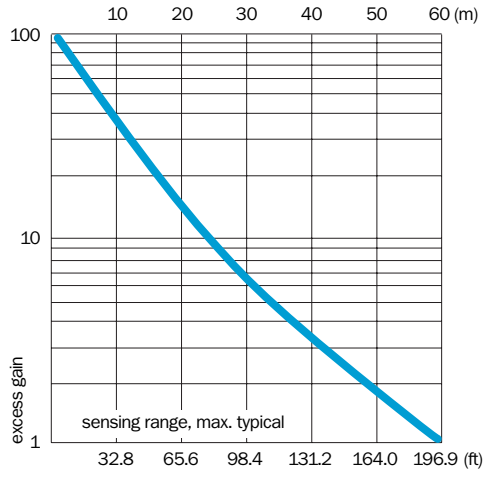
WS/WE 24-2

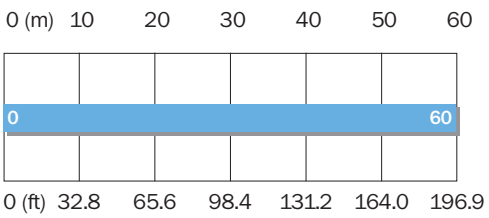
Dimensional Drawing



dimensions in inches (mm)

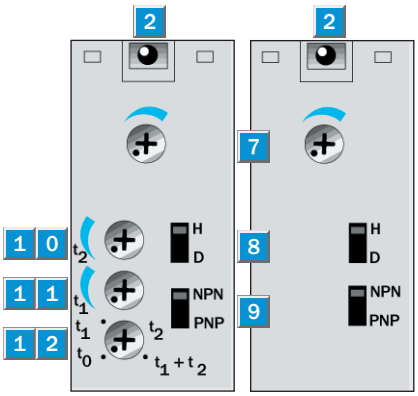
Excess Gain





Adjustments

WS/WE 24-2B440	WS/WE 24-2B230
WS/WE 24-2B240	WS/WE 24-2B430
	WS/WE 24-2V530



1 Alignment sight
2 LED signal strength indicator
3 Center of optical axis
4 M5 threaded mounting hole, 6 mm deep
5 M5 threaded mounting hole, through-hole
6 PG cable gland and plug rotatable by 90°
7 Sensitivity adjustment
8 Light/dark selector
9 NPN/PNP selector
10 Time control t_2 = OFF-delay
11 Time control t_1 = ON-delay
12 Time delay selector switch

Order Information

Type	Part no.
WS/WE 24-2B230	1 017 861
WS/WE 24-2B240	1 017 862
WS/WE 24-2B430	1 017 853
WS/WE 24-2B440	1 017 875
WS/WE 24-2V530	1 017 877

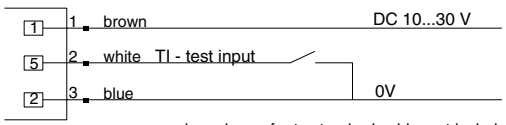
Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Special Accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

Technical Data	WS/WE 24-2-	B230	B240	B430	B440	V530
Sensing range	0...196.9 ft (0...60 m)	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■
Light source[1], **light type**	LED, red light	■	■	■	■	■
Light spot diameter	27.6 in at 164 ft (700 mm at 50 m)	■	■	■	■	■
Angle of divergence/reception	1°/2.5°	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■	■	■
Current consumption[4]						
Sender without heating	≤ 50 mA	■		■		■
Sender with heating	≤ 70 mA		■		■	
Receiver without heating	≤ 40 mA	■		■		■
Receiver with heating	≤ 60 mA		■		■	
Switching outputs	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■
Max. switching frequency[6]	1000/s	■	■	■	■	■
Alarm output	Alarm, PNP					■
Time delay	Adjustable, 0.5...10 sec		■		■	
Test input "TE"	Sender switched off	■	■	■	■	■
Sender OFF	PNP or NPN: test input to 0 V	■	■	■	■	■
Connection types	Plug, M12 4-pin			■	■	
	Plug, M12 5-pin					■
	PG 9 terminal chamber	■	■			
VDE protection class[7]	□	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■
Approximate weight	11.6 oz (330 g)	■	■	■	■	■
Front lens heating			■		■	
Housing material	Die cast zinc	■	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Same values for WS and WE, without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

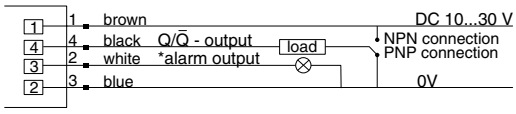
Connection Diagram

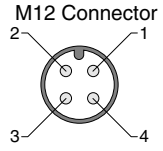
Sender

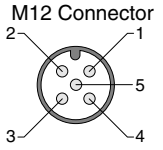


wire colors refer to standard cable, not included
* alarm output available on special models only

Receiver



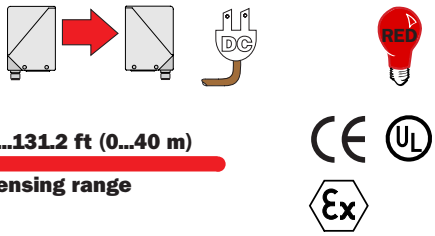




SICK

WS/WE 24 Exi

Through Beam Sensors



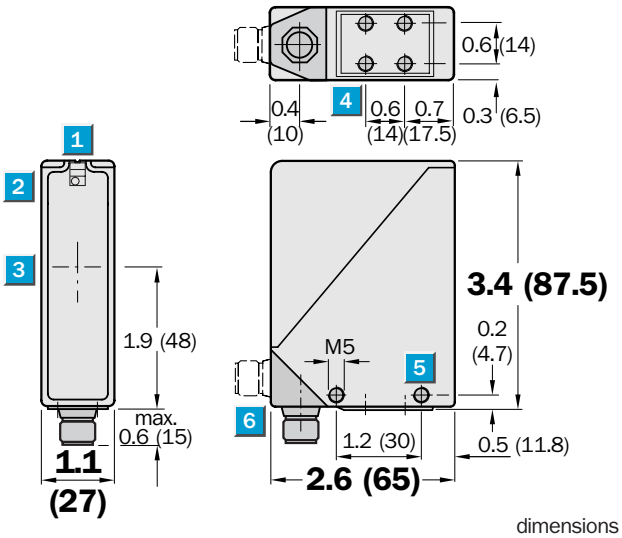
0...131.2 ft (0...40 m)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Signal strength indicator
- Explosion protection EEx ia IIC T6
- FM approved for Class I, Division I hazardous environments
- Terminal chamber for connection flexibility
- Cable connections swivel 90° for easy installation

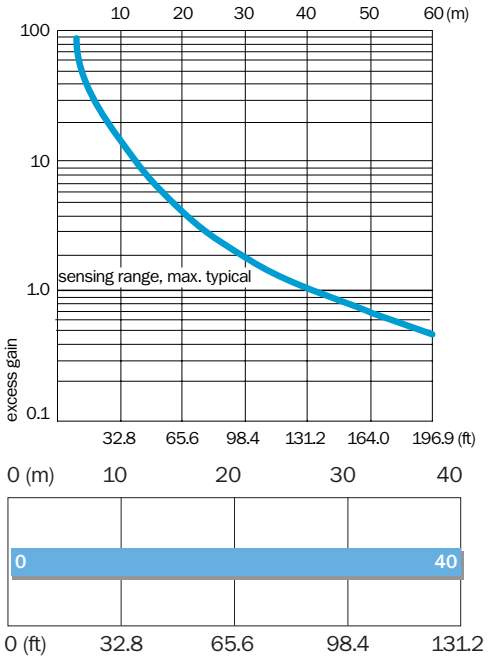
WS/WE 24 Exi

Dimensional Drawing



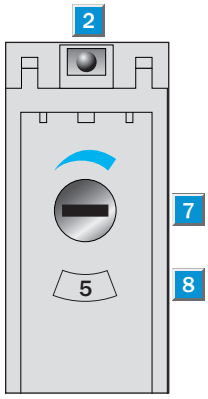
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Alignment sight
2 LED signal strength indicator on WE
Power indicator on WS
3 Center of optical axis
4 M5 threaded mounting hole – 8 mm deep
5 M5 threaded mounting hole
6 Cable gland, M12 plug, rotatable
7 Sensitivity adjustment
8 Sensitivity indicator

Order Information

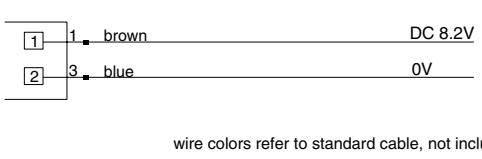
Type	Part No.
WS/WE 24-X2301	1 011 516
WS/WE 24-X4301	1 011 517

Accessories	page
Cables and connectors	909
Mounting brackets	923, 924, 935
Power supply units	966

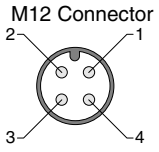
Technical Data	WS/WE 24-	X2301	X4301							
Sensing range	0...131.2 ft (0...40 m)									
Sensitivity	Adjustable									
Light source[1], **light type**	LED, red light									
Light spot diameter	Approx. 17.7 in at 82 ft (450 mm at 25 m)									
Supply voltage V_S[2]	8.2 V DC (5...13.5 V)[3]									
Ripple[4]	0.4 V_{SS}									
Terminal capacitance	≤ 15 nF									
Terminal inductance	≤ 150 µH									
Current consumption[5]										
Sender permanent	≥ 2.2 mA									
Receiver with light beam unbroken	≥ 2.2 mA									
Receiver with light beam broken	≤ 1 mA									
Switching output	Control current dependent on									
	switching state (to NAMUR EN 50227)									
Switching mode	Light switching									
Response time[6]	≤ 10 ms									
Max. switching frequency[7]	50/s									
Connection types	Plug, M12 4-pin									
	Terminal chamber									
Approval	PTB No. Ex97 D2035									
VDE protection class[8]	□									
Circuit protection[9]	A, C									
Enclosure rating	IP 67									
Ambient temperature T_A	Operation -4...104°F (-20...40°C)									
	Storage -13...158°F (-25...70°C)									
Approximate weight	11.6 oz (330 g)									
Housing material	Die cast zinc									

1) Average service life 100,000 h at T_A = 25°C
2) Supply with disconnector device EN 2 Ex
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



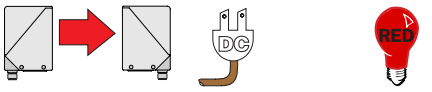
wire colors refer to standard cable, not included



SICK

WS/WE 24-2

Through Beam Sensors



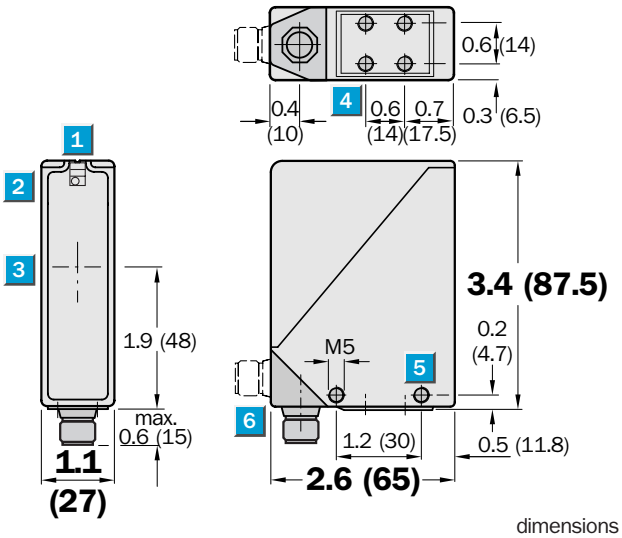
0...131.2 ft (0...40 m)
sensing range

Highlights

- Rugged die cast metal housing
- Red light for easy alignment
- Signal strength indicator
- Cable connections swivel 90° for easy installation

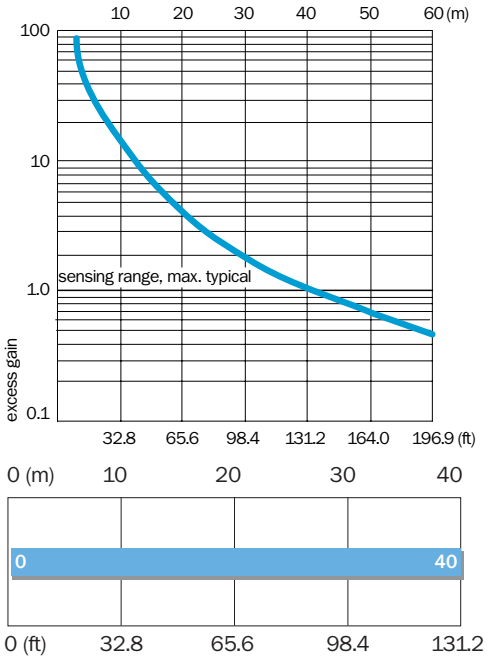
WS/WE 24-2

Dimensional Drawing



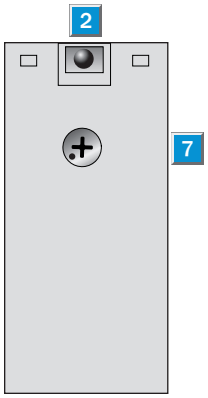
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1 Alignment sight
2 LED signal strength indicator
3 Center of optical axis
4 M5 threaded mounting hole – 6 mm deep
5 M5 threaded mounting hole, through hole
6 Cable gland, M12 plug, rotatable
7 Sensitivity control

Order Information

Type	Part No.
WS/WE 24-2Z4301	1 015 129

Accessories

	page
Cables and connectors	909
Mounting brackets	923, 924, 935
Power supply units	966

Technical Data	WS/WE 24-2-	Z4301
Sensing range, max. typical	0...131.2 ft (0...40 m)	
Sensitivity	Adjustable	
Light source[1], **light type**	LED, red light	
Light spot diameter	Approx. 17.7 in at 82 ft (450 mm at 25 m)	
Angle of divergence	1°/2.5°	
Supply voltage V_S	26.5...31.6 V[2]	
Ripple[3]	< 5 V_{SS}	
Current consumption[4]	≤ 50 mA	
Response time[5]	≤ 500 µs	
Max. switching frequency[6]	1000 Hz	
Pre-failure signalling output	Alarm	
Connection type	Plug	
VDE protection class[7]	⧈	
Circuit protection[8]	A, C	
Enclosure rating	IP 67	
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	
	Storage -13...158°F (-25...70°C)	
Approximate weight	11.6 oz (330 g)	
Housing material	Die cast zinc	

WS 24-2 Assignment of Data Bits (Host level)

D_0*	Test function	0	Sender ON	Input
		1	Sender OFF	
D_1	NC	0		Input
		1		
D_2	NC	0		Input
		1		
D_3	NC	0		Output
		1		

WS 24-2 Assignment of Parameter Bits (Host level)

P_0*	NC	0	Parameter
		1	
P_1*	NC	0	Parameter
		1	
P_2*	NC	0	Parameter
		1	
P_3*	NC	0	Parameter
		1	

WE 24-2 Assignment of Data Bits (Host level)

D_0	Switching state	0	No reflection	Input
		1	Reflection	
D_1	Alarm	0	Active	Input
		1	Inactive	
D_2	NC	0		Input
		1		
D_3*	NC	0		Output
		1		

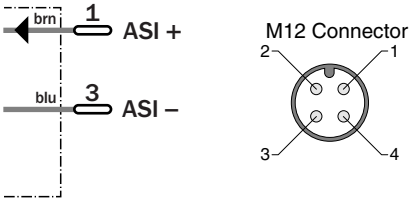
WE 24-2 Assignment of Parameter Bits (Host level)

P_0*	NC	0		Parameter
		1		
P_1*	Light/dark selector	0	Dark-switching	Parameter
		1	Light-switching	
P_2*	NC	0		Parameter
		1		
P_3*	NC	0		Parameter
		1		

* Default setting = 1

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Same values for WS and WE, without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

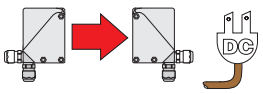
Connection Diagram



SICK

WS/WE 34

Through Beam Sensors



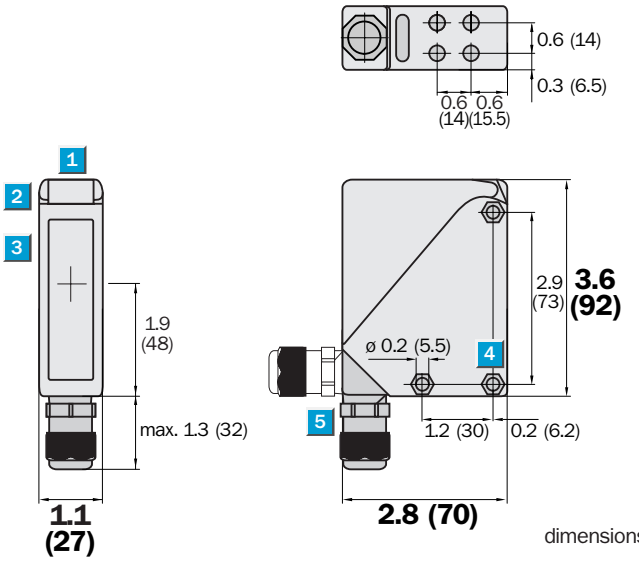
0...196.9 ft (0...60 m)
sensing range

Highlights

- Sturdy plastic housing
- Signal strength indicator
- Red light for easy alignment
- Selectable time delays
- Alarm output and test input
- Terminal chamber for connection flexibility

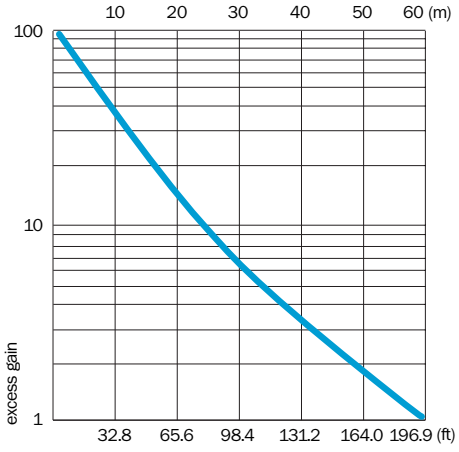
WS/WE 34

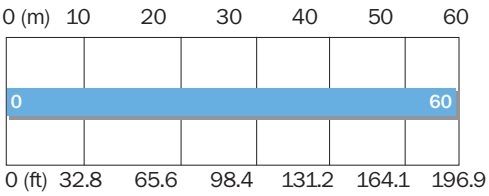
Dimensional Drawing



dimensions in inches (mm)

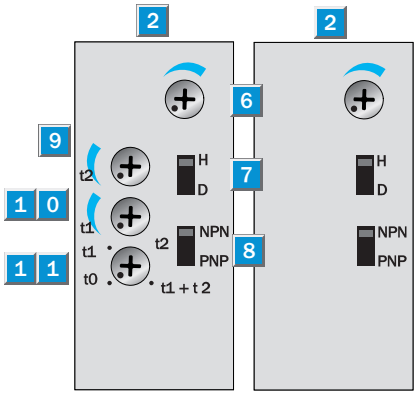
Excess Gain





Adjustments

WS/WE 34B440	WS/WE 34-B430
WS/WE 34-V240	WS/WE 34-V230
WS/WE 34-V540	WS/WE 34-V530



1 Alignment sight
2 LED signal strength indicator
3 Center of optical axis
4 Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
5 M16 screw fixing or plug rotatable by 90°
6 Sensitivity control
7 Light/dark selector
8 NPN/PNP selector
9 Time control t_2 = OFF-delay
10 Time control t_1 = ON-delay
11 Time delay selector switch

Order Information

Type	Part no.
WS/WE 34-V230	1 019 253
WS/WE 34-V240	1 019 251
WS/WE 34-B430	1 019 254
WS/WE 34-B440	1 019 255
WS/WE 34-V530	1 019 256
WS/WE 34-V540	1 019 252

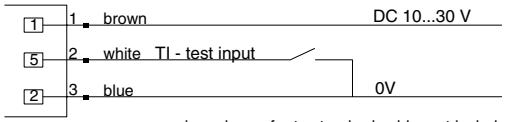
Accessories	page
Cables and connectors	909
Mounting brackets	923, 935
Special Accessories	
Weather hoods	955

Technical Data	WS/WE 34-	V230	V240	B430	B440	V530	V540
Sensing range	0...196.9 ft (0...60 m)	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■
Light source[1], light type	LED, red light	■	■	■	■	■	■
Light spot diameter	Approx. 27.6 in at 164 ft (700 mm at 50 m)	■	■	■	■	■	■
Angle of divergence/reception	1°/2.5°	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	< 5 V_{PP}	■	■	■	■	■	■
Current consumption[4]		■	■	■	■	■	■
Sender	≤ 50 mA	■	■	■	■	■	■
Receiver	≤ 40 mA	■	■	■	■	■	■
Switching output	PNP or NPN, Q or $\overline{Q}$	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■
Alarm output	PNP	■	■			■	■
Time delay	Adjustable, 0.5...10 s		■		■		■
Test input "TE"	Sender switched off	■	■	■	■	■	■
Sender off	PNP or NPN: TE to 0 V	■	■	■	■	■	■
Connection types	M16 terminal chamber	■	■				
	Plug, M12 4-pin			■	■		
	Plug, M12 5-pin					■	■
VDE protection class[7]	□	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	4.9 oz (140 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal flight time for ohmic loads
6) With light/dark ratio 1:1
7) Withstand voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

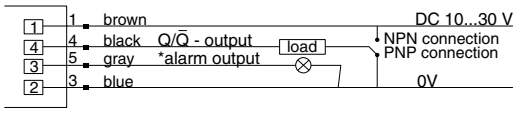
Connection Diagram

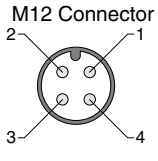
Sender

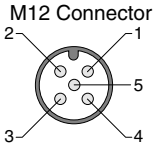


wire colors refer to standard cable, not included
* alarm output available on special models only

Receiver



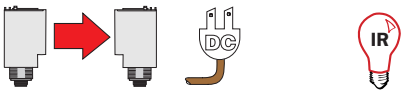




SICK

WS/WE 2000

Through Beam Sensors



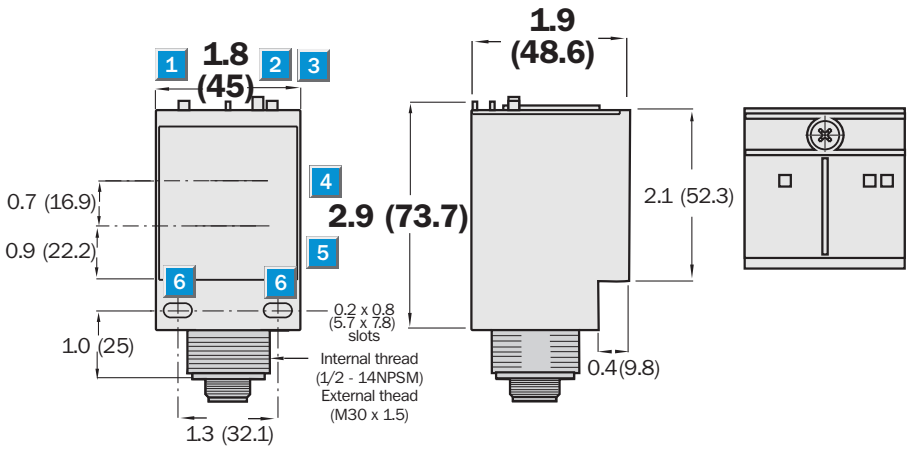
0...164 ft (0...50 m)
sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Sensitivity adjustment
- Selectable time delays
- Alarm output
- Cable or M12 quick disconnect versions

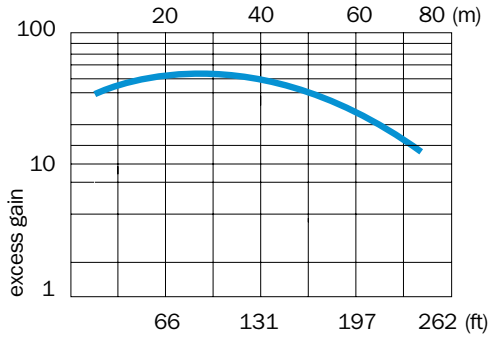
WS/WE 2000

Dimensional Drawing



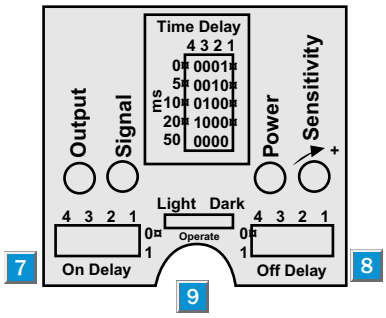
dimensions in inches (mm)

Excess Gain

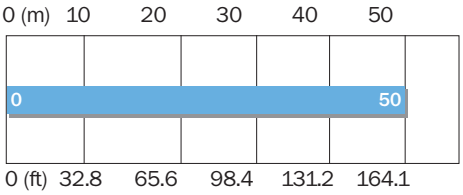


Adjustments

All types



1 LED power indicator (green)
2 LED signal strength indicator (red)
3 LED output indicator (yellow)
4 Center of optical axis, sender
5 Center of optical axis, receiver
6 Mounting through-hole Ø 0.2 x 0.8 mm,
7 ON delay selector
8 OFF delay selector
9 Light/dark switching selector



Order Information

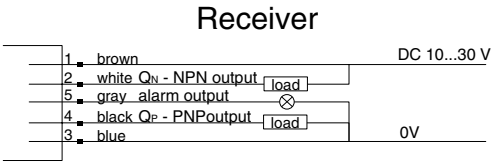
Type	Part no.
WS/WE 2000-B1102	7 023 173
WS/WE 2000-B1122	7 023 175
WS/WE 2000-B5100	7 023 176
WS/WE 2000-B5120	7 023 178
WS/WE 2000-B4100	7 028 604

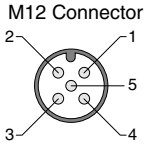
Accessories	page
Cables and connectors	909
Mounting brackets	927

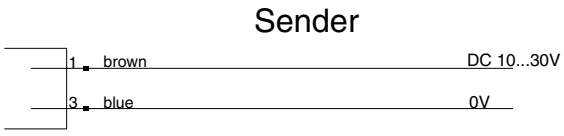
Technical Data	WS/WE 2000-	B1102	B1122	B5100	B5120	B4100
Sensing range, adjustable	0...164 ft (0...50 m)	■	■	■	■	■
Light source[1], light type	LED, infrared light	■	■	■	■	■
Light spot diameter	Approx. 12.5 in at 45.9 ft (320 mm at 14 m)	■	■	■	■	■
Angle of divergence	Approx. 1.3°	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■
Ripple[3]	≤ 5 V	■	■	■	■	■
Current consumption[4]	≤ 80 mA	■	■	■	■	■
Switching outputs	PNP or NPN, Q and $\overline{Q}$	■	■	■	■	■
Voltage drop (Max.)	2 V	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■
Response time[5]	≤ 1 ms	■	■	■	■	■
Max. switching frequency[6]	500 Hz	■	■	■	■	■
Alarm output	PNP	■	■	■	■	
Time delay settings	0, 5, 10, 20 or 50 ms	■	■	■	■	
ON/OFF delay			■		■	
Connection types	Cable, 2 m, PVC	■	■			
	Plug, M12 5-pin			■	■	
	Plug, M12 4-pin					■
VDE protection class[8]	□	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■

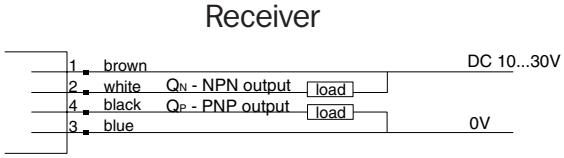
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

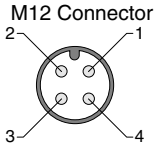
Connection Diagram







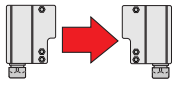




SICK

WS/WE 36

Through Beam Sensors



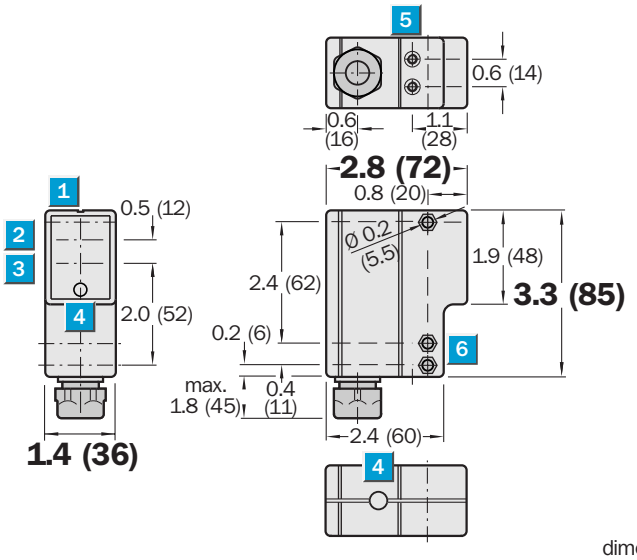
0...196.9 ft (0...60 m)
sensing range

Highlights

- Rugged plastic housing
- Alarm output and test input
- Selectable time delays
- Sensitivity adjustment
- Terminal chamber for connection flexibility or M12 quick disconnect
- Optional lens heater available

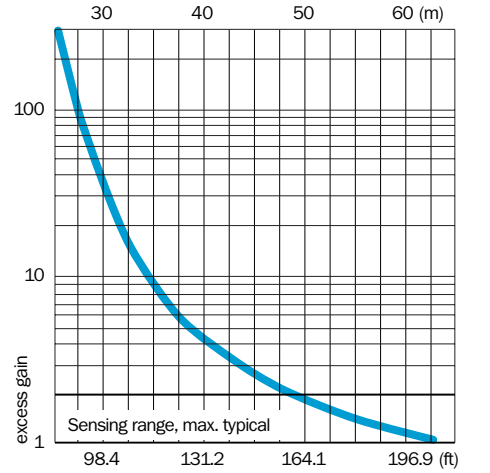
WS/WE 36

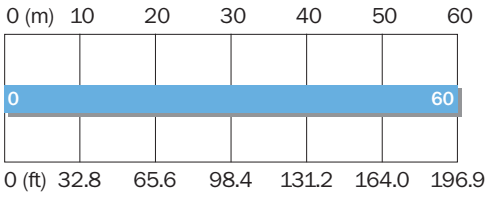
Dimensional Drawing



dimensions in inches (mm)

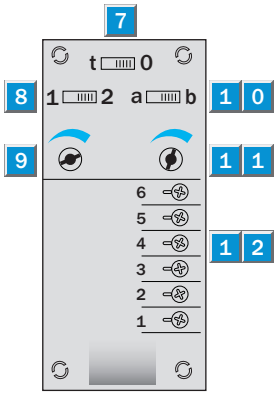
Excess Gain





Adjustments

All types



1 Alignment sight
2 Center of optical axis, receiver
3 Center of optical axis, sender
4 LED signal strength indicator, top and front
5 M5 threaded mounting hole – 5.5 mm deep
6 Mounting holes
recesses on both sides for M5 hex nuts
7 ON/OFF timer switch
t = Time ON, 0 = Time OFF
8 Time delay
1 ON-delay
2 OFF-delay
9 Time control 0.02 to 1 s
1 0 Light/dark selector
a = Light switching, b = Dark switching
1 1 Sensitivity adjustment
1 2 Terminal connections

Order Information

Type	Part no.
WS/WE 36-B230	1 010 922
WS/WE 36-B430	1 011 107
WS/WE 36-B730	1 011 114
WS/WE 36-B930	1 010 977

Accessories

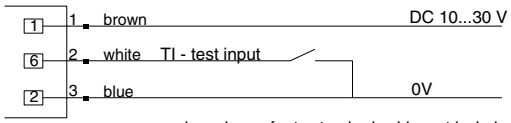
	page
Cables and connectors	909
Mounting brackets	924, 935
Attachable heated cover	959

Technical Data	WS/WE 36-	B230	B430	B730	B930
Sensing range	0...196.9 ft (0...60 m)	■	■	■	■
Sensitivity	Adjustable	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■
Light spot diameter	Approx. 51.2 in at 82 ft (1300 mm at 25 m)	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■
Ripple[3]	≤ 5 V_{SS}	■	■	■	■
Current consumption[4]	≤ 40 mA	■	■	■	■
Switching outputs	PNP: Q_P and NPN Q_N	■		■	■
	PNP: Q_P		■		
Light/dark switching	Switch-selectable	■	■	■	■
Output current I_A max.	200 mA	■	■	■	■
Response time[5]	≤ 2.5 ms	■	■	■	■
Max. switching frequency[6]	400 Hz	■	■	■	■
Alarm output	Alarm, PNP, open collector	■	■	■	■
Internal resistance	≥ 1.5 kΩ ± 5%	■	■	■	■
Operating condition "correct"[7]	Output HIGH (V_S – 1.5 V)	■	■	■	■
Operating condition "faulty"	Switching periodically at 5/s to V_S	■	■	■	■
Test input "TE"	Sender switched off	■	■	■	■
Sender OFF	Test input to 0 V	■	■	■	■
Connection types	PG terminal chamber	■			
	Plug, M12 4-pin		■		
	1/2" NPSM terminal chamber				■
	Plug, square 7-pin			■	
VDE protection class[8]	⧈	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■		■
	IP 65			■	
Ambient temperature T_A	Operation -40...131°F (-40...55°C)	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■
Approximate weight	5.6 oz (160 g)	■	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Signal reserve ≥ 50%
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q_N and Q_P short-circuit protected
C = Interference pulse suppression

Connection Diagram

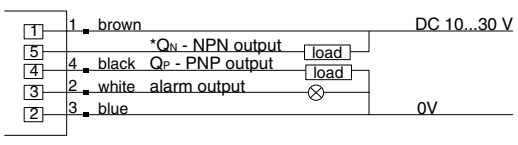
Sender



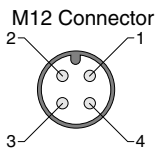
wire colors refer to standard cable, not included
* NPN output available on WS/WE 36-B230/-B930 only

*NPN output available on WS/WE 36-B230/B730/B930 only

Receiver



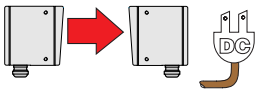
M12 Connector



SICK

WS/WE 45

Through Beam Sensors



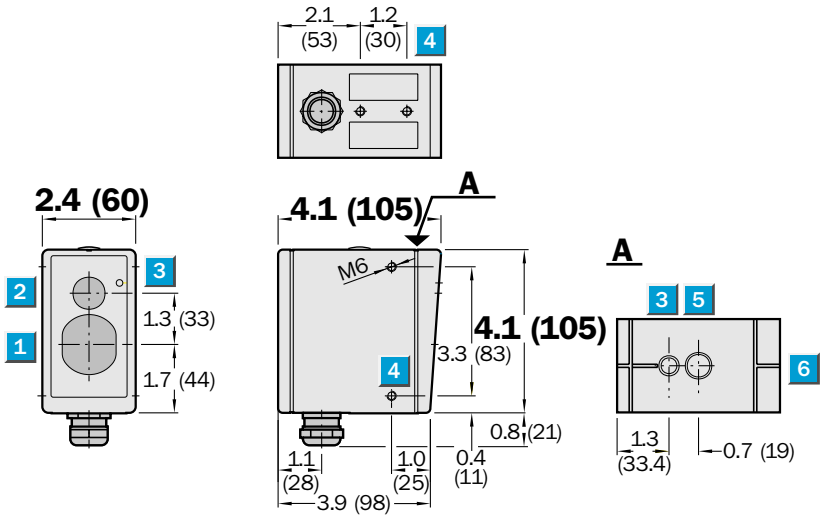
0...1148.3 ft (0...350 m)
sensing range

Highlights

- Rugged metal housing
- Selectable time delays
- Sensitivity adjustment
- Alarm output and test input
- Wide range supply voltage
- Optical sight for easy alignment
- Models available with integrated lens heater
- Terminal chamber for connection flexibility

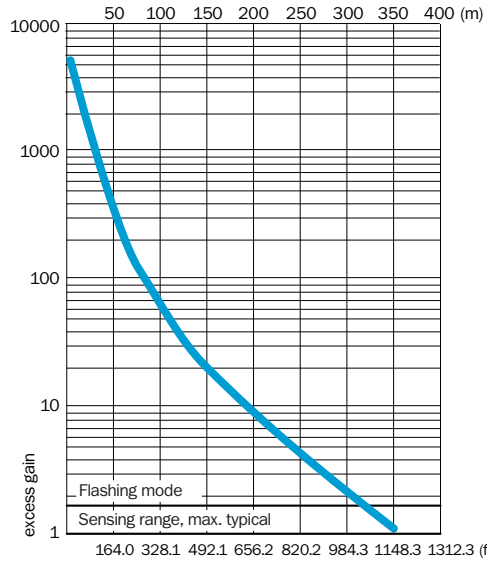
WS/WE 45

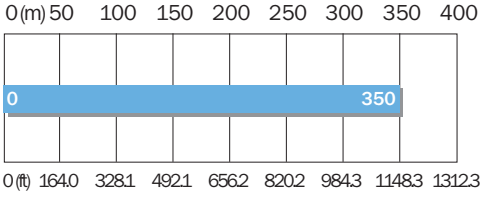
Dimensional Drawing



dimensions in inches (mm)

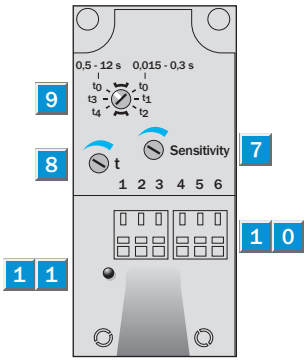
Excess Gain





Adjustments

All types



1 Center of optical axis, sender (WS), receiver (WE)
2 View finder lens
3 LED signal strength indicator
4 M6 threaded mounting hole – 8 mm deep
5 Eyepiece for alignment aid
6 Alignment sight
7 Sensitivity adjustment
8 Time adjustment
9 Time delay selector switch
10 Terminal strip
11 Status indicator

Switch-selectable Time Delay

0.5 – 12 s
t_0 without time delay
t_3 ON-delay when object enters detection zone
t_4 OFF-delay when object leaves detection zone

0.015 – 0.3 s
t_0 without time delay
t_1 ON-delay when object enters detection zone
t_2 OFF-delay when object leaves detection zone

Order Information

Type	Part no.
WS/WE 45-P250	1 010 983
WS/WE 45-P260	1 010 985
WS/WE 45-N250	1 010 982
WS/WE 45-N260	1 010 984
WS/WE 45-P950	1 010 991
WS/WE 45-P960	1 010 993
WS/WE 45-N950	1 010 990
WS/WE 45-N960	1 010 992

Accessories

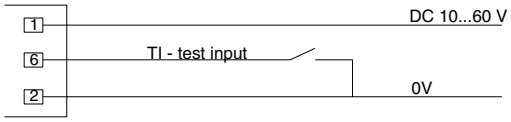
Accessories	page
Mounting brackets	935
Cooling plates	958
Dust shield	955
Weather hood	955

Technical Data	WS/WE 45-	P250	P260	N250	N260	P950	P960	N950	N960
Sensing range	0...1148.3 ft (0...350 m)	■	■	■	■	■	■	■	■
Sensitivity	Adjustable	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 14.8 ft at 984.3 ft (4.5 m at 300 m)	■	■	■	■	■	■	■	■
Angle of divergence	Approx. 0.9°	■	■	■	■	■	■	■	■
Supply voltage V_S	10...60 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]									
sender without heating	≤ 50 mA		■		■		■		■
sender with heating	≤ 250 mA	■		■		■		■	
receiver without heating	≤ 50 mA		■		■		■		■
receiver with heating	≤ 250 mA	■		■		■		■	
Switching outputs	PNP, Q and $\overline{Q}$	■	■			■	■		
	NPN, Q and $\overline{Q}$			■	■			■	■
Output current I_A max.	200 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 500 µs	■	■	■	■	■	■	■	■
Max. switching frequency[6]	1000 Hz	■	■	■	■	■	■	■	■
Alarm output	Alarm	■	■	■	■	■	■	■	■
Max. output current I_{Alarm}	100 mA, open collector	■	■	■	■	■	■	■	■
Insufficient light received	Flashes at approx. 5/s, switch to V_S	■	■	■	■	■	■	■	■
(Reserve < 50%)									
Test input "TE", sender OFF	PNP: Test input to 0 V	■	■			■	■		
	NPN: Test input to V_S			■	■			■	■
Connection type	PG 13.5 terminal chamber	■	■	■	■				
	1/2" NPSM terminal chamber					■	■	■	■
VDE protection class	⏚	■	■	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)[8]	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Approximate weight	28 oz (800 g)	■	■	■	■	■	■	■	■
Front lens heating		■		■		■		■	
Housing material	Die cast metal	■	■	■	■	■	■	■	■

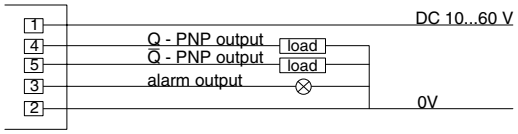
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) A = V_S connections reverse-polarity protected
   B = Output Q_N and Q_P short-circuit protected
   C = Interference pulse suppression
8) Up to 140°C with cooling plates (see Accessories)

Connection Diagram

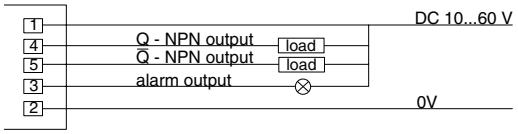
Sender



Receiver, PNP Model



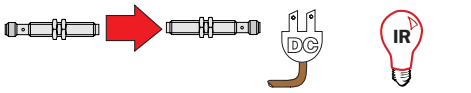
Receiver, NPN Model



SICK

VS/VE 12-2

Through Beam Sensors



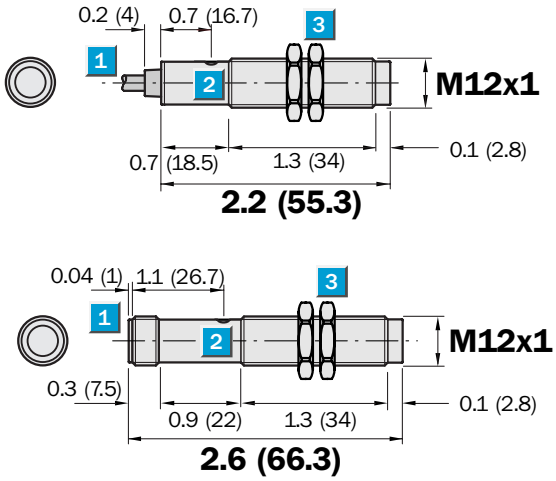
0...16.4 ft (0...5 m)
sensing range

Highlights

- Rugged nickel-plated housing
- Standard 12 mm diameter
- Easily replaces 12 mm inductive sensors for difficult applications
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

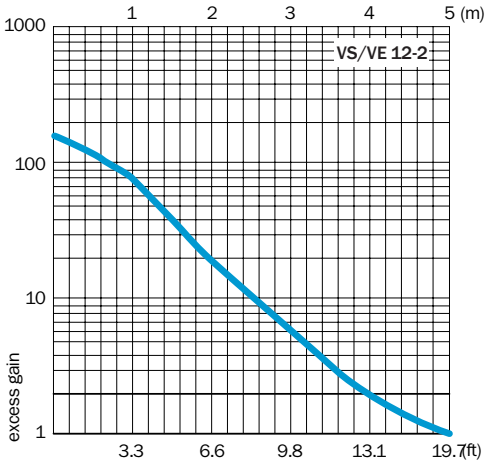
VE/VE 12

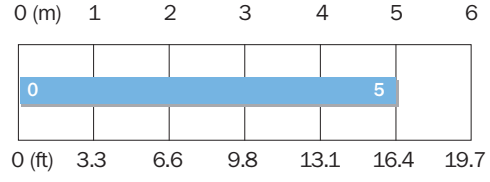
Dimensional Drawing



dimensions in inches (mm)

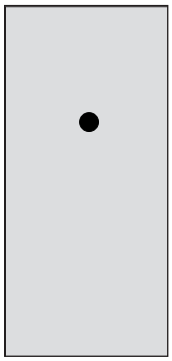
Excess Gain





Adjustments

All types



1 Cable or plug M12 4-pin
2 Yellow LED indicator (continuously:
Sender VS 12-2: - power on, sender active
Receiver VE 12-2: - light reception > switching threshold 1
3 Mounting nuts (2x), SW 17 metal

Order Information

Type	Part no.[11]
VS/VE12-2P132	6 026 223
VS/VE12-2P430	6 026 224
VS/VE12-2N132	6 026 221
VS/VE12-2N430	6 026 222

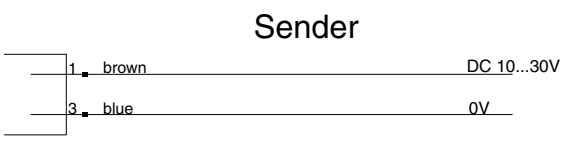
11) Part no. includes sender and receiver unit

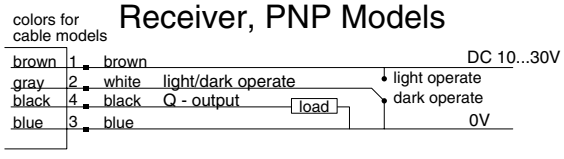
Accessories	page
Cables and connectors	909
Mounting brackets	925

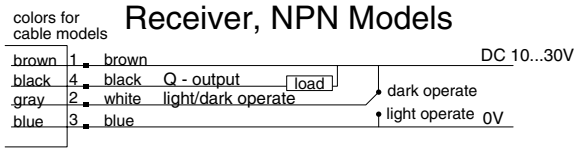
Technical Data	VS/VE 12-2-	P132	P430	N132	N430					
Sensing range	0...16.4 ft (0...5 m)	■	■	■	■					
Light source[1], light type	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 3.9 in at 13.1 ft (100 mm at 4 m)	■	■	■	■					
Angle of divergence	Approx. 1.4° (SR = max.)	■	■	■	■					
Angle of reception	Approx. 4.5° (SR = 1/2 max.)	■	■	■	■					
Supply voltage V_S	10...30 V DC [2]	■	■	■	■					
Ripple[3]	≤ 10%	■	■	■	■					
Current consumption[4]	≤ 20 mA	■	■	■	■					
Switching outputs	Q: PNP	■	■							
	Q: NPN			■	■					
Output current I_A max.	≤ 100 mA	■	■	■	■					
Operation mode	Light/dark switching selectable[5]	■	■	■	■					
Response time[6]	≤ 2 ms	■	■	■	■					
Max. switching frequency[7]	250 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[8]	■		■						
	Sender VS, 2 x 0.14 mm², Ø 3.75 mm	■		■						
	Receiver VE, 3 x 0.14 mm², Ø 3.75 mm	■		■						
	Plug, M12 4-pin		■		■					
VDE protection class[9]	□	■	■	■	■					
Circuit protection[10]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 67	■	■	■	■					
Ambient temperature T_A	Operation -13...158°F (-25...70°C)	■	■	■	■					
	Storage -13...158°F (-25...70°C)	■	■	■	■					
Approximate weight	Sender and receiver each 1.9 oz (54 g)	■		■						
	Sender and receiver each 0.6 oz (18 g)		■		■					
Housing material	Nickel-plated brass housing / PA	■	■	■	■					

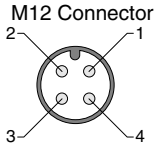
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) L/D switching type control line
L/D = open (not assigned) dark switching D.ON
L/D = + V_S: light switching L.ON
L/D = 0 V: dark switching D.ON
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







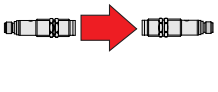


wire colors refer to standard cable, not included with quick disconnect models

SICK

VS/VE 18

Through Beam Sensors



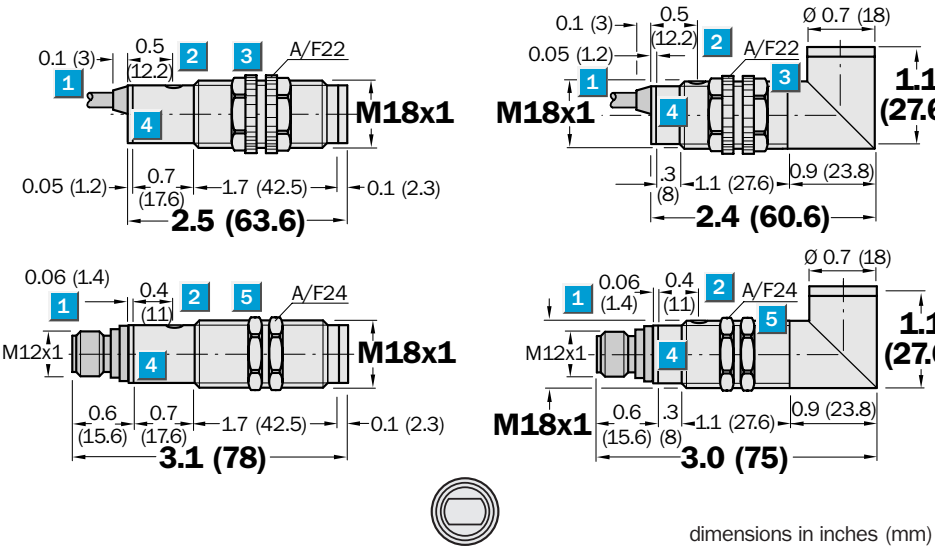
0...65.6 ft (0...20 m)
sensing range

Highlights

- Rugged plastic or metal housing
- Infrared sender
- Standard 18 mm size
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

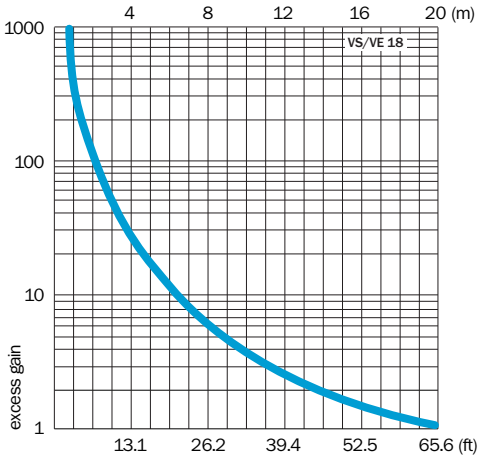
VS/VE 18

Dimensional Drawing



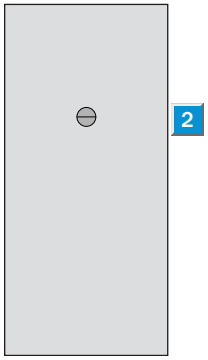
dimensions in inches (mm)

Excess Gain



Adjustments

See selection table on page xx



1 Connecting cable or plug
2 Sensitivity control
3 Fastening nut, width across 22 mm, made of plastic for equipment with plastic housing
4 Operating display for VS, LED, yellow
Signal strength indicator for VE, LED, yellow
5 Fastening nut, width across 24 mm, made of metal for equipment with metal housing

Order Information

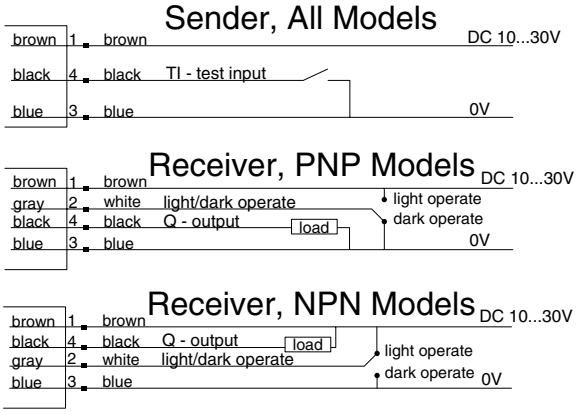
See selection table on page 896

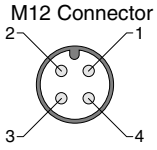
Accessories	page
Cable receptacle	909
Mounting brackets	925, 926

Technical Data	VS/VE 18-	3...	4...
Housing design	Straight	■	■
	Angled, 90°	■	■
Sensing range, max. typical	0...65.6 ft (0...20 m)	■	■
Light spot diameter	Approx. 27.6 in at 45.9 ft (700 mm at 14 m)	■	■
Angle of divergence	2.8°	■	■
Sensitivity adjustable (optional)	Potentiometer 270°	■	■
Light source[1], **light type**	LED, infrared light	■	■
Supply voltage V_S	10...30 V DC[2]	■	■
Ripple[3]	± 10%	■	■
Current consumption[4]	≤ 30 mA	■	■
Switching outputs (optional)	PNP/NPN; open collector: Q	■	■
Operation mode	Q, dark switching	■	
	Q, light switching	■	
via control wire[5]	Q, light/dark switching		■
	+ V_S = light switching		■
	0 V = dark switching		■
Output current I_A max.	100 mA	■	■
Response time[6]	≤ 2 ms	■	■
Max. switching frequency[7]	250 Hz	■	■
Test input "TE", VS sender off	PNP, NPN: TE to 0 V	■	■
Connection types			
sender VS 18-0D...:	Cable, 2 m[8], PVC, 3 x 0.14 mm², Ø 3.1 mm	■	■
receiver VE 18...:	Cable, 2 m[8], PVC, 3 x 0.14 mm², Ø 3.1 mm	■	
	Cable, 2 m[8], PVC, 4 x 0.14 mm², Ø 5 mm		■
sender VS 18-0D...:	Plug, M12 4-pin	■	■
receiver VE 18...:	Plug, M12 4-pin	■	■
VDE protection class[9]	□	■	■
Circuit protection[10]	A, B, C, D	■	■
Enclosure rating	IP 67/NEMA 6	■	■
Ambient temperature T_A	-13...158°F (-25...70°C)	■	■
Approximate weight	Metal housing: sender & receiver ea. 4.2 oz (120 g)	■	■
	Plastic housing: sender & receiver ea. 3.5 oz (100 g)	■	■
Housing material	Metal housing, nickel-plated brass; PBT/PC	■	■
	Plastic housing, PBT/PC	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Control wire open:
NPN: light-switching
PNP: dark-switching
6) With resistive load
7) With light/dark ratio 1:1
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A = Connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models

SICK

VSE 18 L

Through Beam Sensors

0...196.9 ft (0...60 m)

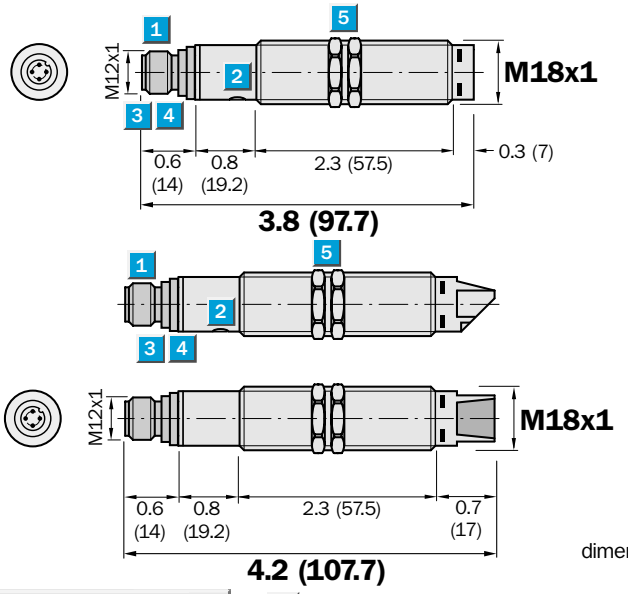
sensing range

Highlights

- Longest ranges
- Detects small parts and switches pecisely thanks to small laser spot
- Laser Class I
- Optionally (integrated) horizontal and radial optic axes

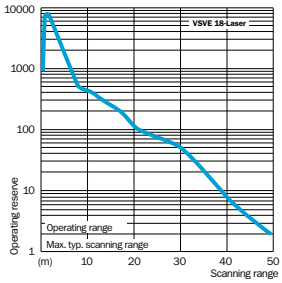
VSE 18 L

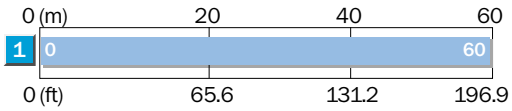
Dimensional Drawing



dimensions in inches (mm)

Excess Gain

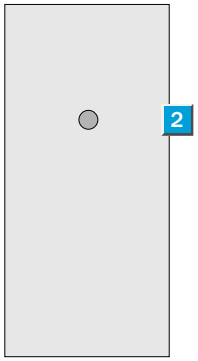




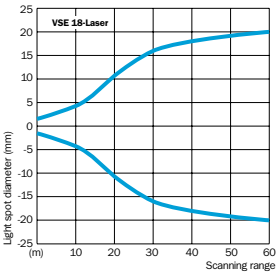
Max. typical sensing range

Adjustments

All types



1 Plug M12, 4-pin
2 Sensitivity adjustment, trimmer 270° (only receiver VE 18 L)
3 Green LED indicator: V_S supply voltage feed
4 Yellow LED indicator (only receiver VE 18 L),
– lights continuously: reception signal > reserve factor 2
– blinks: Reception signal < reserve factor 2 but > switching threshold 1
Yellow LED indicator (only sender VS 18 L),
– lights continuously: Sender active
– does not light: Sender off
5 Mounting nuts (2x), SW 24, metal (included with delivery)



Order Information

Type	Part no.
VSE 18 L-4P324	6 027 931
VSE 18 L-4N324	6 027 933
VSE 18 L-4P344	6 027 935
VSE 18 L-4N344	6 027 937

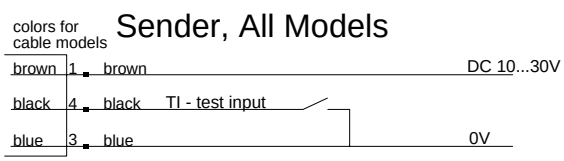
Accessories

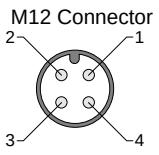
	page
Cables and connectors	909
Mounting brackets	925, 926

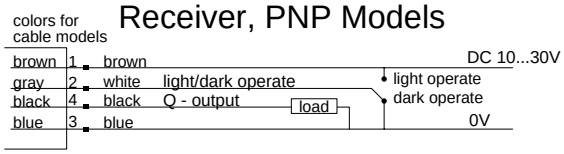
Technical Data	VSE 18 L-	4P324	4P344	4N324	4N344	VS-0D314	VS-0D334
Sensing range RW, max. typical	0...196.9 ft (0...60 m)	■	■	■	■	■	■
		■	■	■	■	■	■
Smallest detectable object	Approx. 0.02 in Ø at 3.3 ft (0.5 mm Ø at 1 m)	■	■	■	■	■	■
	Approx. 0.031 in Ø at 6.6 ft (0.8 mm Ø at 2 m)	■	■	■	■	■	■
	Approx. 0.4 in Ø at 164 ft (10 mm Ø at 50 m)	■	■	■	■	■	■
Light spot diameter	Approx. 1.6 in at 164 ft (40 mm at 50 m)					■	■
Angle of divergence of sender	Approx. 0.06° (SR = max.)					■	■
	Approx. 0.04° (SR = 1/2max.)					■	■
Receiver reception angle	Approx. 0.08° (SR = max.)	■	■	■	■		
	Approx. 0.06° (SR = 1/2max.)	■	■	■	■		
Light source[1] Light type	Red laser light, 650 nm					■	■
Laser class	Laser class 1 (IEC 60825-1)					■	■
Laser sender output capacity	Max. 0.4 mW					■	■
Housing	Axial optics	■		■		■	
	Radial optics		■		■		■
Sensitivity setting	Trimmer 270° (only receiver VE 18 L)	■	■	■	■		
Status indicators	Yellow LED:	■	■	■	■	■	■
	Switching output/sender active						
	LED green: supply voltage V_S = ON	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[2]	■	■	■	■	■	■
Ripple[3]	≤ 10 %	■	■	■	■	■	■
Current consumption[4]	≤ 25 mA	■	■	■	■	■	■
Switching outputs	Q: PNP	■	■				
	Q: NPN			■	■		
Output current I_A max.	≤ 100 mA	■	■	■	■		
Switching mode	Light/dark switching selectable[5]	■	■	■	■		
Response time[6]	≤ 0.5 ms	■	■	■	■		
Switching frequency max.[7]	1000/s	■	■	■	■		
Test input »TE«	0 V = Sender not active					■	■
Connection types	Plug, M12	■	■	■	■	■	■
VDE protection class[9]	□	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■	■	■
Ambient temperature	Operation 5...131°F (-15...55°C	■	■	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■	■	■
Approximate weight	With plug (2.1 oz) 60 g	■	■	■	■	■	■
Housing material	Housing: Nickel-coated brass/PC	■	■	■	■	■	■
	Optics: PC with protective glass pane	■	■	■	■	■	■

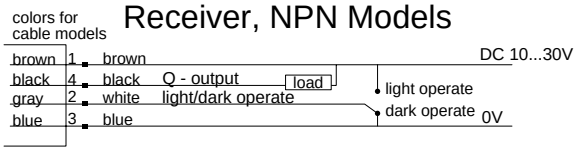
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) L/D switching type control line
L/D = open (not assigned)
dark-switching D.ON
L/D = + V_S: light-switching L.ON
L/D = 0 V: dark-switching D.ON
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V
9) A = V_S connections reverse-polarity protected
B = Inputs and output reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







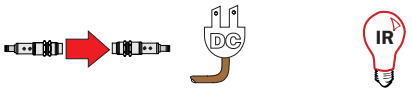


wire colors refer to standard cable, not included with quick disconnect models

SICK

VS/VE 180

Through Beam Sensors

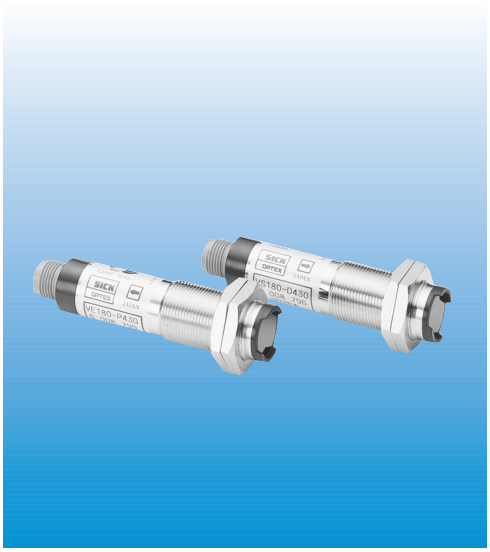


0...75.5 ft (0...23 m)
sensing range

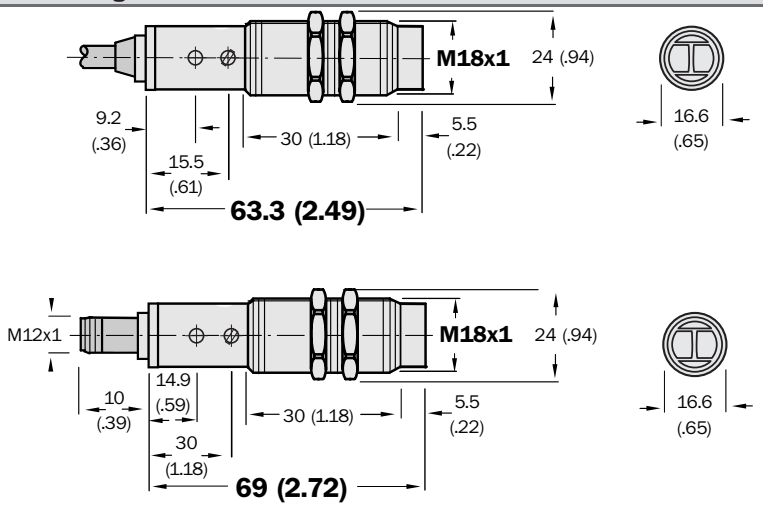
Highlights

- Rugged metal housing
- LED status indicator
- Standard 18 mm size
- Adjustable sensitivity
- Easy mounting with included nuts
- Cable or M12 quick disconnect versions

VS/VE 180

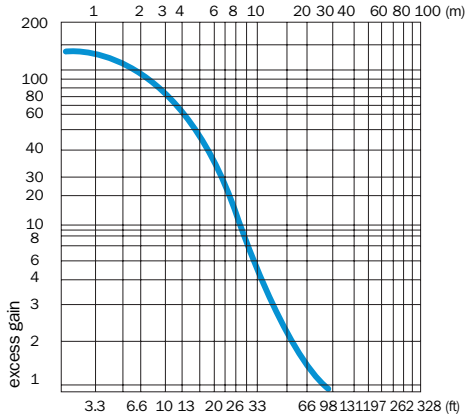


Dimensional Drawing



dimensions in inches (mm)

Excess Gain



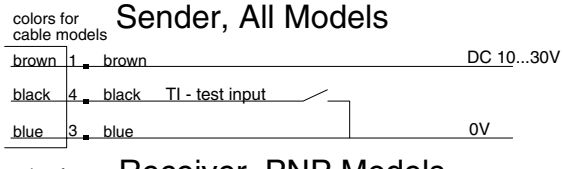
Order Information	
Type	**Part no.**
VS/VE 180-P132	6 008 864
VS/VE 180-N132	6 008 865
VS/VE 180-P430	6 008 866
VS/VE 180-N430	6 008 867

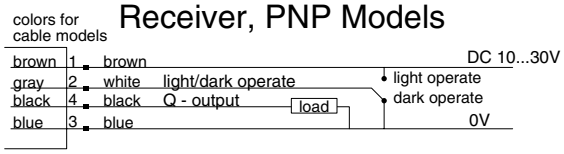
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

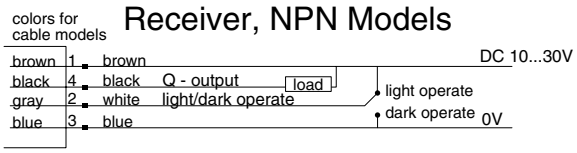
Technical Data	VS/VE 180-	P132	N132	P430	N430					
Sensing range, adjustable	0...75.5 ft (0...23 m)/PL 80 A	■	■	■	■					
Light source[2], light type	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 31.5 in at 42.2 ft (800 mm at 15 m)	■	■	■	■					
Angle of divergence	Approx. 3°	■	■	■	■					
Supply voltage V_S	10...30 V DC[4]	■	■	■	■					
Ripple[5]	≤ 5 V	■	■	■	■					
Current consumption[6]	≤ 30 mA	■	■	■	■					
Switching outputs	PNP	■		■						
	NPN		■		■					
Output current I_A max.	100 mA	■	■	■	■					
Operation mode	Light or dark switching selectable via wire	■	■	■	■					
Response time[7]	≤ 1.5 ms	■	■	■	■					
Max. switching frequency[8]	333 Hz	■	■	■	■					
Connection types	Cable, PVC, 2 m[9]; 3 x 0.14 mm², Ø 3.1 mm	■	■							
	Plug, M 12 4-pin			■	■					
VDE protection class[10]	⧈	■	■	■	■					
Circuit protection[11]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 66/NEMA 4	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	2.3 oz (65 g)			■	■					
sender and receiver each approx.	4.4 oz (125 g)	■	■							
Housing material	Nickel-coated brass housing	■	■	■	■					

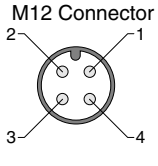
1) Object to be detected with 90% remission (relating to standard white in acc. with DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Object to be detected with 90% remission 100 x 100 mm
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) Do not bend below 0°C
10) Reference voltage DC 50 V
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram







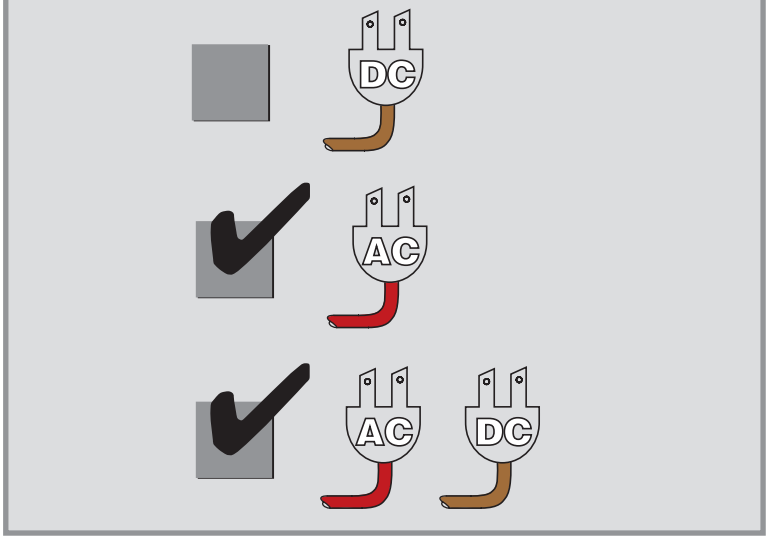


wire colors refer to standard cable, not included with quick disconnect models

SICK

Through Beam Sensors

Through Beam Sensors



WS/WE 1000

Through Beam Sensors

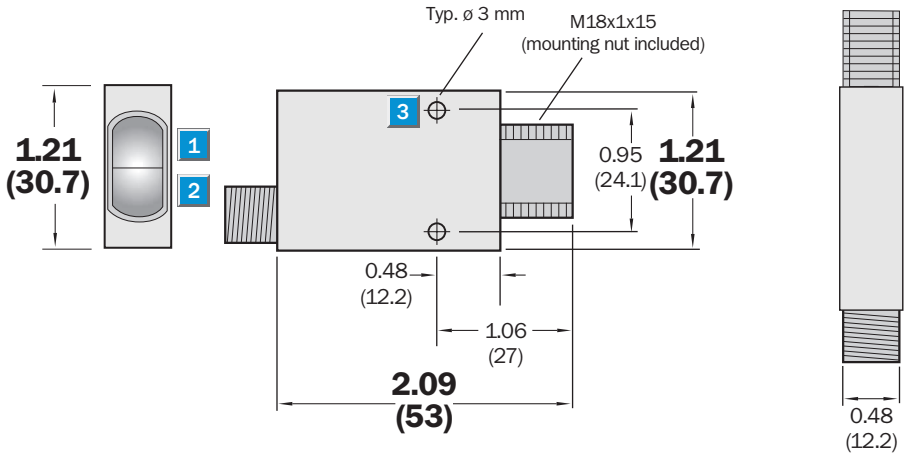
0...16.4 ft (0...5 m)
sensing range

Highlights

- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

WS/WE 1000

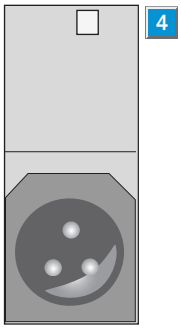
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 3 mm through hole for mounting
4 LED output indicator, yellow

Order Information

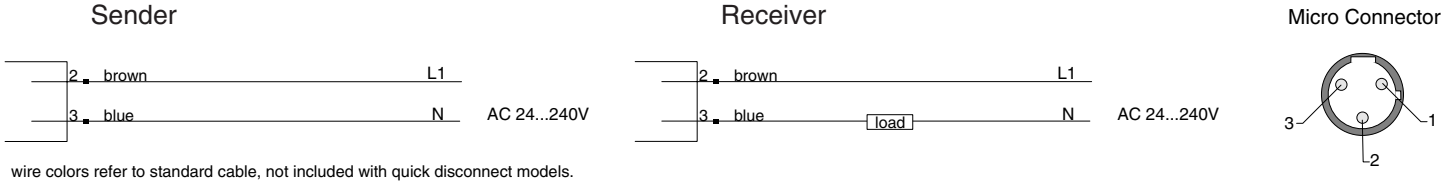
Type	Part no.
WS/WE 1000-S112	7 023 855
WS/WE 1000-S310	7 023 856
WS/WE 1000-S311	7 025 944
WS/WE 1000-T112	7 025 983
WS/WE 1000-T310	7 025 984
WS/WE 1000-T311	7 025 946

Accessories	page
Cables and connectors	910
Mounting brackets	925, 926

Technical Data	WS/WE 1000-	S112	S310	S311	T112	T310	T311
Sensing range, max.	0...16.4 ft (0...5 m)	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light, 880 nm	■	■	■	■	■	■
Light spot diameter	Approx. 15.8 in at 16.4 ft (401 mm at 5 m)	■	■	■	■	■	■
Angle of divergence	Approx. 10.5°	■	■	■	■	■	■
Supply voltage V_S	24…240 V AC	■	■	■	■	■	■
Current consumption[2]	Sender ≤ 4.5 mA	■	■	■	■	■	■
	Receiver ≤ 1.7 mA	■	■	■	■	■	■
Switching outputs	Triac	■	■	■	■	■	■
Max. output current I_A receiver	5...100 mA (5...300 mA at <50°C)	■	■	■	■	■	■
Operation mode	Light switching				■	■	■
	Dark switching	■	■	■			
Response time[3]	8.3 ms	■	■	■	■	■	■
Max. switching frequency[4]	60 Hz	■	■	■	■	■	■
Connection types	Cable, 2 m	■			■		
	Plug, micro 3-pin		■			■	
	Plug, micro 3-pin, with cable 150 mm			■			■
VDE protection class[5]	⊡	■	■	■	■	■	■
Circuit protection	Interference suppression	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40...75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

1) Average service life 50,000 h where $T_A = 25°C$
2) OFF state (leakage current)
3) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 200 V

Connection Diagram



wire colors refer to standard cable, not included with quick disconnect models.

WS/WE 250

Through Beam Sensors

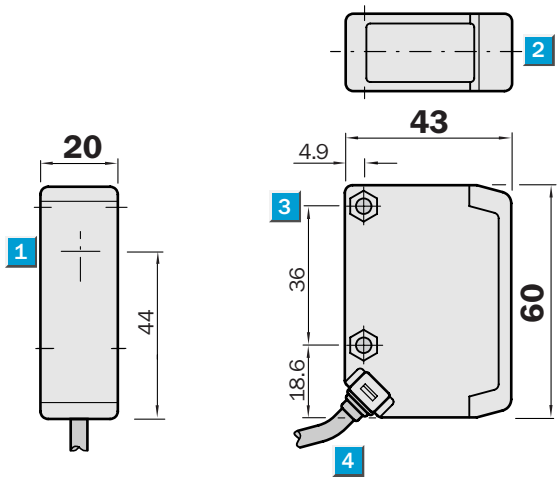
0...82 ft (0...25 m)
sensing range

Highlights

- Rugged plastic housing
- Red light for easy alignment
- Sensitivity adjustment
- Relay output
- Wide range supply voltage
- Easy mounting with included bracket

WS/WE 250

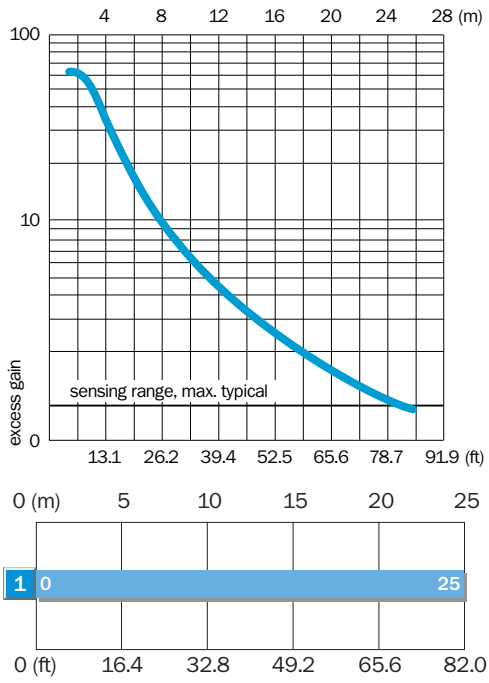
Dimensional Drawing



dimensions in inches (mm)

1 Center of the optical axis, sender (WS 250), receiver (WE 250)
2 Red LED signal strength indicator (receiver only WE 250)
3 Through borehole Ø 4.2 mm, for M4 hexagon nut on both sides
4 Connection cable

Excess Gain



Order Information	
Type	**Part no.**
WS/WE 250-S132	6 010 603

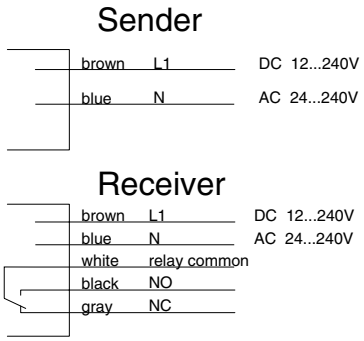
Accessories	page
Mounting brackets*	924

* included with delivery

Technical Data	WS/WE 250-	S132
Sensing range	0...82.0 ft (0...25 m)	
Light source[1], **light type**	LED, visible red light	
Light spot diameter	Approx. 4.9 ft at 65.6 ft (1.5 m at 20 m)	
Angle of divergence	Approx. 4°	
Angle of reception	Approx. 20°	
Supply voltage V_S[2]	12...240 V DC	
	24...240 V AC	
Power consumption		
sender	≤ 2 VA	
receiver	≤ 2 VA	
Switching outputs	Relay, SPDT, electrically isolated	
Switching current I_A max.[3]	3 A/240 V AC; 3 A/30 V DC	
Operation mode	Light switching	
Response time	≤ 15 ms	
Max. switching frequency[4]	33 Hz	
Connection types	Cable, 2 m PVC[5]	
sender WS	2 x 0.76 mm², Ø 6.3 mm	
receiver WE	5 x 0.76 mm², Ø 6.3 mm	
VDE protection class[6]	⧈	
Circuit protection[7]	A, C	
Enclosure rating	IP 67	
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	
	Storage -40...158°F (-40...70°C)	
Approximate weight	10.2 oz (290 g)	
Housing material	Glass fiber reinforced ABS	

1) Average service life at T_A = 25°C; LED, red light 100,000 h
2) ± 10%
3) Ensure spark extinguishing with inductive or capacitive load
4) With light/dark ratio 1:1
5) Do not bend below 0°C
6) Reference voltage 250 V UC
7) A = V_s connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



WS/WE 27-2

Through Beam Sensors

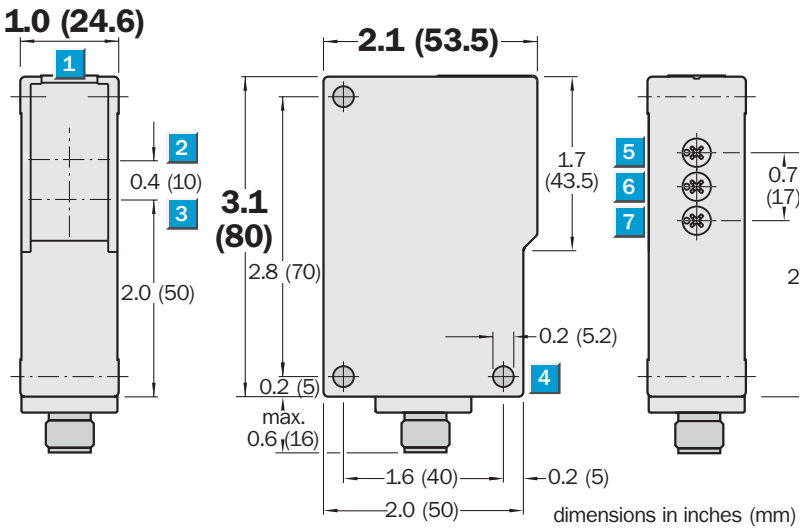
0...114.8 ft (0...35 m)
sensing range

Highlights

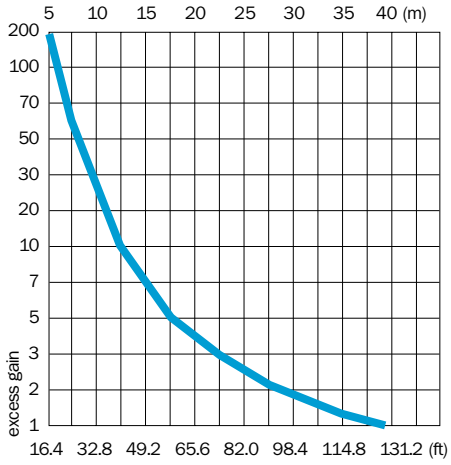
- Rugged plastic housing
- Red light for easy alignment
- Selectable time delays
- Wide range supply voltage
- Signal strength indicator
- Sensitivity adjustment

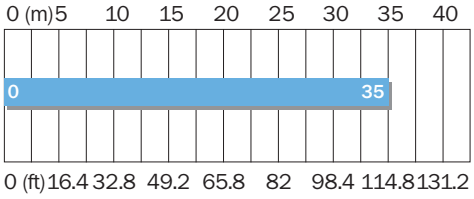
WS/WE 27-2

Dimensional Drawing



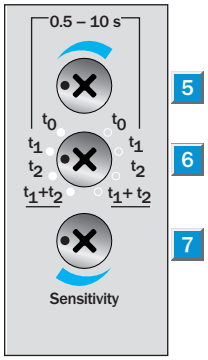
Excess Gain





Adjustments

All types



1	LED signal strength indicator
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 5.2 mm
5	Time control
6	Time delay selector switch
○	Light switching
●	Dark switching
7	Sensitivity adjustment

Switch-selectable Time Delay

0.5 – 10 s

t_0	Without time delay
t_1	ON-delay from interruption of light path
t_2	OFF-delay from reset of light path
$t_1 + t_2$	ON- and OFF-delay

Order Information

Type	Part no.
WS/WE 27-2R630	1 015 116
WS/WE 27-2R830	1 016 075

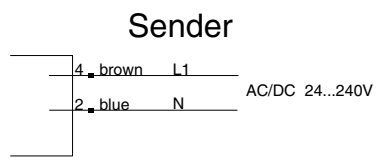
Accessories

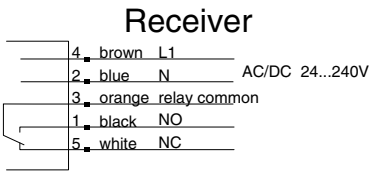
	page
Cables and connectors	911, 914
Mounting brackets	923, 924, 935

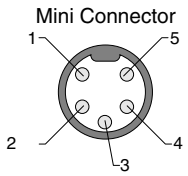
Technical Data	WS/WE 27-2-	R630	R830
Sensing range	0...114.8 ft (0...35 m)		
Light source[1], **light type**	LED, red light		
Light spot diameter	Approx. 47.2 in at 182 ft (1200 mm at 25 m)		
Angle of divergence	Approx. 3°		
Supply voltage V_S	24...240 V UC (+ 10%, – 20%)		
Current consumption	< 2 VA		
Switching outputs	Relay, SPDT, electrically isolated[2]		
Max. switching voltage	250 V AC / 120 V DC		
Max. switching current	4 A / 240 V AC or 24 V DC		
Max. switching capacity	AC 1000 V A / DC 100 W		
Response time	< 6 ms		
Max. switching frequency[3]	10 Hz		
Delay range	0.5...10 s		
Connection types	Plug, square 6-pin		
	Plug, mini 5-pin		
VDE protection class[4]	⊡		
Circuit protection[5]	A, C		
Enclosure rating	IP 65		
Ambient temperature T_A	Operation -40...140°F (-40...60°C)		
	Storage -40...167°F (-40...75°C)		
Approximate weight	3.5 oz (100 g)		
Housing material	Glass fiber reinforced ABS		

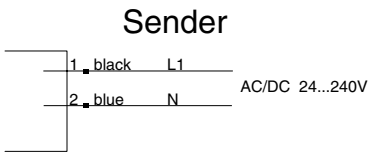
1) Average service life 100,000 h at T_A = 25°C
2) Provide suitable spark suppression for inductive and capacitive loads.
3) With light/dark ratio 1:1
4) Reference voltage 250 V AC
5) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

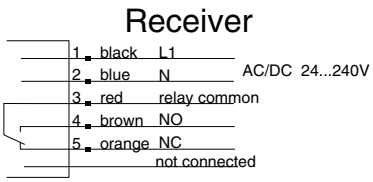
Connection Diagram

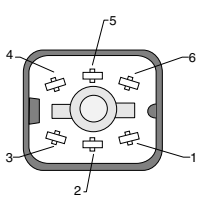








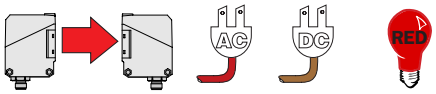




SICK

WS/WE 260

Through Beam Sensors



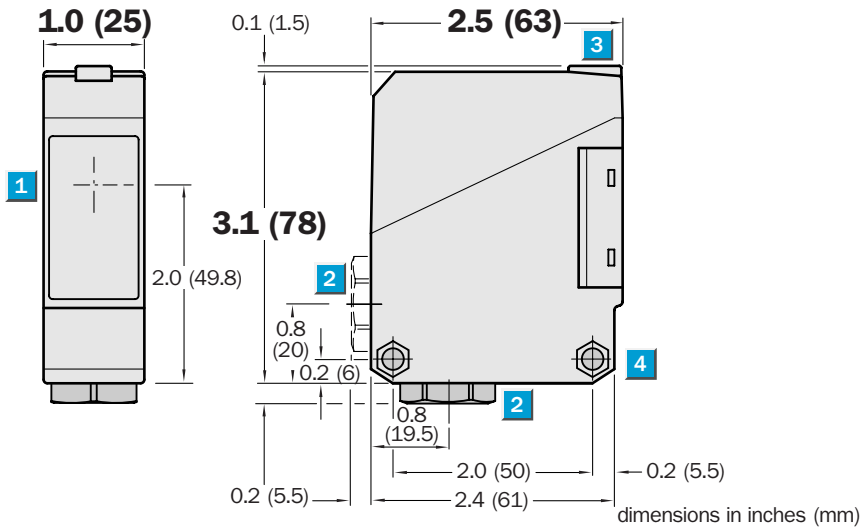
0...147.6 ft (0...45 m)
sensing range

Highlights

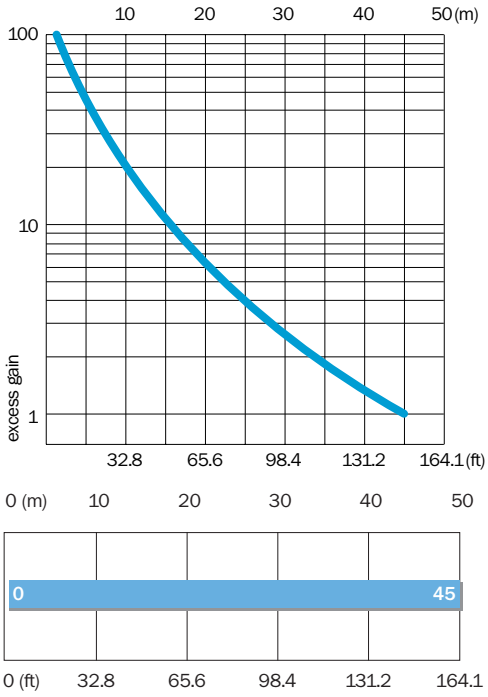
- Rugged plastic housing
- Sensitivity adjustment
- Terminal chamber for connection flexibility
- Wide range supply voltage
- Adjustable time delays
- Easy mounting with included bracket

WS/WE 260

Dimensional Drawing

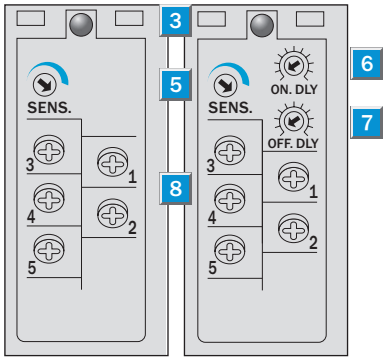


Excess Gain



Adjustments

WS/WE 260-S270	WS/WE 260-R270



1 Center of optical axis, sender and receiver
2 Cable entry gland 1/2" PF thread
for cable diameters from 6 to 10 mm
optionally at bottom or rear
3 LED signal strength indicator, red
4 Through hole Ø 5.2 mm on both sides
for M5 hex nut
5 Sensitivity adjustment
6 Time control ON-delay t_{ON}
7 Time control OFF-delay t_{OFF}
8 Terminals

Order Information

Type	Part no.
WS/WE 260-S270	6 020 773
WS/WE 260-R270	6 020 774

Accessories

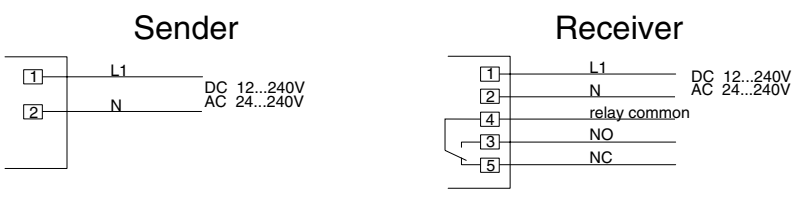
	page
Mounting brackets*	924, 935
Slotted maskes	951

* included with delivery

Technical Data	WS/WE 260-	S270	R270
Sensing range	0...147.6 ft (0...45 m)		
Sensitivity	Adjustable, potentiometer 270°		
Light source[1], **light type**	LED, visible red light		
Light spot diameter	Approx. 27.6 in at 131.2 ft (700 mm at 40 m)		
Angle of divergence, sender	Approx. 1°		
Angle of reception, receiver	Approx. 20°		
Supply voltage V_S[2]	12...240 V DC		
	24...240 V AC		
Power consumption			
Sender	≤ 4 VA		
Receiver	≤ 5 VA		
Switching output	Relay, SPDT, electrically isolated		
Switching current I_A max.[3]	3 A/240 V AC; 3 A/30 V DC		
Operation mode	Light switching		
Response time	≤ 20 ms		
Max. switching frequency[4]	25 Hz		
Time delays			
ON-delay t_{ON}	0.1...10 s, can be connected separately		
OFF-delay t_{OFF}	0.1...10 s, can be connected separately		
Connection type	Terminal chamber		
CE noise radiation	Level EN 50081-1		
	("Residential standard")		
VDE protection class[5]	□		
Circuit protection[6]	A, C		
Enclosure rating	IP 67		
Ambient temperature T_A	Operation -13...131°F (-25...55°C)		
	Storage -40...158°F (-40...70°C)		
Approximate weight	4.2 oz (120 g)		
Housing material	Glass fiber reinforced ABS		

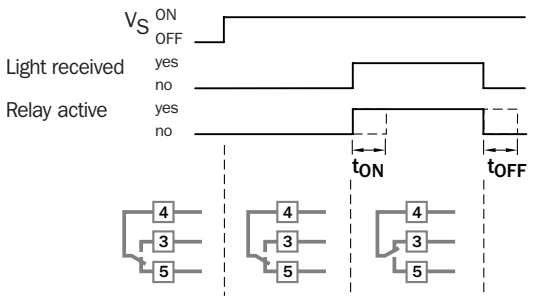
1) Average service life 100,000 h at T_A = 25°C
2) ± 10%
3) Provide suitable spark suppression for inductive or capacitive loads
4) With light/dark ratio 1:1
5) Reference voltage 250 V UC
6) A = V_S connections reverse-polarity protected
C = Interference suppression

Connection Diagram



Time Delay

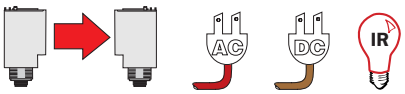
t = 0.1 – 10 s



SICK

WS/WE 2000

Through Beam Sensors



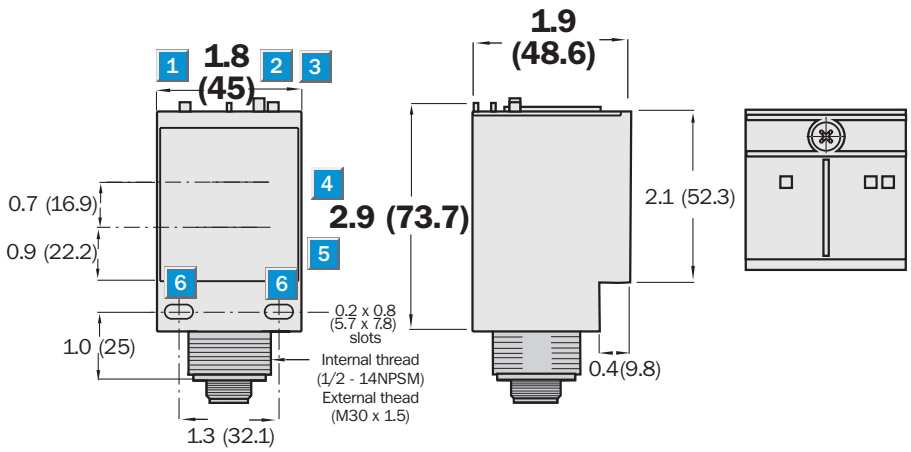
0...164 ft (0...50 m)
sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Sensitivity adjustment
- Selectable time delays
- Wide range supply voltage
- Cable or mini quick disconnect versions

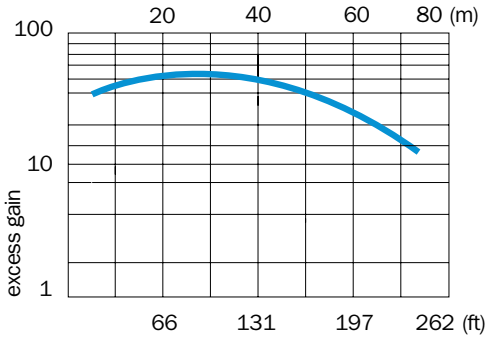
WS/WE 2000

Dimensional Drawing



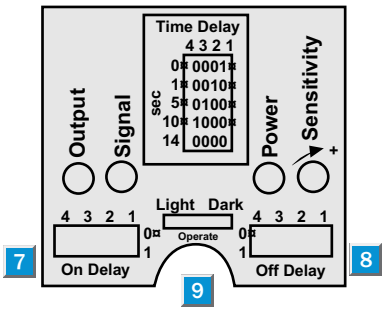
dimensions in inches (mm)

Excess Gain

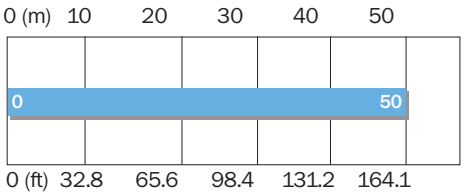


Adjustments

All types



1 LED power indicator (green)
2 LED signal strength indicator (red)
3 LED output indicator (yellow)
4 Center of optical axis, sender
5 Center of optical axis, receiver
6 Mounting through-hole Ø 0.2 x 0.8 mm,
7 ON delay selector
8 OFF delay selector
9 Light/dark switching selector



Order Information

Type	Part no.
WS/WE 2000-R1102	7 023 179
WS/WE 2000-R1122	7 023 180
WS/WE 2000-R5100	7 023 182
WS/WE 2000-R5120	7 023 184

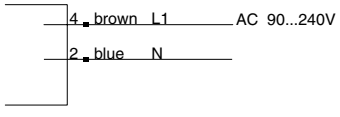
Accessories	page
Cables and connectors	911
Mounting brackets	927

Technical Data	WS/WE 2000-	R1102	R1122	R5100	R5120					
Sensing range, adjustable	0...164 ft (0...50 m)	■	■	■	■					
Light source[1], **light type**	LED, infrared light	■	■	■	■					
Light spot diameter	Approx. 12.5 in at 45.9 ft (320 mm at 14 m)	■	■	■	■					
Angle of divergence	Approx. 1.3°	■	■	■	■					
Supply voltage V_S	24...240 V AC/DC	■	■	■	■					
Current consumption[4]	≤ 6 W	■	■	■	■					
Switching outputs	Relay, SPDT, electrically isolated	■	■	■	■					
Switching voltage (Max.)	265 V (peak)		■	■	■					
Switching current (Max.)	3 A	■	■	■	■					
Operation mode	Light/dark switching via switch	■	■	■	■					
Response time[5]	≤ 10 ms	■	■	■	■					
Max. switching frequency[6]	10 Hz	■	■	■	■					
		■	■	■	■					
Time delay settings	0, 1, 5, 10 or 14 s	■	■	■	■					
OFF delay			■		■					
ON/OFF delay										
Connection types	Cable, 2 m, PVC	■	■							
	Plug, mini 5-pin			■	■					
VDE protection class[8]	⧈	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	5.3 oz (150 g)	■	■	■	■					
Housing material	Glass fiber reinforced plastic	■	■	■	■					

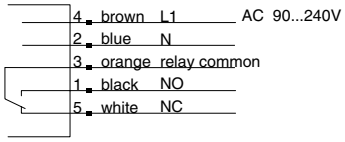
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Type

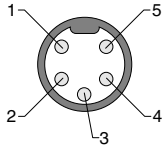
Sender



Receiver



Mini Connector



wire colors refer to standard cable, not included with quick disconnect models

WS/WE 24-2

Through Beam Sensors

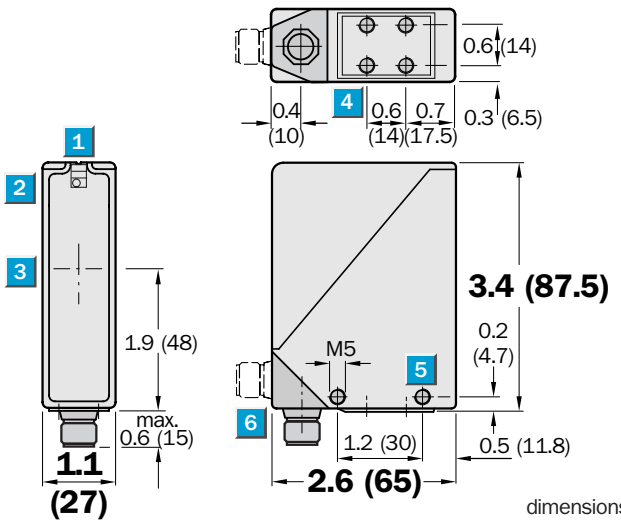
0...196.9 ft (0...60 m)
sensing range

Highlights

- Rugged metal housing
- Adjustable sensing range
- Wide range supply voltage
- Signal strength indicator
- Red light for easy alignment
- Selectable time delays
- Terminal chamber for connection flexibility

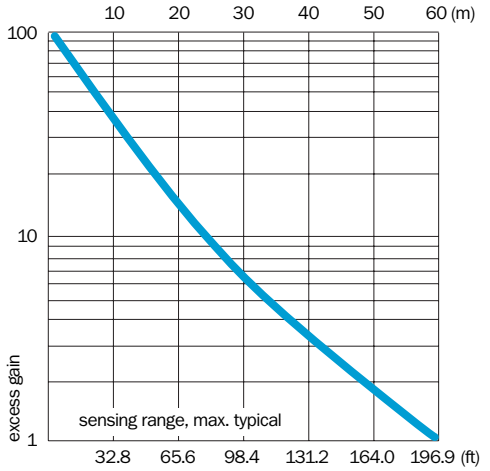
WS/WE 24-2

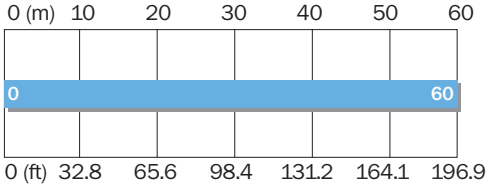
Dimensional Drawing



dimensions in inches (mm)

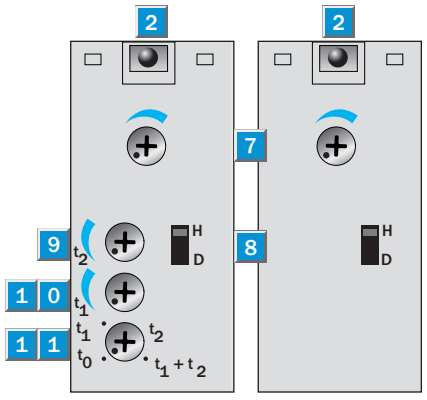
Excess Gain





Adjustments

WS/WE 24-2R240	WS/WE 24-2R230



1	Alignment sight
2	LED signal strength indicator
3	Center of optical axis
4	M5 threaded mounting hole, 6 mm deep
5	M5 threaded mounting hole, through-hole
6	PG cable gland rotatable by 90°
7	Sensitivity adjustment
8	Light/dark selector
9	Time control t_2 = OFF-delay
10	Time control t_1 = ON-delay
11	Time delay selector switch

Order Information

Type	Part no.
WS/WE 24-2R230	1 017 863
WS/WE 24-2R240	1 017 864

Accessories	page
Mounting brackets	923, 935
Special Accessories	
Dust shields	955
Weather hoods	955
Cooling plates	958

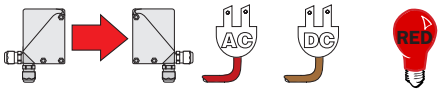
Technical Data	WS/WE 24-2-	R230	R240							
Sensing range	0...196.9 ft (0...60 m)	■	■							
Sensitivity	Adjustable	■	■							
Light source[1], **light type**	LED, red light	■	■							
Light spot diameter	23.6 in at 164 ft (600 mm at 50 m)	■	■							
Angle of divergence/reception	Approx. 1°/2.5°	■	■							
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]	■	■							
Power consumption without heating	< 2 VA	■								
Power consumption with heating	< 3 VA		■							
Switching output	Relay, SPDT, electrically isolated[4]	■	■							
Max. switching voltage	250 V AC/120 V DC	■	■							
Max. switching current	4 A/240 V AC, 4 A/24 V DC	■	■							
Max. switching capacity	AC: 1000 VA/DC: 100 W	■	■							
Response time	≤ 10 ms	■	■							
Max. switching frequency[5]	10 Hz	■	■							
Time delay	Adjustable, 0.5...10 sec		■							
Connection type	PG 9 terminal chamber	■	■							
VDE protection class[6]	□	■	■							
Circuit protection[7]	A, C	■	■							
Enclosure rating	IP 67	■	■							
		■	■							
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■							
	Storage -40...167°F (-40...75°C)	■	■							
Approximate weight	11.6 oz (330 g)	■	■							
Front lens heating			■							
Housing material	Die cast zinc	■	■							

1) Average service life 100,000 h at $T_U = 25°C$
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 250 V UC
8) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

WS/WE 34

Through Beam Sensors



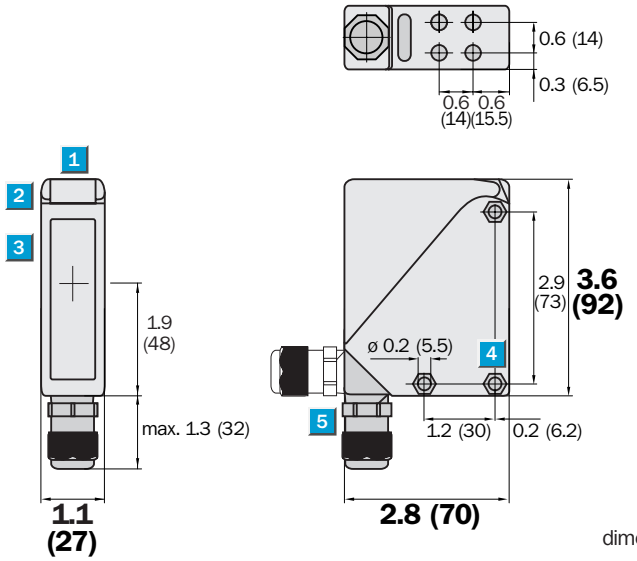
0...196.9 ft (0...60 m)
sensing range

Highlights

- Sturdy plastic housing
- Red light for easy alignment
- Selectable time delays
- Wide range supply voltage
- Signal strength indicator
- Terminal chamber for connection flexibility
- Cable connections swivel 90° for easy installation

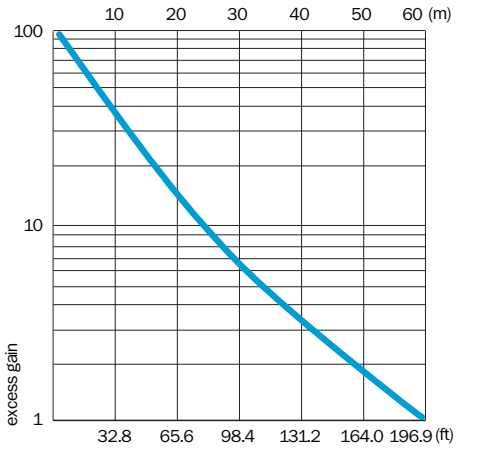
WS/WE 34

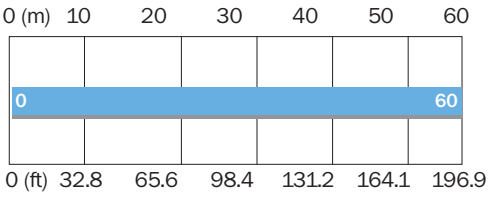
Dimensional Drawing



dimensions in inches (mm)

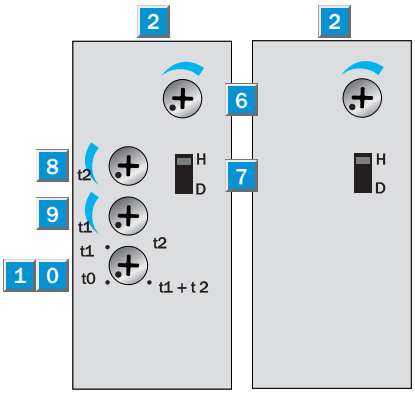
Excess Gain





Adjustments

WS/WE 34-R240 | WS/WE 34-R230



1 Alignment sight
2 LED signal strength indicator
3 Center of optical axis
4 Mounting hole Ø 5.5 mm, for M5 hexagon nuts on both sides
5 M16 screw fixing rotatable by 90°
6 Sensitivity control
7 Light/dark selector
8 Time control t_2 = OFF-delay
9 Time control t_1 = ON-delay
10 Time delay selector switch

Order Information

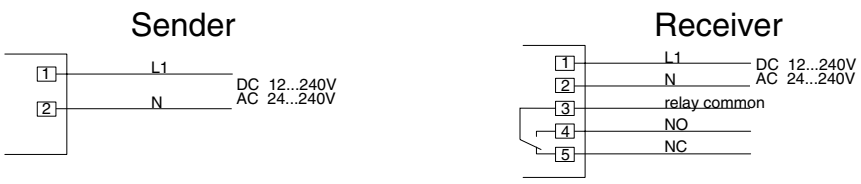
Type	Part no.
WS/WE 34-R230	1 019 257
WS/WE 34-R240	1 019 258

Accessories	page
Mounting brackets	923, 935
Special accessories	
Weather hoods	955

Technical Data	WS/WE 34-	R230	R240							
Sensing range	0...196.9 ft (0...60 m)									
Sensitivity	Adjustable									
Light source[1], light type	LED, red light									
Light spot diameter	Approx. 27.6 in at 164.0 ft (700 mm at 50 m)									
Angle of divergence/angle of reception	1°/2.5°									
Supply voltage V_S	12...240 V DC[2], 24...240 V AC[3]									
Power consumption	< 2 VA									
Switching output	Relay, SPDT, electrically isolated[4]									
Max. switching voltage	250 V AC/120 V DC									
Max. switching current	4 A/240 V AC, 4 A/100 W DC									
Max. switching capacity	1000 VA AC/100 VA DC									
Response time	≤ 10 ms									
Max. switching frequency[5]	10 Hz									
Time delay	Adjustable, 0.5 to 10 s									
Connection type	M16 terminal chamber									
VDE protection class[6]	□									
Circuit protection[7]	A, C									
Enclosure rating	IP 67									
Ambient temperature	Operation -40...140°F (-40...60°C)									
	Storage -40...167°F (-40...75°C)									
Approximate weight	4.9 oz (140 g)									
Housing material	Glass fiber reinforced ABS									

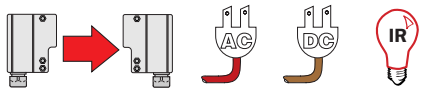
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Withstand voltage 250 V UC
7) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram



WS/WE 36

Through Beam Sensors



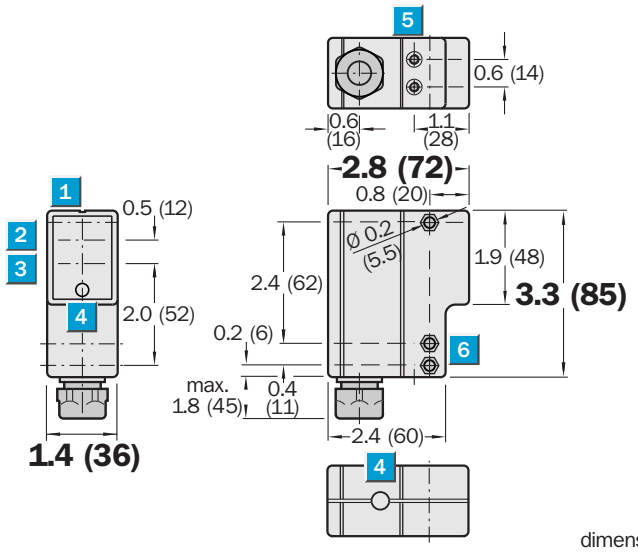
0...196.9 ft (0...60 m)
sensing range

Highlights

- Rugged plastic housing
- Sensitivity adjustment
- Terminal chamber for connection flexibility
- Selectable time delays
- Wide range supply voltage
- High output current
- Optional lens heater

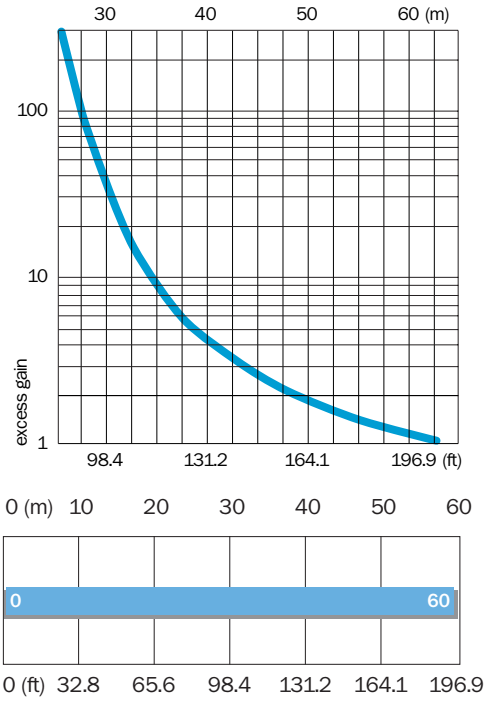
WS/WE 36

Dimensional Drawing



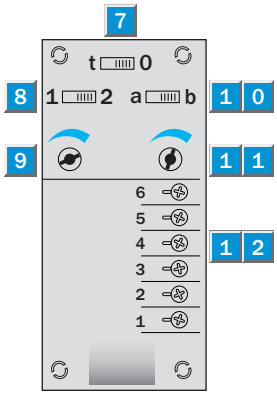
dimensions in inches (mm)

Excess Gain



Adjustments

All types



1	Alignment sight
2	Center of optical axis, receiver
3	Center of optical axis, sender
4	LED signal strength indicator, top and front
5	M5 threaded mounting hole – 5.5 mm deep
6	Through hole on both sides
7	ON/OFF timer switch
	t = Time ON, 0 = Time OFF
8	Time delay
	1 ON-delay
	2 OFF-delay
9	Time control 0.5 to 12 s
10	Light/dark selector
	a = Light switching, b = Dark switching
11	Sensitivity adjustment
12	Terminal connections

Order Information

Type	Part no.
WS/WE 36-R230	1 010 978
WS/WE 36-R730	1 010 980
WS/WE 36-R930	1 010 981

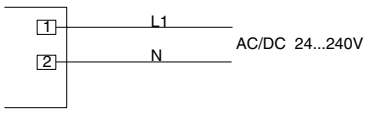
Accessories	page
Cables and connectors	915
Mounting brackets	924, 935
Attachable heated cover	959

Technical Data	WS/WE 36-	R230	R730	R930						
Sensing range	0...196.9 ft (0...60 m)	■	■	■						
Sensitivity	Adjustable	■	■	■						
Light source[1], **light type**	LED, infrared light	■	■	■						
Light spot diameter	Approx. 51.2 in at 82 ft (1300 mm at 25 m)	■	■	■						
Supply voltage V_S	24...240 V UC (+ 10%/– 25%)	■	■	■						
Power consumption	< 2 VA	■	■	■						
Switching output	Relay, SPDT, electrically isolated[2]	■	■	■						
Max. switching voltage	AC: 250 V / DC: 120 V	■	■	■						
Max. switching current	4 A / 240 V AC or 24 V DC	■	■	■						
Max. switching capacity	AC: 1000 VA / DC: 100 W	■	■	■						
Response time	≤ 20 ms	■	■	■						
Max. switching frequency[3]	10 Hz	■	■	■						
Light/dark switching	Switch-selectable	■	■	■						
Connection types	PG 11 terminal chamber	■								
	Plug, square 7-pin		■							
	1/2" NPSM terminal chamber			■						
VDE protection class[4]	⧈	■	■	■						
Circuit protection[5]	A, C	■	■	■						
Enclosure rating	IP 67	■		■						
	IP 65		■							
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■						
	Storage -40...158°F (-40 ...70°C)	■	■	■						
Approximate weight	5.6 oz (160 g)	■	■	■						
Housing material	Glass fiber reinforced ABS	■	■	■						

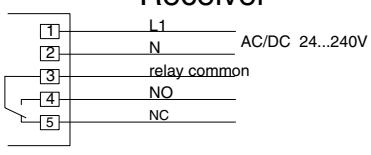
1) Average service life 100,000 h at $T_A = 25°C$
2) Provide suitable spark suppression for inductive or capacitive loads
3) With light/dark ratio 1:1
4) Reference voltage 250 V AC
5) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

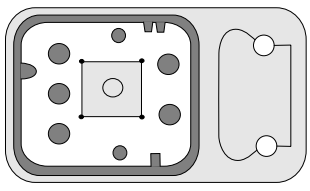
Connection Diagram

Sender

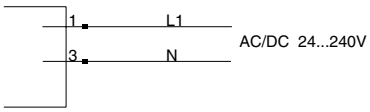


Receiver

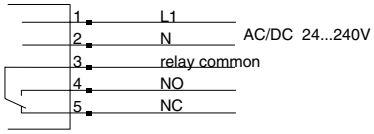




Sender



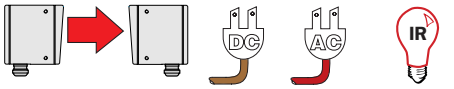
Receiver



SICK

WS/WE 45

Through Beam Sensors



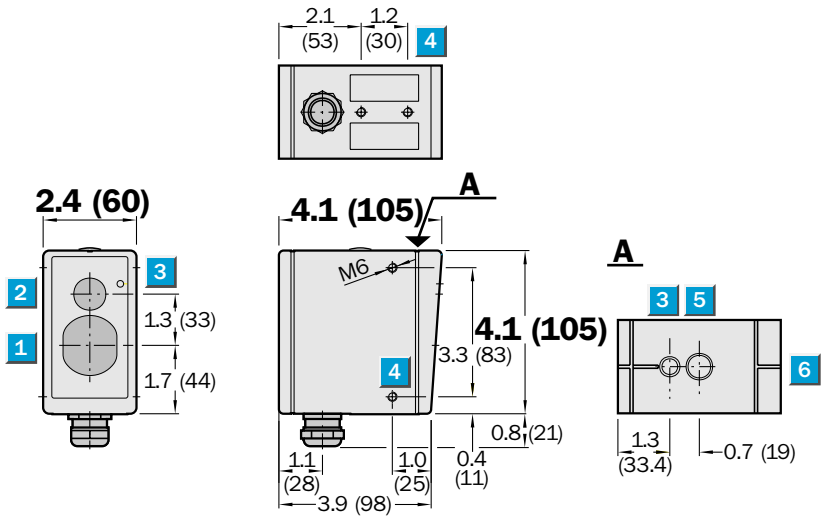
0...1148.3 ft (0...350 m)
sensing range

Highlights

- Rugged metal housing
- Signal strength indicator
- Sensitivity adjustment
- Wide range supply voltage
- Selectable time delays
- Terminal chamber for connection flexibility
- Models available with integrated lens heater

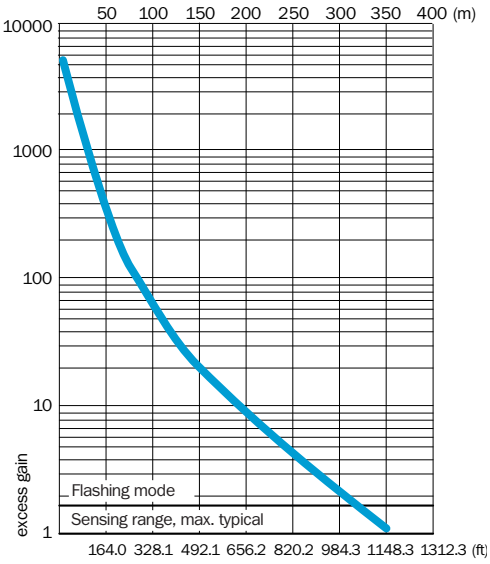
WS/WE 45

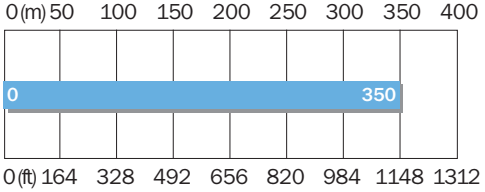
Dimensional Drawing



dimensions in inches (mm)

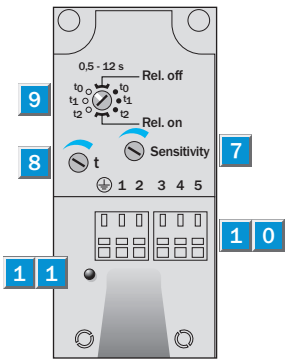
Excess Gain





Adjustments

All types



1	Center of optical axis, sender (WS), receiver (WE)
2	View finder lens
3	LED signal strength indicator
4	M6 threaded mounting hole – 8 mm deep
5	Eyepiece for alignment aid
6	Alignment sight
7	Sensitivity adjustment
8	Time adjustment
9	Time delay selector switch left: light switching, right: dark switching
1 0	Terminal strip
1 1	Status indicator

Switch-selectable Time Delay

0.5 – 12 s

t_0 without time delay
t_1 ON-delay when object enters detection zone
t_2 OFF-delay when object leaves detection zone

Order Information

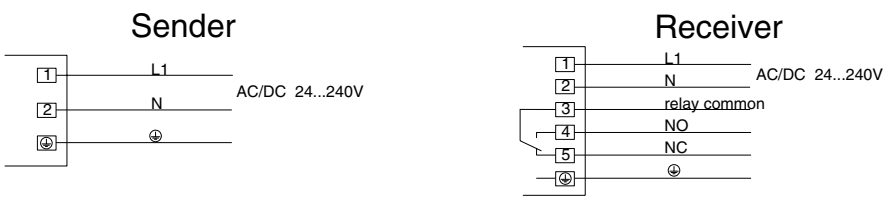
Type	Part no.
WS/WE 45-R250	1 010 994
WS/WE 45-R260	1 010 995
WS/WE 45-R950	1 010 998
WS/WE 45-R960	1 010 994

Accessories	page
Mounting brackets	935
Cooling plates	958
Dust shield	955
Weather hood	955

Technical Data	WS/WE 45-	R250	R260	R450	R960
Sensing range	0...1148.3 ft (0...350 m)	■	■	■	■
Sensitivity	Adjustable	■	■	■	■
Light source[1], light type	LED, infrared light, pulsating	■	■	■	■
Light spot diameter	Approx. 14.8 ft at 984.3 ft (4.5 m at 300 m)	■	■	■	■
Angle of divergence	Approx. 0.9°	■	■	■	■
Supply voltage V_S	24...240 V UC (+ 10%, – 25%)	■	■	■	■
Power consumption					
sender without heating	≤ 3 VA		■		■
sender with heating	≤ 6 VA	■		■	
receiver without heating	≤ 3 VA		■		■
receiver with heating	≤ 6 VA	■		■	
Switching outputs	Relay, SPDT, isolated[2]	■	■	■	■
Max. switching voltage	AC: 250 V / DC: 120 V	■	■	■	■
Switching current	4 A / 240 V AC o. 24 V DC	■	■	■	■
Max. switching capacity	AC: 1000 VA / DC: 100 W	■	■	■	■
Response time	≤ 10 ms	■	■	■	■
Max. switching frequency[3]	10/s	■	■	■	■
Connection type	Terminal chamber PG 13.5	■	■		
	1/2" NPSM terminal chamber			■	■
VDE protection class	⏚	■	■	■	■
Circuit protection[4]	A, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)[5]	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■
Approximate weight	28 oz (800 g)	■	■	■	■
Front lens heating		■		■	
Housing material	Metal	■	■	■	■

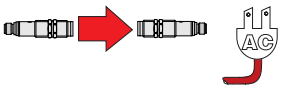
1) Average service life 100,000 h at T_A = 25°C
2) Provide suitable spark suppression for inductive or capacitive loads
3) With light/dark ratio 1:1
4) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
5) Up to 140°C with cooling plates (see Accessories)

Connection Diagram



VS/VE 18

Through Beam Sensors



0...72.2 ft (0...22 m)
sensing range

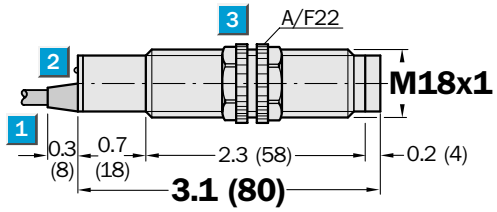
Highlights

- Rugged plastic housing
- Wide range supply voltage
- Enhanced sensing range
- Cable and M12 quick disconnect styles available
- Easy mounting with included nuts

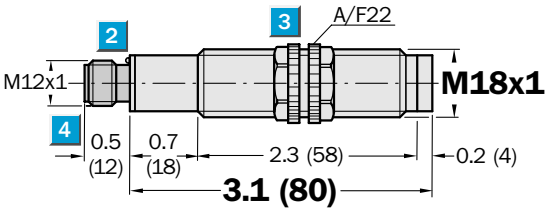
VS/VE 18

Dimensional Drawing

VE 18-2T 2132



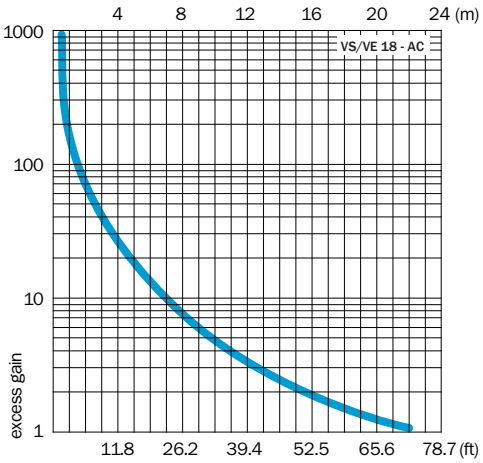
VE 18-2T 2430

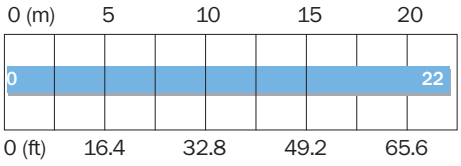


dimensions in inches (mm)

1 Connecting cable
2 Signal strength indicator (VE)
3 Fastening nuts, width across 22 mm, (included)
4 Equipment plug M12, 4-pin

Excess Gain





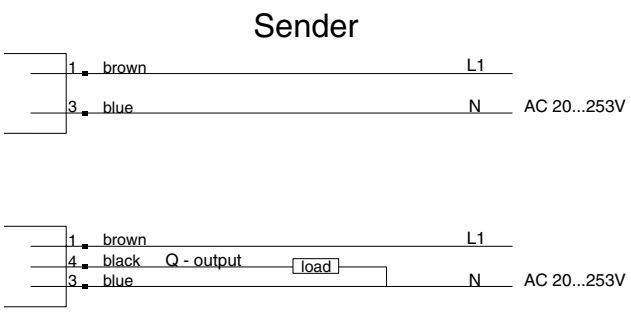
Order Information	
Type	**Part no.**
VS/VE 18-2T 2132	6 011 380
VS/VE 18-2T 2430	6 011 381

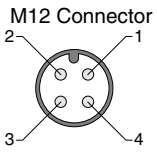
Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

Technical Data	VS/VE 18-	2T2132	2T2430
Housing	M18, straight		
Sensing range, max. typical	0...72.2 ft (0...22 m)		
Light source[1], light type	LED, infrared light		
Light spot diameter	Approx. 31.5 in at 52.5 ft (800 mm at 16 m)		
Angle of divergence of sender	Approx. 2.9°		
Angle of reception of receiver	Approx. 20°		
Supply voltage V_S[2]	20 ... 253 V AC/50 ... 60 Hz		
Current consumption[3] sender	≤ 30 mA		
receiver	≤ 15 mA		
Switching output	Triac		
Switching current I_A max.	5...300 mA		
voltage drop	3 V max. (U = 250 V AC)		
max. switching current	6 A/10 ms; f = 10 Hz		
leakage current	Max. 1.5 mA (V_S = 250 V AC)		
Switching voltage	V_S		
Operation mode	Dark switching		
Response time[4]	≤ 20 ms		
Max. switching frequency[5]	25 Hz		
Connection types	Cable, 2 m[6]		
	Sender VS : 2 x 0.34 mm², Ø 4.7 mm		
	Receiver VE: 3 x 0.34 mm², Ø 4.7 mm		
	Plug, M12 4-pin		
VDE protection class[7]	□		
Circuit protection[8]	C		
Enclosure rating	IP 67		
Ambient temperature T_A	-13...158°F (- 25...70°C)		
Approximate weight	Sender: 3.4 oz (95 g);		
	Receiver: 3.4 oz (95 g)		
	Sender: 1.1 oz (30 g);		
	Receiver: 1.1 oz (30 g)		
Housing material	PBT/PC		

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) Without load
4) With resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0°C
7) Reference voltage 250 V AC
8) C = Interference suppression

Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models.

Theory of Operation...Zero Pressure Accumulation

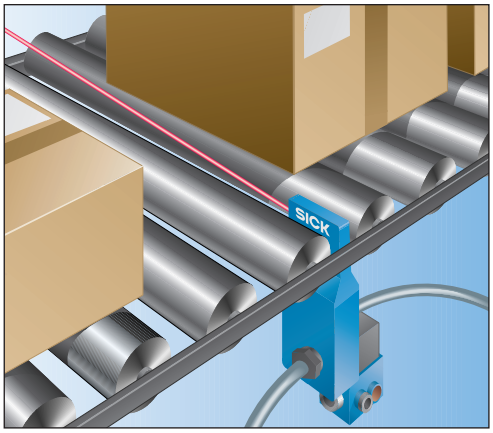


Fig. 1 WTR sensor mounted between the conveyor rollers


Fig. 2 ZoneControl sensors are ideal in conveyor applications


Fig. 3 Checking and triggering accumulation of conveyed objects, as needed

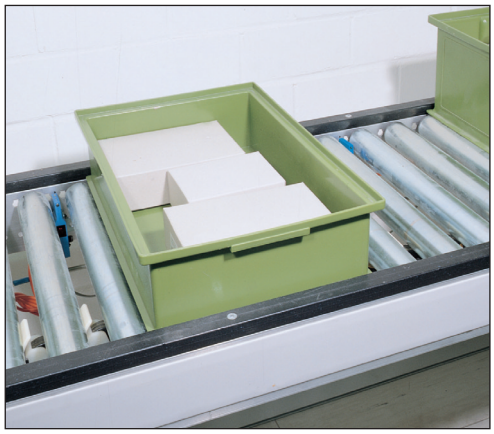


Fig. 4 Background objects are ignored by ZoneControl sensors

About ZoneControl Sensors

What is an accumulation conveyor?

An accumulation conveyor is a transportation conveyor designed to efficiently stage product when demand is low and deliver product when demand is high. An accumulation conveyor acts as the shock absorber in any distribution warehouse, logistics center or work-in-process operation.

What is ZPA?

Zero Pressure Accumulation (ZPA) is a more specific reference to an accumulation conveyor. A ZPA conveyor is designed to accumulate and release product with zero forward pressure on product. This results in a decreased risk of product damage or derailment.

What is ZoneControl™?

ZoneControl™ is the SICK family of ZPA control solutions. *ZoneControl*™ consist of integrated ZPA systems designed for accumulation conveyors and all the necessary peripherals and accessories to support the system. The *ZoneControl*™ family of products offers multiple ZPA solutions, all of which are similar in their function, but accommodate different types of conveyors by utilizing a variety of mounting configurations.

What is an integrated solution?

A ZPA control system typically consists of four primary components: a ZPA logic circuit, a pneumatic valve or other discrete output for motor control, a sensing device and daisy chain cabling. Integrated ZPA solutions generally integrate three or four of the primary components. Solutions which integrate only three of the components will have connectivity for the fourth component, usually the sensing device or pneumatic valve.

How is ZPA control accomplished?

Accumulation conveyors are designed with integral zones that are independently controlled. The individually controlled zones are activated or deactivated according the control logic circuit and sensor status at the local and neighboring zones. There are two basic types of ZPA control: pneumatic and electric.

Pneumatic Control – AtoB and AtoD

Accumulation conveyors that pneumatically actuate the drive system utilize small air bladders, often called pucks, to actuate the conveyor drive and/or brake system. When the logic circuit generates an output, a pneumatic solenoid valve is energized causing the valve to open or close. An open valve will allow air to flow and inflate the air bladder, a closed valve will prevent airflow to the bladder causing the bladder to exhaust and deflate. The air bladder, when inflated, will elevate a drive or brake system against the conveyor transportation medium respectively activating or deactivating the zone.

A system that activates or drives the conveyor with airflow to the air bladder is referred to as air-to-drive (AtoD). A pneumatic system that deactivates or brakes the conveyor with airflow to the air bladder is referred to as air-to-brake (AtoB).

Electric Control

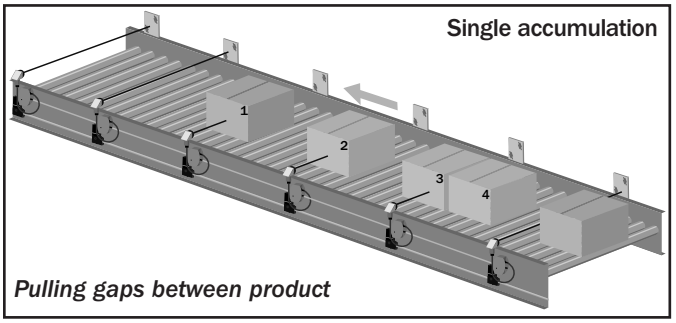
An electrically controlled accumulation conveyor utilizes individual electric motors to drive each zone. The logic circuit generates a discrete output to an electric motor drive circuit that activates the electric motor, in turn activating the zone.

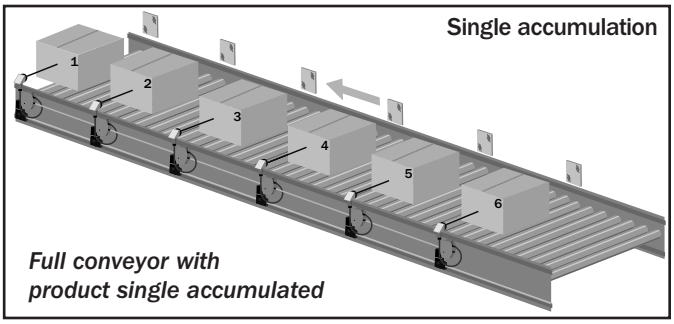
What accumulation modes are available with ZoneControl™?

The most typical accumulation modes are single and slug accumulation; occasionally an accumulation time delay is used to manipulate product accumulation.

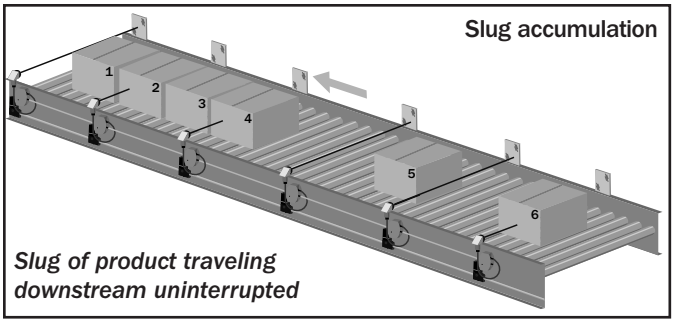
Theory of Operation...Zero Pressure Accumulation

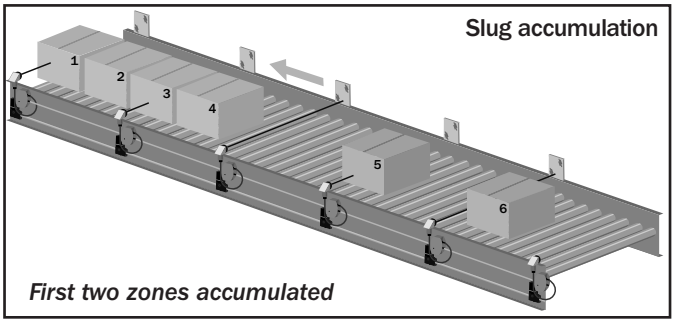
Single accumulation will not allow a large block or slug of product to travel from the in-feed zone of an accumulation conveyor to the discharge zone without inflicting a gap between packages. Single accumulation will accumulate (deactivate) the upstream zone of any two consecutive zones that are detecting product, or in other words, any zone will accumulate when it is detecting product AND the downstream zone is detecting product. The result is a zone length gap between packages. The discharge zone does not have a downstream zone, which is effectively a full downstream zone; therefore, the discharge zone will accumulate when it receives a package.





Slug accumulation will allow a large block or slug of product to travel uninterrupted from the in-feed zone of an accumulation conveyor to the furthest downstream zone, typically the discharge zone. The conveyor will not accumulate (deactivate) any zone until product reaches the furthest downstream zone at which time that zone will accumulate and the immediate upstream zone effectively becomes the furthest downstream zone.





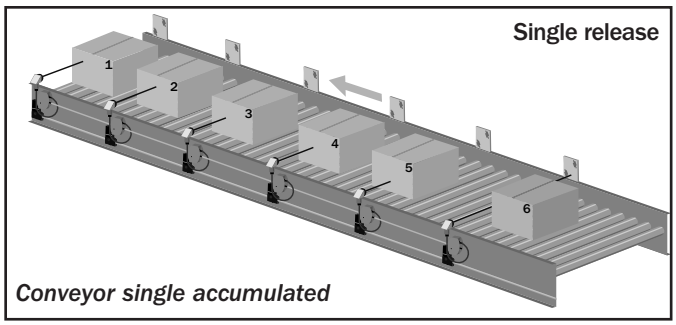
Adjustable accumulation utilizes an adjustable accumulation time delay, that effectively delays package detection, which varies the accumulation function from single to slug. When the accumulation time delay is set to zero seconds, any package detection will be immediately recognized causing the upstream zone to accumulate (deactivate) in the same manner as single accumulation. As the time delay is increased, smaller packages will not be recognized and will advance until stopped by accumulated product downstream. As the stopped packages back up into the sensing device, the accumulation time delay will time out causing the upstream zone to accumulate in a manner similar to slug accumulation.

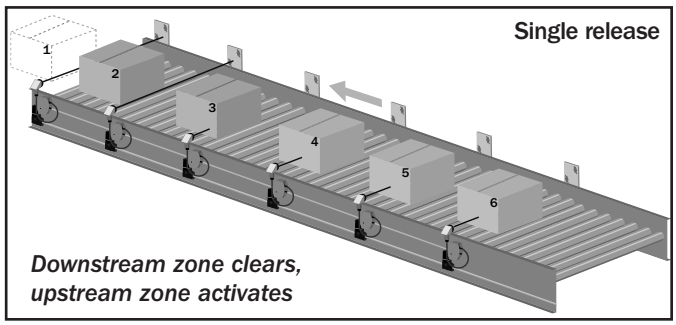
What release modes are available with ZoneControl™?
The most typical release modes are single and slug release; occasionally time delays are used to manipulate product release.

In **single release** mode, a given zone will not release (activate) until the sensing device in the downstream zone has been cleared of packages. Single release can be initiated by applying an electrical release signal at the discharge zone or removing packages in the discharge zone.

Applying an electrical single release signal at the discharge zone will act as an empty downstream zone that will cause the discharge zone to release; the immediate upstream zone will not release until the discharge zone has cleared.

Removal of packages from the discharge zone will cause that zone and the immediate upstream zone to release. Subsequent upstream zones will not release until the immediate downstream zone has cleared.

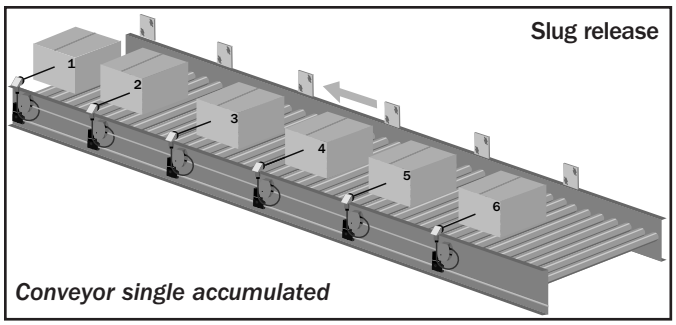




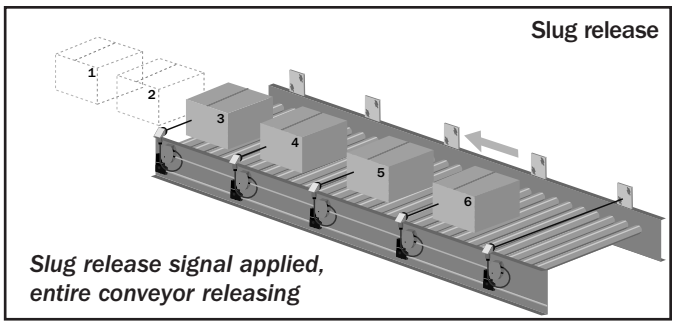
Theory of Operation...Zero Pressure Accumulation

Single release time delay will add an additional gap between zones as they are released. The additional gap is directly proportional to the time delay selected.

In **slug release** mode, all zones will be activated simultaneously, regardless of sensor status, for as long as the slug release signal is applied. Slug release is initiated by applying an electrical signal at any zone using a *ZoneControl*™ T-cable or Zone Interface Module (ZIM).



Conveyor single accumulated



Slug release signal applied, entire conveyor releasing

Slug release time delay will inflict a small gap between zones as they are released. The small gap is directly proportional to the time delay selected. When applying a *ZoneControl*™ solution with slug release time delay, the release signal must be applied at the discharge zone.

When are single and slug modes most commonly used?
Single accumulation and release is most effective when extremely high throughput is not necessary or the risk of forward pressure is not acceptable. Large or heavy products are frequently accumulated and released in single mode.
Slug accumulation and release is most effective when extremely high throughput is desired and instances of low momentary forward pressure can be tolerated. High speed conveying with small to medium package sizes are often accumulated and released in slug mode.

What is slug release termination?
In some applications it is necessary to terminate a slug release signal after a determined number of zones. Slug release termination interrupts the slug release signal by opening the slug release wire. Slug release termination is accomplished with an in-line cable that does not pass the slug signal; all other conductors are passive. Or, slug release termination can be accomplished with a ZPA Interface Module (ZIM) in which the user can remove a jumper to interrupt the slug release signal. The slug termination cable and ZPA Interface Module (ZIM) are offered in the *ZoneControl*™ family of products.

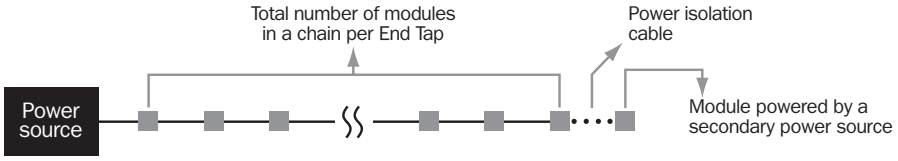
Power Isolation
Power isolation is necessary when more than one power supply is used on a ZPA control system. Power isolation interrupts the positive voltage supply line between two ZPA chains on separate power supplies. Power isolation is accomplished with an in-line cable that does not pass the positive supply voltage; all other conductors are passive. See examples on the following page.

Modules per Tap
There is a limit to the number of *ZoneControl*™ devices that can be connected in series (chain) before an additional power supply and power isolation unit are required. This limit is known as the “Modules per Tap” specification. The number of Modules per Tap will vary from one ZPA solution to another and is affected primarily by the power source, pneumatic valve or output load, and daisy chain cabling. There are three common wiring schemes for ZPA systems: End Tap, Center Tap and Dual Center Tap.

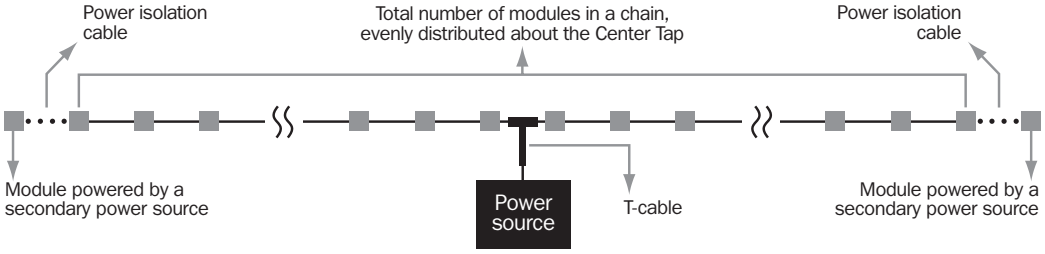
All *ZoneControl*™ “Modules per Tap” specifications are calculated using a 100 W power source, 24 and 28 V DC and 1 m power supply cable for End Tap and Center Tap. Dual Center Tap is calculated using the appropriate power supply cable length for the chain.

Theory of Operation...Zero Pressure Accumulation

The End Tap wiring scheme positions the power source at one end of a ZPA chain, typically the discharge end. A short power cable is used to connect the power source to the first ZPA module. When using End Tap wiring a 28 V DC power source will accommodate the most modules per chain. End Tap wiring is most effective when the ZPA system requires a relatively small

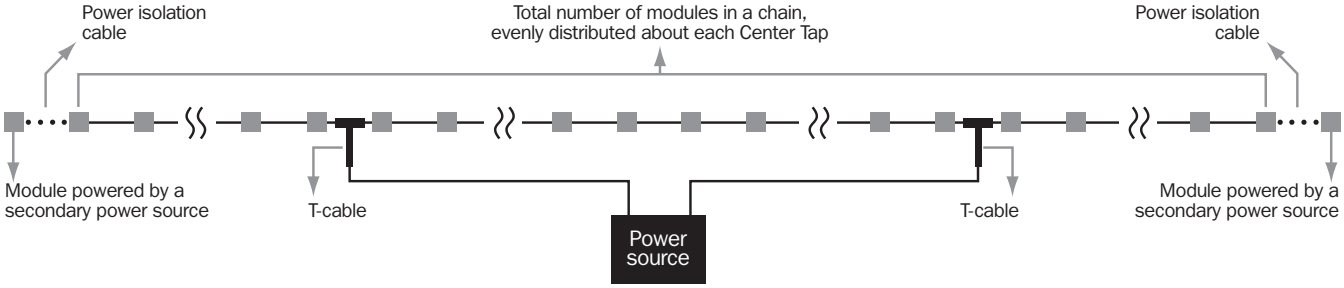


number of modules or when a small number of modules remain unpowered on a large ZPA system that uses Center Tap wiring. The Center Tap wiring scheme positions the power source at the center point of a ZPA chain. A short cable with an attached T-cable is used to connect the power source to the ZPA chain between two modules. This Center Tap supplies power to the chain in both directions. The Center Tap configuration is the simplest and most common installation for wiring the power source to ZPA systems.



The Dual Center Tap wiring scheme positions the power source at the center point of a ZPA chain. Two long cables with attached T-cables are used to apply a Center Tap at the mid point between the power source and the end of the ZPA chain in both directions, hence, Dual Center Tap. When using Dual Center Tap wiring a 24 V DC power source will accommodate the most modules per chain.

Zone Size

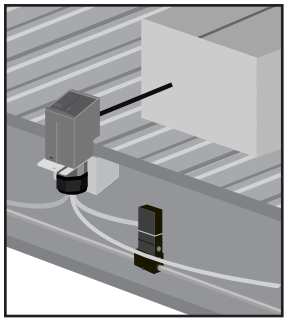


Zone size is the length of an individual zone within an accumulation conveyor. Typically, an accumulation conveyor has two, three or six foot zones.

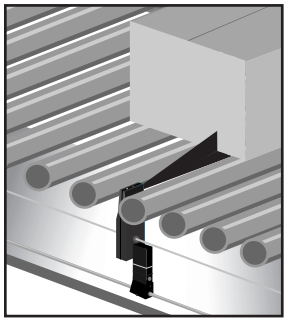
Mounting Location

In general, there are three basic locations where the sensing device of a ZPA system can be located or mounted to the accumulation conveyor: Over-the-Conveyor, Under-the-Conveyor or Side-Frame-Mount. The *ZoneControl*™ family of products offers multiple solutions and each can be easily mounted in one of the three basic locations.

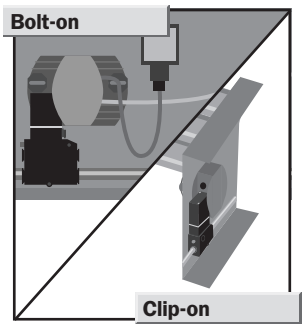
Over-the-Conveyor



Under-the-Conveyor

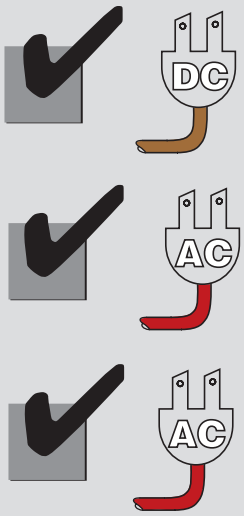


Side-Frame-Mount



ZoneControl Sensors

ZoneControl Sensors



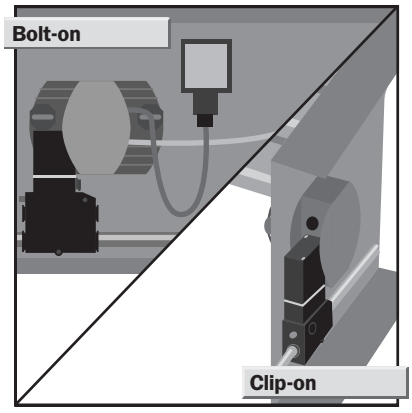
ZLM 1

Conveyor Sensors

Highlights

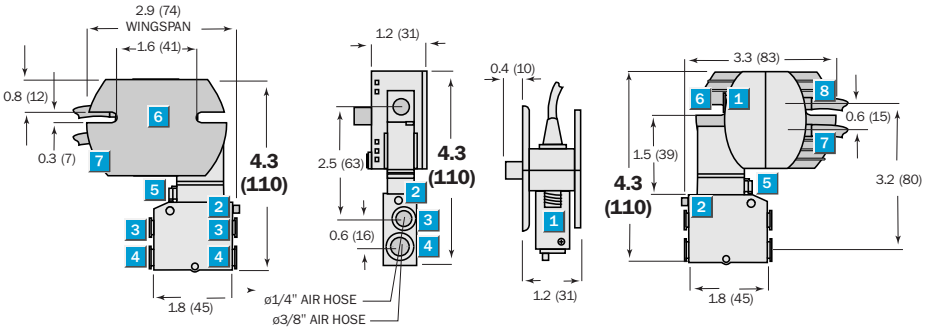
- Side-Frame-Mount
- Integrated ZPA logic, pneumatic valve, daisy chain cables and sensor cable
- American style valve with Imperial size quick connect fittings
- Connection cable for standard sensor, mounted remotely
- Single or slug accumulation logic
- Single or slug release logic
- Industrial grade M12 daisy chain cables

ZPA Logic Module with Pneumatic Valve Output

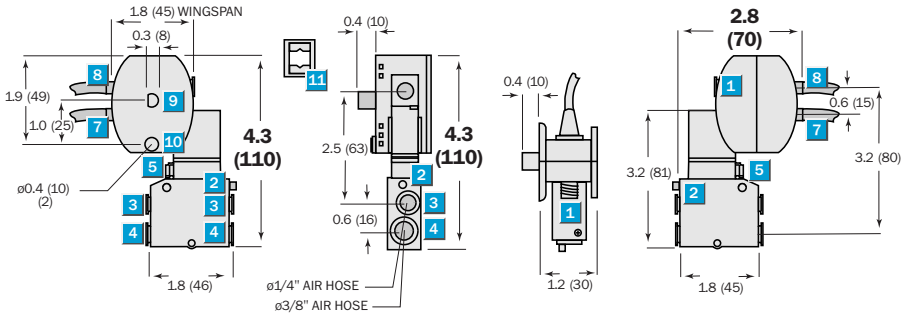


Dimensional Drawing

Bolt-on



Clip-on



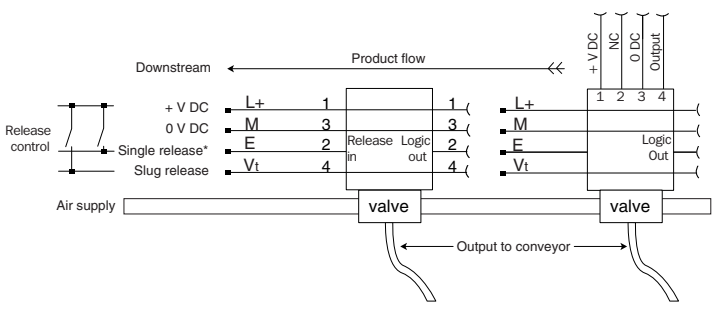
dimensions in inches (mm)

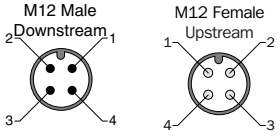
1	Daisy chain connector, male	7	Daisy chain cable, female or male (model dependent)
2	Exhaust	8	Sensor connection cable, female
3	Output port (x1)	9	Mounting stud
4	Supply ports (x2)	10	Anti-rotation stud
5	Manual over-ride switch	11	Mounting clip
6	Mounting slots (x2		

Accessories	Page
Reflectors	936
Cables	494, 495
Interface module	492

Technical Data ZLM 1-	C	B
Power		
Supply voltage V_s	24 V DC +20/-10%	
Ripple	< 5 V_{ss} within V_s	
Current consumption	≤ 47 mA with valve, without sensor	
Sensor		
Photoelectric sensor connection type	Cable - 0.5 m, 4-pin M8 or M12 female, (connects to sensing device - sold separately)	
Photoelectric sensor output requirements	PNP, light operate retro-reflective or dark operate diffuse (prox), 20 mA typical	
Interconnection		
Logic output type	PNP	
Logic output voltage	Single accumulation mode - beam blocked = V_s - (≤ 2 V), beam unblocked = 0 V	
	Slug accumulation mode - D.S. zone activated = V_s - (≤ 2 V), D.S. zone deactive = 0 V	
Logic output current max.	100 mA	
Logic output switching frequency/response time	200 Hz/2.5 ms	
Daisy chain connection type	Connector - 4-pin M12 male (connects to downstream sensor)	
	Cable - 1.1 m or 2.1 m, 4-pin M12 female (connects to upstream sensor)	
Circuit protection	Short circuit protection; interference pulse suppression; V_s reverse polarity protected	
Modules per End Tap (100 W source)	24 V_s: 3 ft zones = 26, 6 ft zones = 20	28 V_s: 3 ft zones = 35, 6 ft zones = 27
Modules per Center Tap (100 W source)	24 V_s: 3 ft zones = 52, 6 ft zones = 40	28 V_s: 3 ft zones = 46, 6 ft zones = 46
Modules per Dual Center Tap (100 W source)	24 V_s: 3 ft zones = 60, 6 ft zones = 52	28 V_s: 3 ft zones = N/A, 6 ft zones = N/A
Logic function		
Accumulation mode	Single; slug	
Release mode	Single (signal applied at discharge zone); slug (signal applied anywhere along chain)	
Valve		
Compressed air	Filtered, lubricated or unlubricated	
Operation mode	AtoD (Air to Drive); AtoB (Air to Brake)	
Pneumatic circuit function	3/2 way	
Port connections	Quick connect - 3/8 in supply; 1/4 in output (connects to local zone)	
Coil ratings	24 V DC, 1 W	
Output flow rate	40 Nl/min; 1.4 SCFM	
Exhaust flow rate	40 Nl/min; 1.4 SCFM	
Orifice size	0.047 in (1.2 mm)	
Operating pressure range	0…4.5 bar (0…65 PSI)	
Response time	Partially open: 10 ms; open: 23 ms; close: 21 ms	
Physical properties		
VDE protection class		
Enclosure rating	IP 40, NEMA 2	
Ambient operating temperature	14…131°F (-10…55°C)	
Storage temperature	-40…167°F (-40…75°C)	
Shock load	IEC 68	
Approximate weight	5.9 oz (168 g) with 1.1 m cable; 7.3 oz (206 g) with 2.1 m cable: 4.1 oz (115 g) no daisy chain cable	
Housing material	ABS	
Fastening method	Clip-on	Bolt-on
Typical mounting location	Side-Frame-Mount	

Connection Diagram





*Single accumulation models only

ZLM 1

ZLM 1 Clip-on Mounting

Zone Length	Sensor Connection		Single Accumulation - Single and Slug Release		Slug Accumulation - Slug Release	
			AtoD ⇩	AtoB ⇩	AtoD ⇩	AtoB ⇩
3 ft	cable M8	⇨	ZLM 1-C1121A10	ZLM 1-C1121A11	ZLM 1-C2121A10	ZLM 1-C2121A11
3 ft	cable M12	⇨	ZLM 1-C1111A10	ZLM 1-C1111A11	ZLM 1-C2111A10	ZLM 1-C2111A11
6 ft	cable M8	⇨	ZLM 1-C1221A10	ZLM 1-C1221A11	ZLM 1-C2221A10	ZLM 1-C2221A11
6 ft	cable M12	⇨	ZLM 1-C1211A10	ZLM 1-C1211A11	ZLM 1-C2211A10	ZLM 1-C2211A11
M12 male connector	connector M8	⇨	ZLM 1-C1021A10	ZLM 1-C1021A11	ZLM 1-C2021A10	ZLM 1-C2021A11
M12 male connector	connector M12	⇨	ZLM 1-C1011A10	ZLM 1-C1011A11	ZLM 1-C2011A10	ZLM 1-C2011A11

ZLM 1 Bolt-on Mounting

Zone Length	Sensor Connection		Single Accumulation - Single and Slug Release		Slug Accumulation - Slug Release	
			AtoD ⇩	AtoB ⇩	AtoD ⇩	AtoB ⇩
3 ft	cable M8	⇨	ZLM 1-B1121A10	ZLM 1-B1121A11	ZLM 1-B2121A10	ZLM 1-B2121A11
3 ft	cable M12	⇨	ZLM 1-B1111A10	ZLM 1-B2111A11	ZLM 1-B2111A10	ZLM 1-B2111A11
6 ft	cable M8	⇨	ZLM 1-B1221A10	ZLM 1-B1221A11	ZLM 1-B2221A10	ZLM 1-B2221A11
6 ft	cable M12	⇨	ZLM 1-B1211A10	ZLM 1-B1211A11	ZLM 1-B2211A10	ZLM 1-B2211A11
M12 male connector	connector M8	⇨	ZLM 1-B1021A10	ZLM 1-B1021A11	ZLM 1-B2021A10	ZLM 1-B2021A11
M12 male connector	connector M12	⇨	ZLM 1-B1011A10	ZLM 1-B1011A11	ZLM 1-B2011A10	ZLM 1-B2011A11

Order Information					
Model Number	**Part Number**	**Model Number**	**Part Number**	**Model Number**	**Part Number**
ZLM 1-C1121A10	7 027 756	ZLM 1-C1111A10	7 027 764	ZLM 1-C1221A10	7 027 772
ZLM 1-C1121A11	7 027 757	ZLM 1-C1111A11	7 027 765	ZLM 1-C1221A11	7 027 773
ZLM 1-C2121A10	7 027 758	ZLM 1-C2111A10	7 027 766	ZLM 1-C2221A10	7 027 774
ZLM 1-C2121A11	7 027 759	ZLM 1-C2111A11	7 027 767	ZLM 1-C2221A11	7 027 775
ZLM 1-B1121A10	7 027 760	ZLM 1-B1111A10	7 027 768	ZLM 1-B1221A10	7 027 776
ZLM 1-B1121A11	7 027 761	ZLM 1-B1111A11	7 027 769	ZLM 1-B1221A11	7 027 777
ZLM 1-B2121A10	7 027 762	ZLM 1-B2111A10	7 027 770	ZLM 1-B2221A10	7 027 778
ZLM 1-B2121A11	7 027 763	ZLM 1-B2111A11	7 027 771	ZLM 1-B2221A11	7 027 779

Model Number	**Part Number**	**Model Number**	**Part Number**	**Model Number**	**Part Number**
ZLM 1-C1211A10	7 027 780	ZLM 1-C1021A10	7 027 788	ZLM 1-C1011A10	7 027 796
ZLM 1-C1211A11	7 027 781	ZLM 1-C1021A11	7 027 789	ZLM 1-C1011A11	7 027 797
ZLM 1-C2211A10	7 027 782	ZLM 1-C2021A10	7 027 790	ZLM 1-C2011A10	7 027 798
ZLM 1-C2211A11	7 027 783	ZLM 1-C2021A11	7 027 791	ZLM 1-C2011A11	7 027 799
ZLM 1-B1211A10	7 027 784	ZLM 1-B1021A10	7 027 792	ZLM 1-B1011A10	7 027 800
ZLM 1-B1211A11	7 027 785	ZLM 1-B1021A11	7 027 793	ZLM 1-B1011A11	7 027 801
ZLM 1-B2211A10	7 027 786	ZLM 1-B2021A10	7 027 794	ZLM 1-B2011A10	7 027 802
ZLM 1-B2211A11	7 027 787	ZLM 1-B2021A11	7 027 795	ZLM 1-B2011A11	7 027 803

WTR 1

Conveyor Sensors

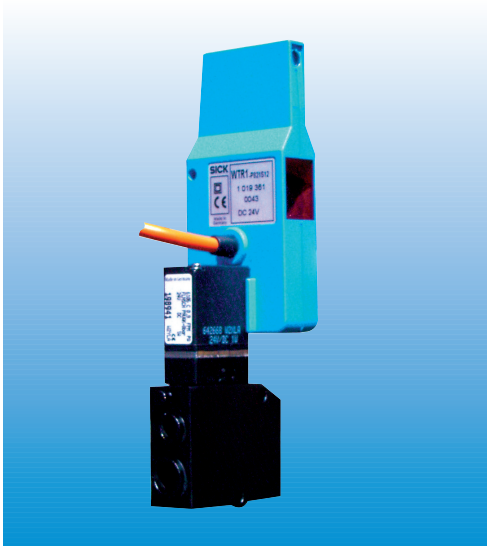
3.9...35.4 in (100...900 mm)
sensing range

CE

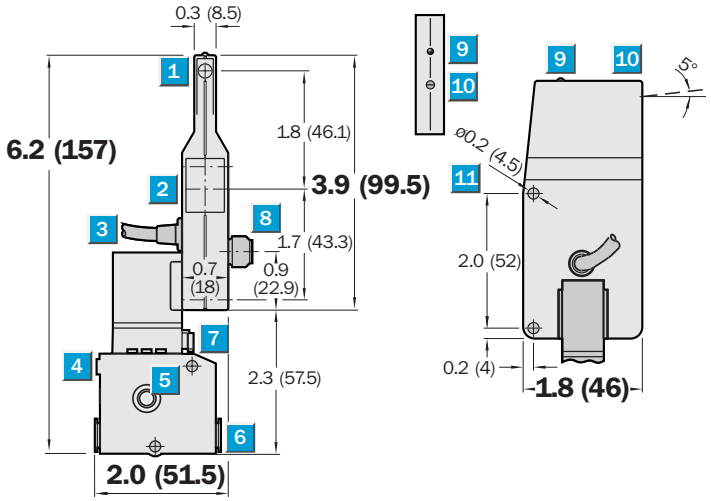
Highlights

- Under-the-Conveyor Mount
- Integrated ZPA logic, photoelectric sensor, pneumatic valve and daisy chain cables
- American style valve with Imperial size quick connect fittings
- Adjustable Background Suppression
- Single or slug accumulation logic
- Single or slug release logic
- Industrial grade M12 daisy chain cables

ZPA Sensor with Pneumatic Valve Output

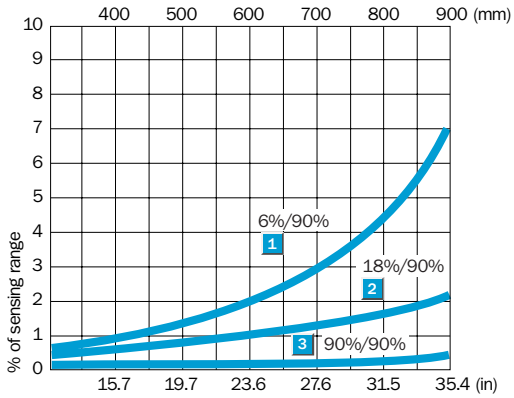


Dimensional Drawing



dimensions in inches (mm)

Background Suppression

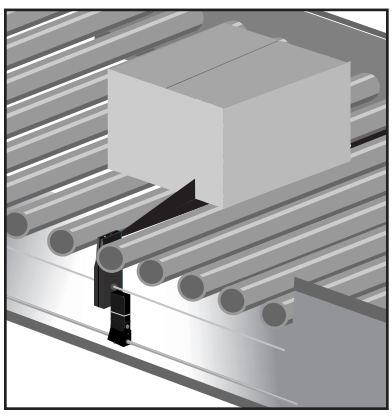


1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

1 Sender
2 Receiver
3 Daisy chain cable, female
4 Exhaust
5 Output port (x1)
6 Supply ports (x2)
7 Manual over-ride switch
8 Daisy chain connection, male
9 Signal strength indicator
10 Sensing distance adjustment
11 Mounting through-holes (x2)

Selection Table

Zone Length		Single Accumulation-Single and Slug Release		Slug Accumulation-Single Release	
		AtoD ⇩	AtoB ⇩	AtoD ⇩	AtoB ⇩
3 ft	⇨	WTR 1-P421A10	WTR 1-P721A11	WTR 1-P921A10	WTR 1-P821A11
6 ft	⇨	WTR 1-P421B10	WTR 1-P721B11	WTR 1-P921B10	WTR 1-P821B11



Order Information

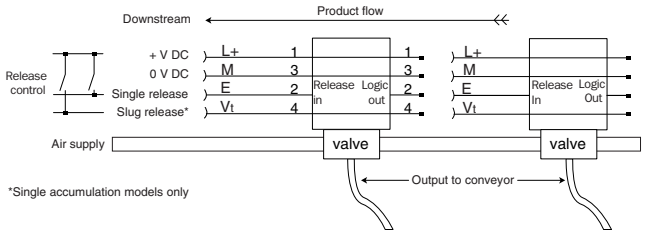
Model Number	Part Number
WTR 1-P421A10	1 025 373
WTR 1-P721A11	1 025 374
WTR 1-P921A10	1 025 375
WTR 1-P821A11	1 025 376
WTR 1-P421B10	1 025 390
WTR 1-P721B11	1 025 391
WTR 1-P921B10	1 025 392
WTR 1-P821B11	1 025 393

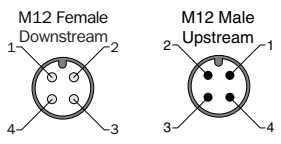
Accessories	Page
Cables	494
Mounting brackets	927
Interface module	492

Technical Data	WTR 1-	P…

Power		
Supply voltage V_s	24 V DC +20/-10%	
Ripple	< 5 V_{ss} within V_s	
Current consumption	≤ 67 mA with valve	
Sensor		
Sensing range	3.9…35.4 in (100…900 mm)	
Adjustable background suppression	11.8…35.4 in (300…900 mm)	
Light spot diameter	Approx. 1.6 in at 35.4 in (40 mm at 900 mm)	
Light source	LED, IR, average life 100,000 hours at 77°F (25°C)	
Light beam tilt angle	5° upward from center	
Interconnection		
Logic output type	PNP	
Logic output voltage	Single accumulation mode - beam blocked = V_s - (≤ 2 V), beam unblocked = 0 V	
	Slug accumulation mode - D.S. zone activated = V_s - (≤ 2 V), D.S. zone deactive = 0 V	
Logic output current max.	100 mA	
Logic output switching frequency/response time	250 Hz/2.0 ms	
Daisy chain connection type	Cable - 1.2 m or 2.0 m, 4-pin M12 female (connects to downstream sensor)	
	Connector - 4-pin M12 male (connects to upstream sensor)	
Circuit protection	Short circuit protection; interference pulse suppression; V_s reverse polarity protected	
Modules per End Tap (100 W source)	24 V_s: 3 ft zones = 23, 6 ft zones = 18	28 V_s: 3 ft zones = 32, 6 ft zones = 26
Modules per Center Tap (100 W source)	24 V_s: 3 ft zones = 46, 6 ft zones = 36	28 V_s: 3 ft zones = 48, 6 ft zones = 48
Modules per Dual Center Tap (100 W source)	24 V_s: 3 ft zones = 60, 6 ft zones = 48	28 V_s: 3 ft zones = N/A, 6 ft zones = N/A
Logic function		
Accumulation mode	Single; slug	
Release mode	Single (signal applied at discharge zone); slug (signal applied anywhere along chain)	
Valve		
Compressed air	Filtered, lubricated or unlubricated	
Operation mode	AtoD (Air to Drive); AtoB (Air to Brake)	
Pneumatic circuit function	3/2 way	
Port connections	Quick connect - 3/8 in supply; 1/4 in output (connects to local zone)	
Coil ratings	24 V DC, 1 W	
Output flow rate	40 Nl/min; 1.4 SCFM	
Exhaust flow rate	40 Nl/min; 1.4 SCFM	
Orifice size	0.047 in (1.2 mm)	
Operating pressure range	0…4.5 bar (0…65 PSI)	
Response time	Partially open: 10 ms; open: 23 ms; close: 21 ms	
Physical properties		
VDE protection class	⧈	
Enclosure rating	IP 54, NEMA 3	
Ambient operating temperature	14…131°F (-10…55°C)	
Storage temperature	-40…167°F (-40…75°C)	
Shock load	IEC 68	
Approximate weight	5.9 oz (168 g) with 1.1 m cable; 7.3 oz (206 g) with 2.1 m cable: 4.1 oz (115 g) no daisy chain cable	
Housing material	Glass fiber reinforced ABS	
Typical mounting location	Under-the-Conveyor	

Connection Diagram





WTR 2

Conveyor Sensors

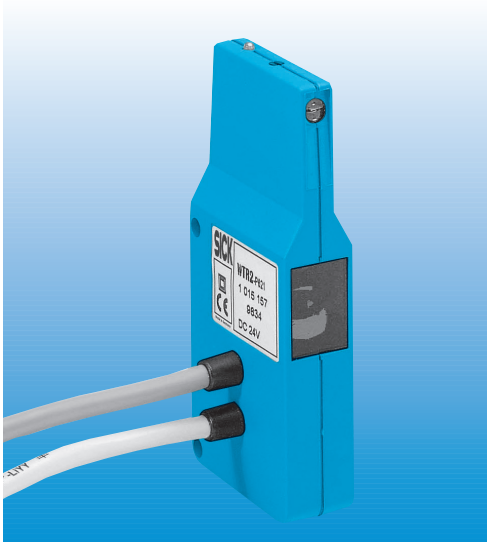
3.9...35.4 in (100...900 mm)
sensing range

CE

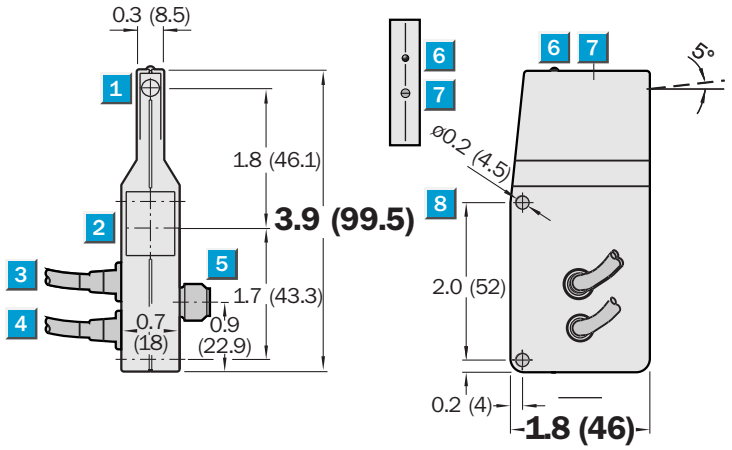
Highlights

- Under-the-Conveyor Mount
- Integrated ZPA logic, photoelectric sensor, pneumatic valve cable and daisy chain cables
- Output cable for connection to electric motor control or pneumatic valve
- Adjustable Background Suppression
- Single or slug accumulation logic
- Single or slug release logic
- Industrial grade M12 daisy chain cables

ZPA Sensor with Electric Motor Control Output



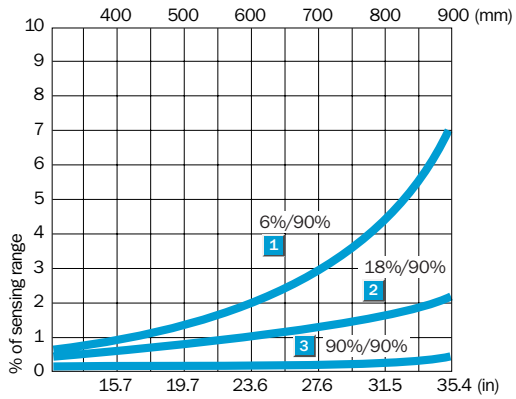
Dimensional Drawing



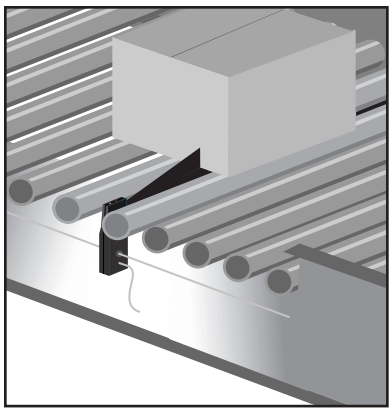
dimensions in inches (mm)

1	Sender
2	Receiver
3	Daisy chain cable, female
4	Output cable, flying leads
5	Daisy chain connection, male
6	Signal strength indicator
7	Sensing distance adjustment
8	Mounting through-holes (x2)

Background Suppression



1	Sensing range on black
2	Sensing range on grey
3	Sensing range on white

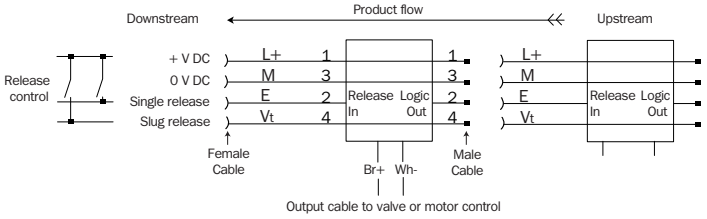


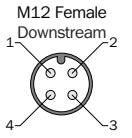
Order Information	
Model Number	**Part Number**
WTR 2-P621	1 015 157

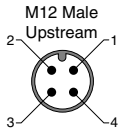
Accessories	Page
Cables	494
Mounting brackets	927
Interface module	492

Technical Data WTR 2-	P621	
Power		
Supply voltage V_s	10…30 V DC	
Ripple	< 5 V_{ss} within V_s	
Current consumption	≤ 25 mA without load, without valve	
Sensor		
Sensing range	3.9…35.4 in (100…900 mm)	
Adjustable background suppression	11.8…35.4 in (300…900 mm)	
Light spot diameter	Approx. 1.6 in at 35.4 in (40 mm at 900 mm)	
Light source	LED, IR, average life 100,000 hours at 77°F (25°C)	
Light beam tilt angle	5° upward from center	
Interconnection		
Logic output type	PNP	
Logic output voltage	Single accumulation mode - beam blocked = V_s - (≤ 2 V), beam unblocked = 0 V	
Logic output current max.	100 mA	
Logic output switching frequency/response time	250 Hz/2.0 ms	
Daisy chain connection type	Cable - 1.2 m or 2.0 m, 4-pin M12 female (connects to downstream sensor)	
	Connector - 4-pin M12 male (connects to upstream sensor)	
Circuit protection	Short circuit protection; interference pulse suppression; V_s reverse polarity protected	
Modules per End Tap (100 W source, 1 W load)	24 V_s: 3 ft zones = 23, 6 ft zones = 18	28 V_s: 3 ft zones = 32, 6 ft zones = 26
Modules per Center Tap (100 W source, 1 W load)	24 V_s: 3 ft zones = 46, 6 ft zones = 36	28 V_s: 3 ft zones = 48, 6 ft zones = 48
Modules per Dual Center Tap (100 W source, 1 W load)	24 V_s: 3 ft zones = 60, 6 ft zones = 48	28 V_s: 3 ft zones = N/A, 6 ft zones = N/A
Logic function		
Accumulation mode	Single	
Release mode	Single (signal applied at discharge zone); slug (signal applied anywhere along chain)	
Output to motor control or external valve		
Output voltage	HIGH = V_s - (≤ 2 V); LOW = 0 V	
Output current max.	600 mA	
Circuit protection	Short circuit protection	
Connection type	Cable - 1.5 m, 2-wire flying leads (connects to local zone)	
Switching frequency/response time	250 Hz/2.0 ms	
Physical properties		
VDE protection class	⧈	
Enclosure rating	IP 54, NEMA 3	
Ambient operating temperature	-40…140°F (-40…60°C)	
Storage temperature	-40…167°F (-40…75°C)	
Shock load	IEC 68	
Approximate weight	3.9 oz (110 g) with 1.2 m cable; 5.3 oz (149 g) with 2.1 m cable	
Housing material	Glass fiber reinforced ABS	
Typical mounting location	Under-the-Conveyor	

Connection Diagram

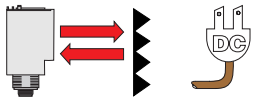






WLR 2100-D

Conveyor Sensors



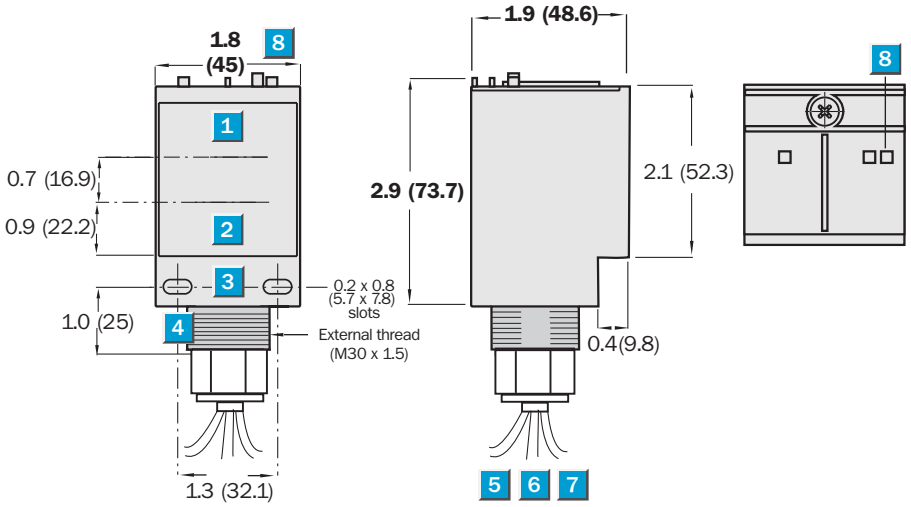
0...29.5 ft (0...9 m)
sensing range

Highlights

- Over-the-Conveyor Mount
- Integrated ZPA logic, photoelectric sensor, pneumatic valve cable and daisy chain cables
- Output cable for connection to electric motor control or pneumatic valve
- Industrial grade M12 daisy chain cables
- Linear polarized retro-reflective sensing technology eliminates false detection of shiny or plastic-wrapped objects
- Single or slug accumulation logic
- Single or slug release logic

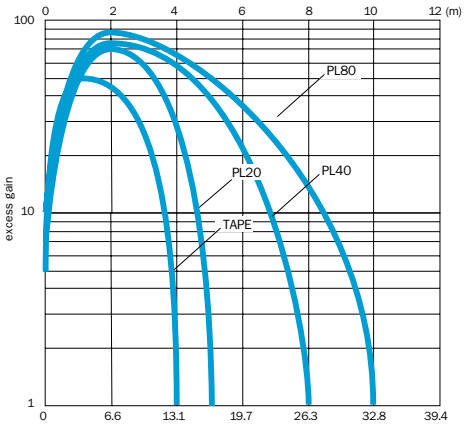
ZPA Sensor with Electric Output

Dimensional Drawing



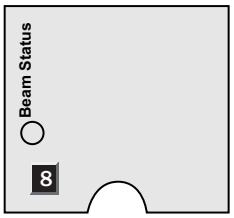
dimensions in inches (mm)

Excess Gain



Inside Cover

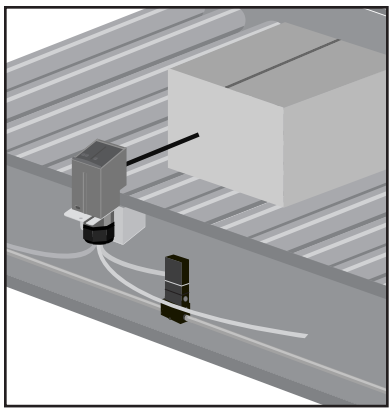
All types



1 Sender
2 Receiver
3 Mounting through-holes (x2)
4 Threaded mount
5 Daisy chain cable, female
6 Output cable, female
7 Daisy chain cable, male
8 Beam status indicator

Selection Table

Zone Length	Valve Connection	Single Accumulation - Single and Slug Release ⇩	Slug Accumulation - Slug Release ⇩
3 ft	DIN 9.4 mm ⇨	WLR 2100-D2311	WLR 2100-D2321
3 ft	Spade Conn ⇨	WLR 2100-D1311	WLR 2100-D1321
6 ft	DIN 9.4 mm ⇨	WLR 2100-D2312	WLR 2100-D2322
6 ft	Spade Conn ⇨	WLR 2100-D1312	WLR 2100-D1322



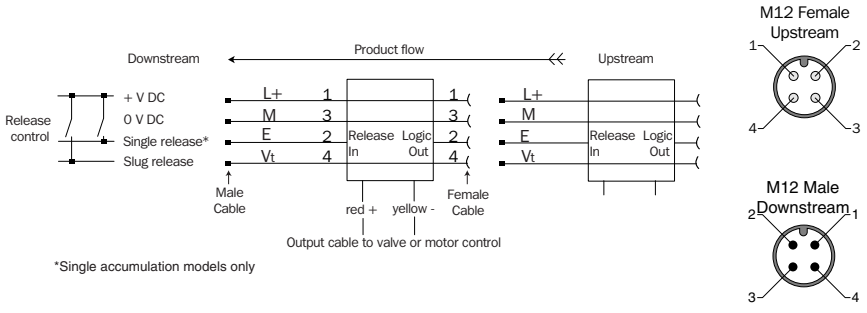
Order Information

Model Number	Part Number
WLR 2100-D1311	7 027 185
WLR 2100-D2311	7 027 808
WLR 2100-D1321	7 027 754
WLR 2100-D2321	7 027 809
WLR 2100-D1312	7 027 753
WLR 2100-D2312	7 027 811
WLR 2100-D1322	7 027 755
WLR 2100-D2322	7 027 810

Accessories	Page
Cables	494
Mounting brackets	927
Interface module	492

Technical Data WLR 2100-	D....	
Power		
Supply voltage V_s	10…30 V DC	
Ripple	< 5 V_{ss} within V_s	
Current consumption	≤ 40 mA, without load, without valve	
Sensor		
Sensing range	0…29.5 ft (0…9 m) with PL 80A reflector	
Light spot diameter	Approx. 8.0 in at 29.5 ft (205 mm at 9 m)	
Light source	LED, red, polarized, average life 100,000 hours at 77°F (25°C)	
Interconnection		
Logic output type	PNP	
Logic output voltage	Single accumulation mode - beam blocked = V_s - (≤ 2 V), beam unblocked = 0 V	
	Slug accumulation mode - D.S. zone activated = V_s - (≤ 2 V), D.S. zone deactivated = 0 V	
Logic output current max.	100 mA	
Logic output switching frequency/response time	500 Hz/1.0 ms	
Daisy chain connection type	Cable - 300 mm, 4-pin M12 male (connects to downstream sensor)	
	Cable - 1.1 m or 2.1 m, 4-pin M12 female (connects to upstream sensor)	
Circuit protection	Short circuit protection; interference pulse suppression; V_s reverse polarity protected	
Modules per End Tap (100 W source, 1 W load)	24 V_s: 3 ft zones = 23, 6 ft zones = 18	28 V_s: 3 ft zones = 31, 6 ft zones = 25
Modules per Center Tap (100 W source, 1 W load)	24 V_s: 3 ft zones = 46, 6 ft zones = 36	28 V_s: 3 ft zones = 46, 6 ft zones = 46
Modules per Dual Center Tap (100 W source, 1 W load)	24 V_s: 3 ft zones = 60, 6 ft zones = 42	28 V_s: 3 ft zones = N/A, 6 ft zones = N/A
Logic function		
Accumulation mode	Single; slug	
Release mode	Single (signal applied at discharge zone); slug (signal applied anywhere along chain)	
Output to motor control or external valve		
Output voltage	HIGH = V_s - (≤ 2 V); LOW = 0 V	
Output current max.	100 mA	
Circuit protection	None	
Connection type	Cable - 300 mm, 2-wire spade or 9.4 mm DIN (43650) type C female (connects to local zone)	
Switching frequency/response time	500 Hz/1.0 ms	
Physical properties		
VDE protection class	⧈	
Enclosure rating	IP 67, NEMA 6	
Ambient operating temperature	-13…131°F (-25…55°C)	
Storage temperature	-40…158°F (-40…70°C)	
Shock load	IEC 68	
Approximate weight	5.3 oz (150 g) with 1.1 m cable; 6.6 oz (188 g) with 2.1 m cable	
Housing material	Glass fiber reinforced ABS	
Typical mounting location	Over-the-Conveyor	

Connection Diagram



WLR 2100-M

Conveyor Sensors

0...29.5 ft (0...9 m)
sensing range

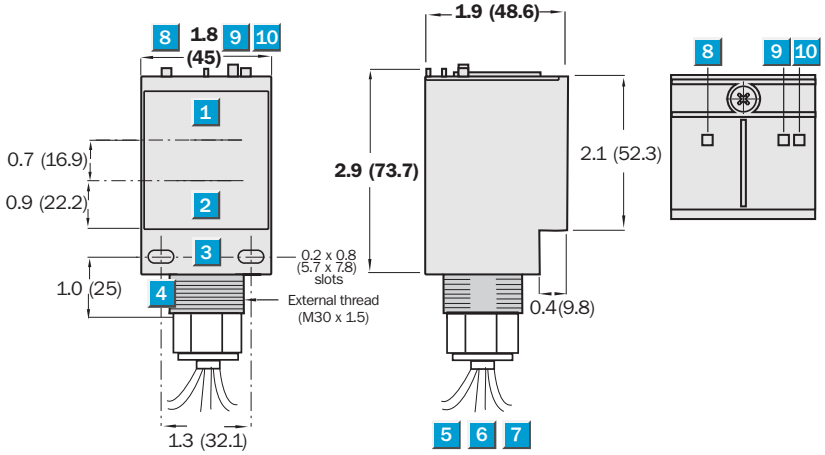
c UL us

Highlights

- Over-the-Conveyor Mount
- Integrated ZPA logic, photoelectric sensor, pneumatic valve cable and daisy chain cables
- Output cable for connection to electric motor control or pneumatic valve
- Linear polarized retro-reflective sensing technology eliminates false detection of shiny or plastic-wrapped objects
- Single or slug time delay release
- Individual slug release configurability, switch selectable

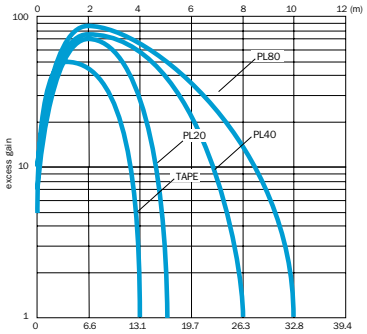
ZPA Sensor with Electric Output

Dimensional Drawing



dimensions in inches (mm)

Excess Gain



A **Slug/Accumulation Delay Settings 0...2 seconds**

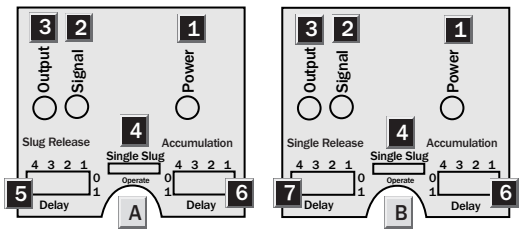
msec.	4321	msec.	4321
0	0000	1095	1000
360	0001	1225	1001
300	0010	1370	1010
435	0011	1500	1011
550	0100	1615	1100
680	0101	1745	1101
820	0110	1890	1110
955	0111	2020	1111

B **Release/Accumulation Delay Settings 0...10 seconds**

msec.	4321	msec.	4321
0.1	0000	5.2	1000
0.7	0001	5.9	1001
1.4	0010	6.6	1010
2.0	0011	7.2	1011
2.6	0100	7.8	1100
3.2	0101	8.4	1101
3.9	0110	9.1	1110
4.6	0111	9.8	1111

Inside Cover and Adjustments

WLR 2100-M6361 | WLR 2100-M6381
WLR 2100-M6362 | WLR 2100-M6382



1 Power indicator
2 Signal strength indicator
3 Output status indicator
4 Single/slug selector switch
5 Slug release time delay DIP switches
6 Accumulation time delay DIP switches
7 Single release time delay DIP switches

1 Sender
2 Receiver
3 Mounting through-holes (x2)
4 Threaded mount
5 Daisy chain cable, female
6 Output cable, female
7 Daisy chain cable, male
8 Power indicator
9 Signal strength indicator
10 Output status indicator

Selection Table

Zone Length	Valve Connection	Adjustable Accumulation - Single or Adjustable Slug Release	Adjustable Accumulation - Slug or Adjustable Single Release
3 ft	DIN 9.4 mm	WLR 2100-M6361	WLR 2100-M6381
6 ft	DIN 9.4 mm	WLR 2100-M6362	WLR 2100-M6382

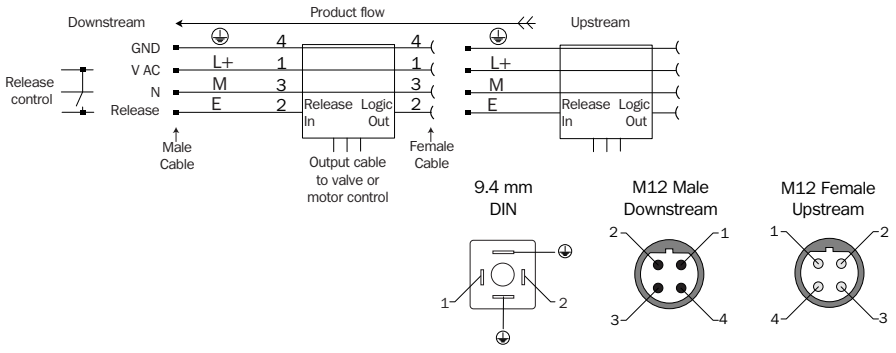
Order Information

Model Number	Part Number
WLR 2100-M6381	7 027 819
WLR 2100-M6382	7 027 820
WLR 2100-M6361	7 027 089
WLR 2100-M6362	7 027 090

Accessories	page
Cables	494, 495
Mounting brackets	927

Technical Data WLR 2100-	M....
Power	
Supply voltage V_s	90…240 V AC
Ripple	< 5 V_{ss} within V_s
Power consumption	≤ 6 W
Sensor	
Sensing range	0…29.5 ft (0…9 m) with PL 80A reflector
Light spot diameter	Approx. 8.0 in at 29.5 ft (205 mm at 9 m)
Light source	LED, red, polarized, average life 100,000 hours at 77°F (25°C)
Interconnection	
Logic output type	FET
Logic output current max.	100 mA
Logic output switching frequency/response time	250 Hz/2.0 ms
Daisy chain connection type	Cable - 300 mm, 4-pin M12 male (connects to downstream sensor)
	Cable - 1.1 m or 2.1 m, 4-pin M12 female (connects to upstream sensor)
Circuit protection	Short circuit protection; interference pulse suppression; V_s reverse polarity protected
Modules per End Tap (440 W source, 5 W load)	24 V_s: 3 ft zones = 27, 6 ft zones = 22
Modules per Center Tap (440 W source, 5 W load)	24 V_s: 3 ft zones = 40, 6 ft zones = 40
Logic function	
Accumulation mode	Adjustable time delay
Release mode	Single and adjustable time delay slug (switch configurable) or slug and adjustable time delay single (switch configurable)
Output to motor control or external valve	
Output voltage	HIGH = V_s - (≤ 2 V); LOW = 0 V
Output current max.	150 mA
Circuit protection	None
Connection type	Cable - 300 mm, 9.4 mm DIN (43650) type C female (connects to local zone)
Switching frequency/response time	500 Hz/1.0 ms
Physical properties	
VDE protection class	⧈
Enclosure rating	IP 67, NEMA 6
Ambient operating temperature	-13…131°F (-25…55°C)
Storage temperature	-40…158°F (-40…70°C)
Shock load	IEC 68
Approximate weight	5.3 oz (150 g) with 1.1 m cable; 6.6 oz (188 g) with 2.1 m cable
Housing material	Glass fiber reinforced ABS
Typical mounting location	Over-the-Conveyor

Connection Diagram



WTR 2

Conveyor Sensors

3.9...35.4 in (100...900 mm)
sensing range

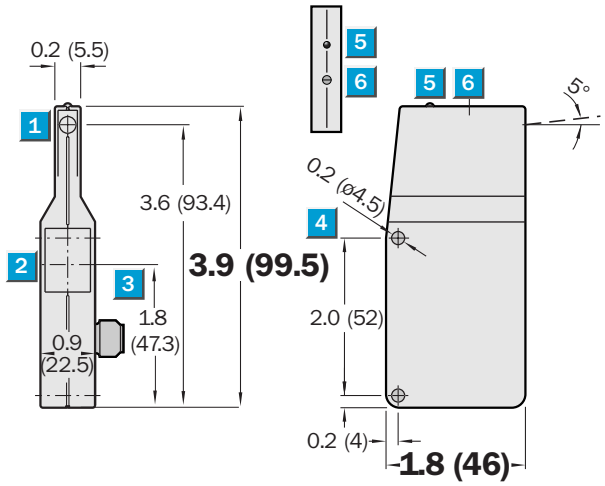
CE

Highlights

- Under-the-Conveyor Mount
- Stand alone sensor easily integrated with ZPA systems
- Multiple output configurations including: PNP, NPN, light and dark operate
- Adjustable Background Suppression (ABS) sensing technology, ignores background targets and no reflector is required
- Industrial grade M12 cable connection

Photoelectric Sensor for Integration with ZLM 1

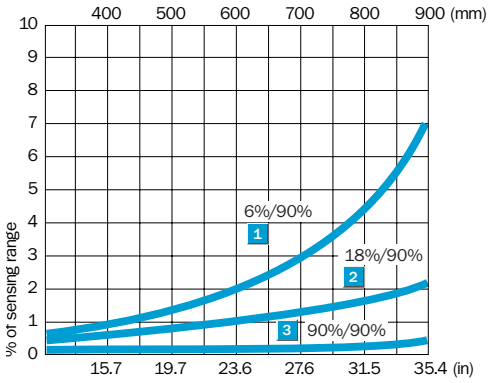
Dimensional Drawing



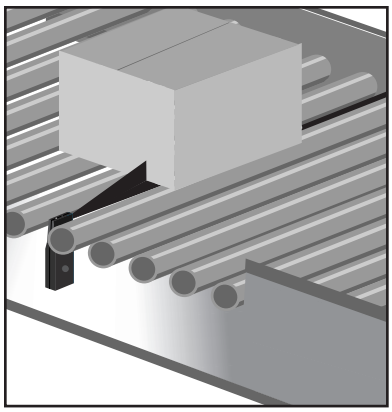
dimensions in inches (mm)

1 Sender
2 Receiver
3 Connector, M12 male
4 Mounting through-holes (x2)
5 Signal strength indicator
6 Sensing distance adjustment

Background Suppression



1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission



Order Information

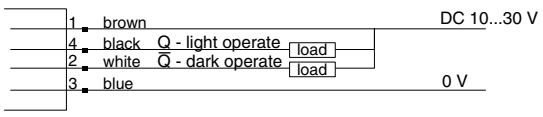
Model Number	Part Number
WTR 2-P551S08	1 022 927
WTR 2-N551S05	1 019 320
WTR 2-N551S06	1 019 583
WTR 2-P521	1 015 074
WTR 2-P511	1 015 158
WTR 2-P521S14	1 025 619

Accessories	Page
Cables	494
Mounting brackets	927
Interface module	492

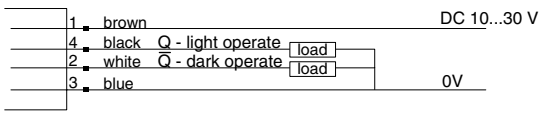
Technical Data WTR 2-	P551S08	N551S05	N551S06	P521S14	P521	P511
Sensing range	3.9…35.4 in (100…900 mm)					
Adjustable background suppression	11.8…35.4 in (300…900 mm)					
Light spot diameter	Approx. 1.6 in at 35.4 in (40 mm at 900 mm)					
Light source	LED, infrared light					
External light immunity	Modulated light source with digital signal evaluation via SICK custom ASIC					
Crosstalk immunity	Automatic modulation frequency shift via SICK custom ASIC					
Response time frequency	< 25 ms beam block, < 1 ms beam unblock/40 Hz				< 1 ms/500 Hz	
Supply voltage V_S	10…30 V DC (limit values)					
Ripple (within V_S tolerance)	< 5 V peak to peak					
Current consumption (no load)	< 40 mA					
Switching type	PNP	NPN		PNP		
Switching current max.	200 mA					
Alarm output type	-		NPN	-		
Alarm output current max.	-		200 mA	-		
Output switching mode	Light or dark switching via complimentary outputs		Dark switching			Light switching
Connection type	M12 4-pin connector					
Housing	Glass fiber reinforced plastic					
Enclosure rating	IP 54					
VDE protection class	□					
EMC	IEC 801					
Shock rating	IEC 68					
Circuit protection	Outputs short circuit protected, V_S reverse polarity protected					
Ambient operating temperature	-40…140°F (-40…60°C)					
Storage temperature	-40…167°F (-40…75°C)					
Mounting bracket	2 017 417 (not included)					
Approximate weight	Approx. 3.5 oz (100 g)					

Connection Diagram

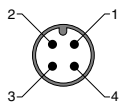
WTR2-N551S05



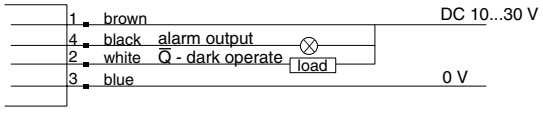
WTR2-P551S08



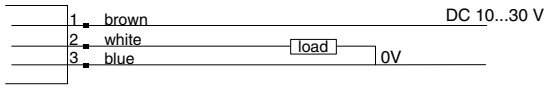
M12 Male



WTR2-N551S06

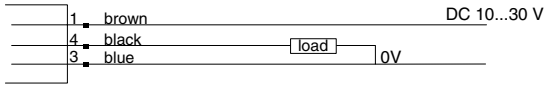


WTR2-P521
WTR2-P511



wire colors refer to standard cable, not included

WTR2-P521S14



SICK

ZIM

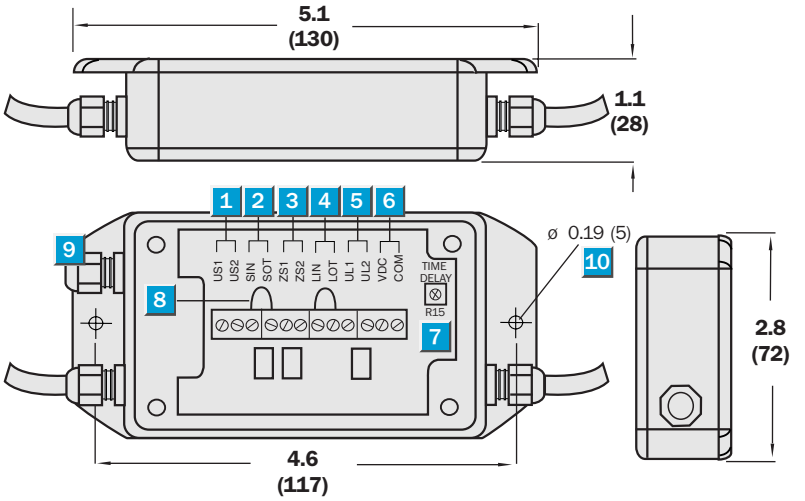
Conveyor Sensors

Highlights

- Provides simple and flexible interface to ZPA control systems
- Reduces installation labor and component costs
- Plug-n-play connectivity for error proof installation
- Relay isolated single and slug release
- Adjustable zone release time delay, 0 to 20 seconds
- Zone status reporting
- Stop zone function
- Provides power tap connections

ZPA Interface Module

Dimensional Drawing



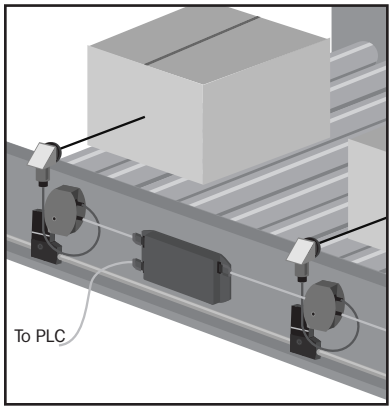
dimensions in inches (mm)

Warning

CAUTION

RISK OF ELECTRICAL SHOCK-MORE THAN ONE DISCONNECT SWITCH MAY BE REQUIRED TO DE-ENERGIZE THE EQUIPMENT BEFORE SERVICING

	Terminal	Function
1	US1/US2	Slug release
2	SIN/SOT	Slug release
3	ZS1/ZS2	Zone status
4	LIN/LOT	Logic interrupt
5	UL1/UL2	Single release
6	VDC/COM	Power
7	R15	Release delay
8	Jumpers (x2)	
9	Cable gland, PG7 (x3) I.D. 2.3 to 6.4 mm	
10	Mounting through-holes (x2)	



Order Information

Model Number	Part Number
ZIM 1-B111	7 027 714
ZIM 2-B211	7 027 715

Technical Data ZIM-	B111	B211
Interface to ZPA system	ZLM1, WLR2100-D	WTR
Upstream connection	Female, M12, 4-PIN, 300 mm cable	Male, M12, 4-PIN, 300 mm cable
Downstream connection	Male, M12, 4-PIN, 300 mm cable	Female, M12, 4-PIN, 300 mm cable
Power		
Supply voltage	24 V DC (±15%)	
Power consumption	≤ 20 mA	
Supply voltage terminal	V DC, COM	
Single release		
Single release input voltage	24…120 V AC/DC (± 10%)	
Single release input current consumption	≤ 25 mA	
Single release input terminals	UL2, UL1	
Slug release		
Slug release input voltage	24…120 V AC/DC (± 10%)	
Slug release input current consumption	≤ 25 mA	
Slug release input terminals	US2, US1	
Zone status		
Zone status output	Dry contact relay (see functional description below)	
Zone status relay output max. voltage/current	30 V DC / 1.0 amps, 120 V AC / 0.2 amps	
Zone status relay output terminals	ZS2, ZS1	
Logic signal		
Logic/release time delay	0.2…20 seconds adjustable, 270° potentiometer	
Logic signal interrupt (stop zone) terminals	LIN, LOT remove jumper to interrupt logic signal	
Slug termination		
Slug termination terminals	SIN, SOT remove jumper to terminate slug release	
Physical properties		
Terminal block wire	24 to 12 AWG, strip length 6.0 mm (0.24 in)	
Screw terminal torque	0.4…0.5 Nm (3.5…4.4 in-lb)	
Enclosure rating	IP 42, NEMA 2	
Operating temperature	-13…131°F (-25…55°C)	
Storage temperature	-40…158°F (-40…70°C)	
Approximate weight	0.9 lb (400 g)	

Functional Descriptions

Single Release Input - will release the immediate upstream zone.

Slug Release Input - will release all zones in the ZPA string, upstream and downstream, unless prohibited by a slug termination.

Zone Status Output - Single Accumulation - relay is closed when the immediate downstream sensor detects a package.

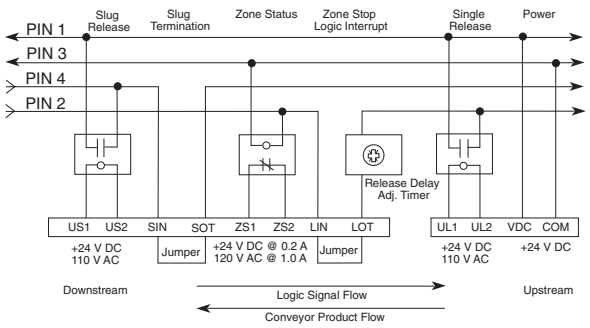
Zone Status Output - Slug Accumulation - relay is closed when the immediate downstream zone is accumulated.

Logic Signal Interrupt Removable Jumper - when removed, will not allow the logic signal to pass upstream resulting in an upstream “Stop Zone”.

Slug Signal Termination Removable Jumper - when removed, will not allow the slug signal to pass through the next upstream/downstream ZPA module.

Single Release Time Delay - will delay the logic signal to the upstream zone by 0.1 to 20 seconds, user adjustable. The result is a delayed release at the upstream zone which generates additional package gap directly proportional to the time delay setting, as the time delay increases the package gap increases.

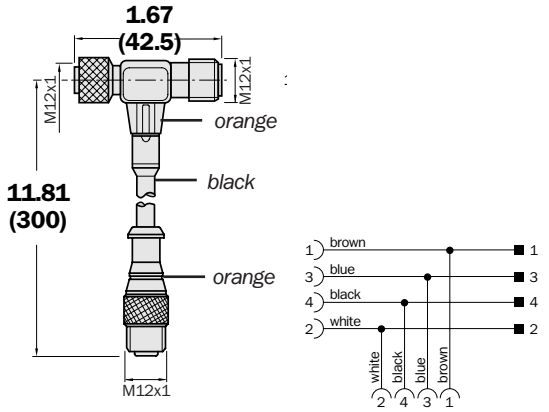
Connection Diagram



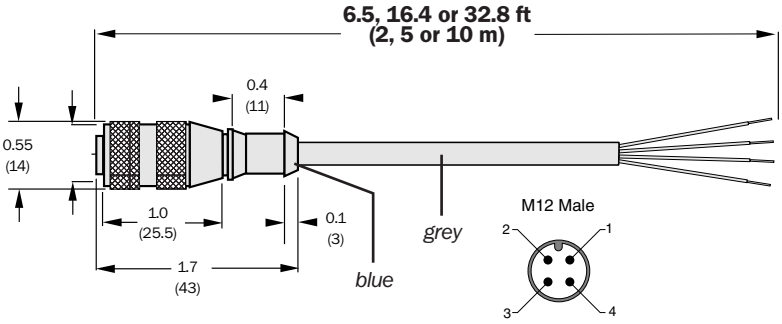
Cables

Power and Interconnect Cables		
Model Number	**Part Number**	**Description**
JD4-TM12300A	6 011 682	T-cable type 1, M12 DC 4-pin
JD4-TM12300B	6 011 683	T-cable type 2, M12 DC 4-pin
KD4-SIM122	7 020 020	2 m straight M12 DC 4-pin cable
KD4-SIM125	7 020 678	5 m straight M12 DC 4-pin cable
KD4-SIM1210	7 020 080	10 m straight M12 DC 4-pin cable
KD4-RIM122	7 020 023	2 m right angle M12 DC 4-pin cable
KD4-RIM125	7 020 679	5 m right angle M12 DC 4-pin cable
KD4-RIM1210	7 021 244	10 m right angle M12 DC 4-pin cable
ZPI-P1	7 027 723	Power isolator
ZSI-P4	7 027 187	Slug terminator
ZGC-1	7 027 804	Gender changer - male/male
ZGC-2	7 028 421	Gender changer - female/female
KA14-SEM121	7 027 083	1 m straight M12 reverse-key AC 4-pin cable
KA14-SEM122	7 027 086	2 m straight M12 reverse-key AC 4-pin cable
ZLM-Kit 1	7 028 451	Kit, 1/4” plug and clip
Plug-1/4"	7 028 457	1/4” plug
Plug 3/8"	7 028 425	3/8” plug

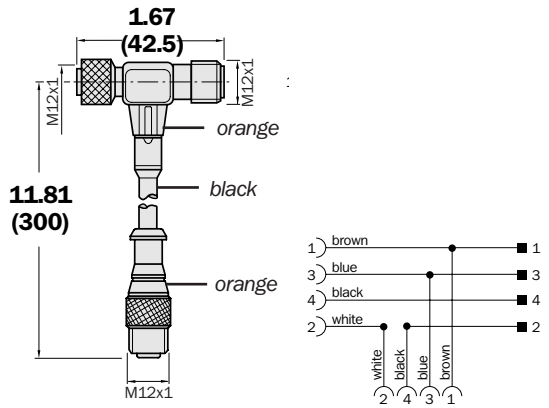
T-cable type 1, M12 DC 4-pin



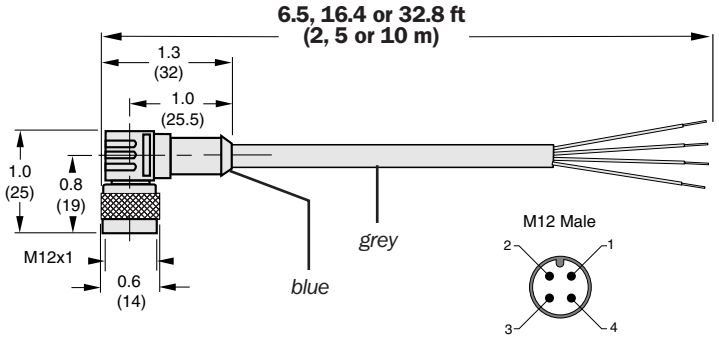
2 m, 5 m, 10 m straight M12 DC 4-pin cable



T-cable type 2, M12 DC 4-pin



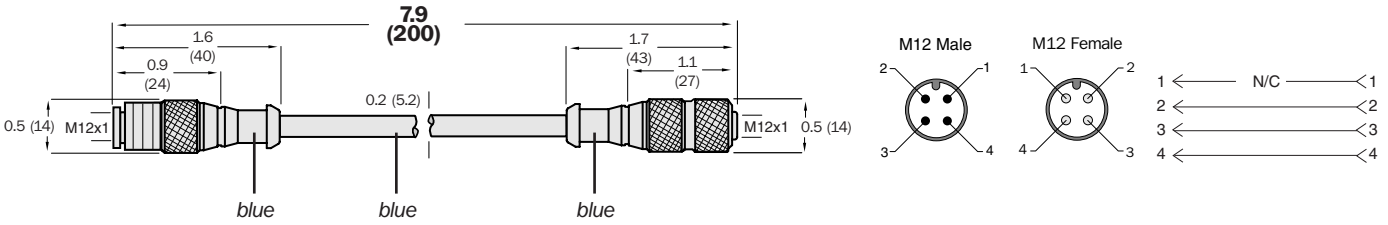
2 m, 5 m, 10 m right angle M12 DC 4-pin cable



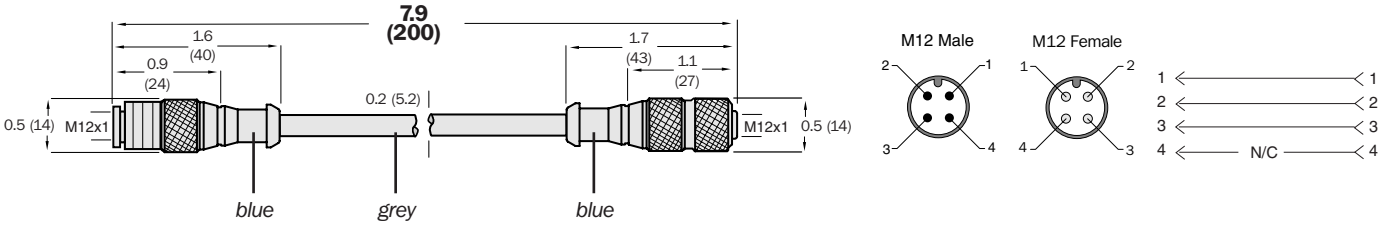
dimensions in inches (mm)

Cables

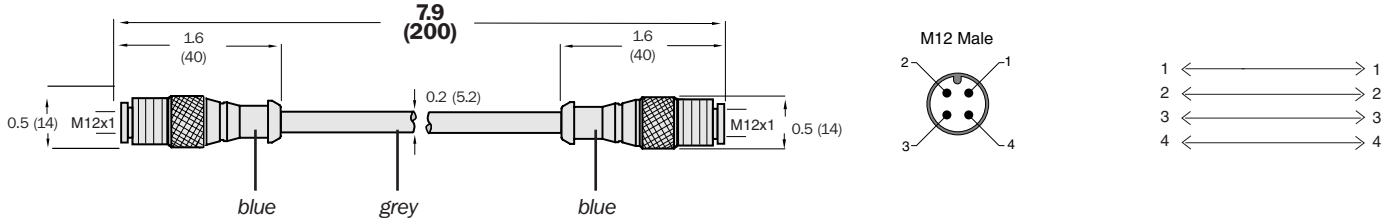
Power isolator



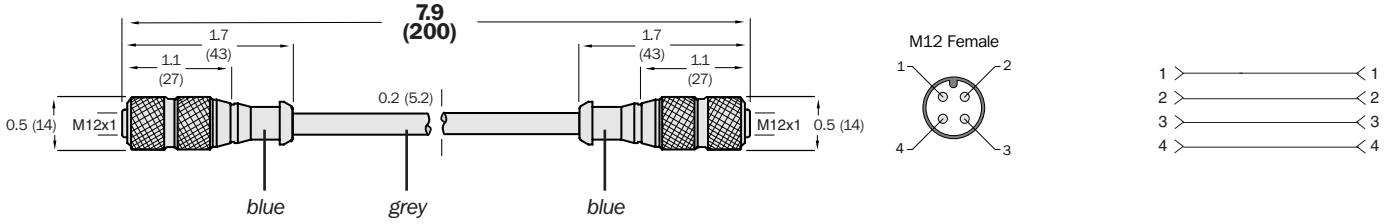
Slug terminator



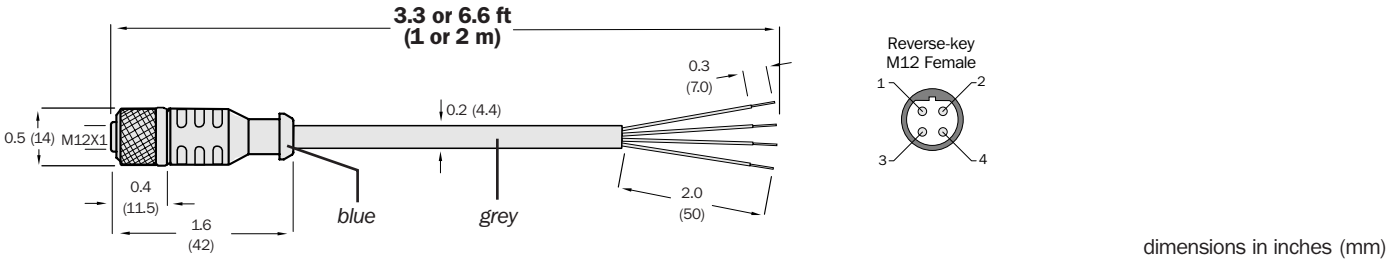
Gender changer - male/male



Gender changer - female/female



1 m, 2 m, straight M12 reverse-key AC 4-pin cable



dimensions in inches (mm)

Theory of Operation...Light Grid Sensors

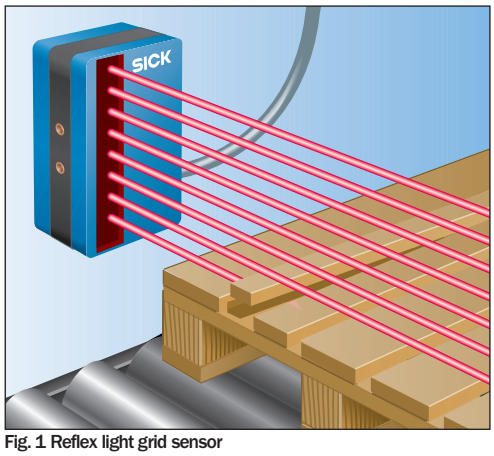


Fig. 1 Reflex light grid sensor

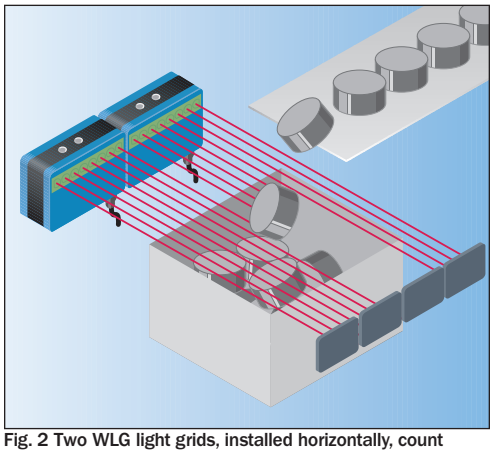


Fig. 2 Two WLG light grids, installed horizontally, count objects before packaging.

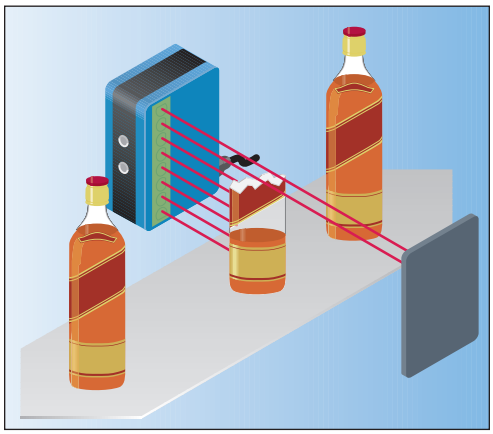


Fig. 3 WLG detects transparent objects and also reliably detects defective containers.

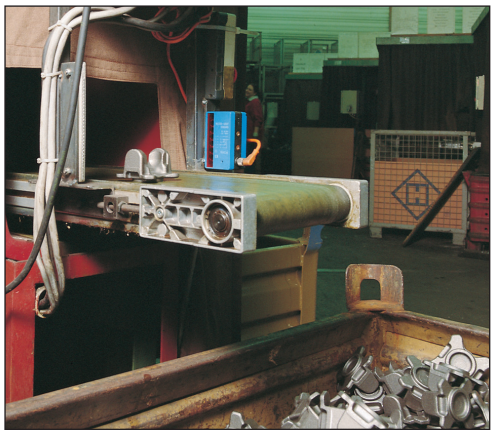


Fig. 4 Counts irregularly shaped objects during production

About Light Grid Sensors

Light grid photoelectric sensors are a small, non-safety version of our famous light curtains.

WLG Light Grid Sensor

The WLG light grids function according to the reflection principle. A suitable reflector, mounted directly across from the sensor's exit window, reflects the emitted light back to the receiver of the sensor. This produces a two-dimensional detection plane between the sensor and reflector. When the detection plane is broken, the sensor produces an output.

The WLG light grid sensor is specifically designed for use in parts ejection applications or any processes where product-positioning variations occur. They can also be used to detect objects, determine the height or length of objects or detect irregularly shaped objects.

MLG Light Grid Sensor

THe MLG light grid is designed to meet a variety of application requirements. It offers a host of possibilities with regard to size, resolution, configuration and interfaces. The electronics are completely integrated into the compact housing. Height measurement, zone division and monitoring, object recognition, hole and crack detection, slack control and blanking control are all tasks suitable for the MLG. In addition, the multiple scan function makes it possible to detect large and small objects.

High modularity and integrated standard measuring function are distinctive features of the MLG. The following features are available:

- various beam spacings of 10, 20, 30 or 50 mm
- detection heights between 100 mm and 3140 mm
- light grid separation of 0 to 5 m or 0 to 8.5 m
- two different mounting styles

Discrete inputs, outputs and serial data offer a wide range of interface combinations. Important parameters, such as the size of objects to be detected can be defined using the user-friendly software, MLG Setup. The MLG Setup application assistant helps setup the most common applications.

Type code Light Grid MLG

MLG with cable synchronization

Example to order a pair of MLG

MLG 1 - 0290 F 5 1 1

MLG Type
MLG = Modular light Grid (pair)
MLG S = Emitter (only)
MLG E = Receiver (only)

Beam Spacing
1 = 10 mm
2 = 20 mm
3 = 30 mm
5 = 50 mm

Detection height in mm (& nb of beams) /

(beam spacing 10 mm)	*(beam spacing 20 mm)*	*(beam spacing 30 mm)*	*(beam spacing 50mm)*
0140 = 140 *15 beams*	0140 = 140 *8 beams*	0120 = 120 *5 beams*	0100 = 100 *3 beams*
0290 = 290 *30 beams*	0280 = 280 *15 beams*	0270 = 270 *10 beams*	0250 = 250 *6 beams*
0440 = 440 *45 beams*	0440 = 440 *23 beams*	0420 = 420 *15 beams*	0400 = 400 *9 beams*
0590 = 590 *60 beams*	0580 = 580 *30 beams*	0570 = 570 *20 beams*	0550 = 550 *12 beams*
0740 = 740 *75 beams*	0740 = 740 *38 beams*	0720 = 720 *25 beams*	0700 = 700 *15 beams*
0890 = 890 *90 beams*	0880 = 880 *45 beams*	0870 = 870 *30 beams*	0850 = 850 *18 beams*
1040 = 1040 *105beams*	1040 = 1040 *53 beams*	1020 = 1020 *35 beams*	1000 = 1000 *21 beams*
1190 = 1190 *120beams*	1180 = 1180 *60 beams*	1170 = 1170 *40 beams*	1150 = 1150 *24 beams*
1340 = 1340 *135beams*	1340 = 1340 *68 beams*	1320 = 1320 *45 beams*	1300 = 1300 *27 beams*
1490 = 1490 *150beams*	1480 = 1480 *75 beams*	1470 = 1470 *50 beams*	1450 = 1450 *30 beams*
1640 = 1640 *165beams*	1640 = 1640 *83 beams*	1620 = 1620 *55 beams*	1600 = 1600 *33 beams*
1790 = 1790 *180beams*	1780 = 1780 *90beams*	1770 = 1770 *60beams*	1750 = 1750 *36beams*
1940 = 1940 *195beams*	1940 = 1940 *98beams*	1920 = 1920 *65beams*	1900 = 1900 *39beams*
2090 = 2090 *210beams*	2080 = 2080 *105beams*	2070 = 2070 *70beams*	2050 = 2050 *42beams*
2240 = 2240 *225beams*	2240 = 2240 *113beams*	2220 = 2220 *75beams*	2200 = 2200 *45beams*
2390 = 2390 *240beams*	2380 = 2380 *120beams*	2370 = 2370 *80beams*	2350 = 2350 *48beams*
	2540 = 2540 *128beams*	2520 = 2520 *85beams*	2500 = 2500 *51beams*
	2680 = 2680 *135beams*	2670 = 2670 *90beams*	2650 = 2650 *54beams*
	2840 = 2840 *143beams*	2820 = 2820 *95beams*	2800 = 2800 *57beams*
	2980 = 2980 *150beams*	2970 = 2970 *100beams*	2950 = 2950 *60beams*
	3140 = 3140 *158beams*	3120 = 3120 *105beams*	3100 = 3100 *63beams*

Interface (& Synchronization Mode)

F(2xx)	= 6 Outputs PNP, 2 Inputs	(cable synch 12 pins)
F(5xx)	= 1x Output PNP	(cable synch 5 pins)
F(8xx)	= 3 Outputs PNP, 1 Input	(cable synch 8 pins)
I(2xx)	= RS485, 4 Outputs PNP, 2 Inputs	(cable synch 12 pins)
I(8xx)	= RS485, 1 Output PNP, 1 Input	(cable synch 8 pins)
E(2xx)	= 6 Outputs NPN, 2 Inputs	(cable synch 12 pins)
E(5xx)	= 1x Output NPN	(cable synch 5 pins)
E(8xx)	= 3 Outputs NPN, 1 Input	(cable synch 8 pins)
J(2xx)	= RS485, 4 Outputs NPN, 2 Inputs	(cable synch 12 pins)
J(8xx)	= RS485, 1 Output NPN, 1 Input	(cable synch 8 pins)

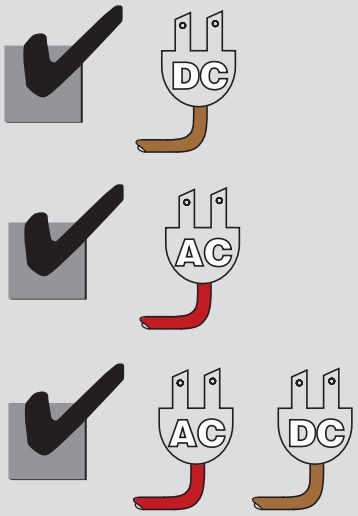
Connection
2 = Terminal chamber, 12 pins
5 = M12 plug, 5 pins
8 = M12 plug, 8 pins

Optical features
1 = 5m; Infrared light
2 = 8.5m; Infrared light

Parameter Mode
1 = Standard parameterization
2 = Programmable (with MLGsetup)/
3 = Factory customized

Light Grid Sensors

Light Grid Sensors



WLG 12

Light Grid Sensors

0...5 ft (0...1.5 m)
sensing range

CE

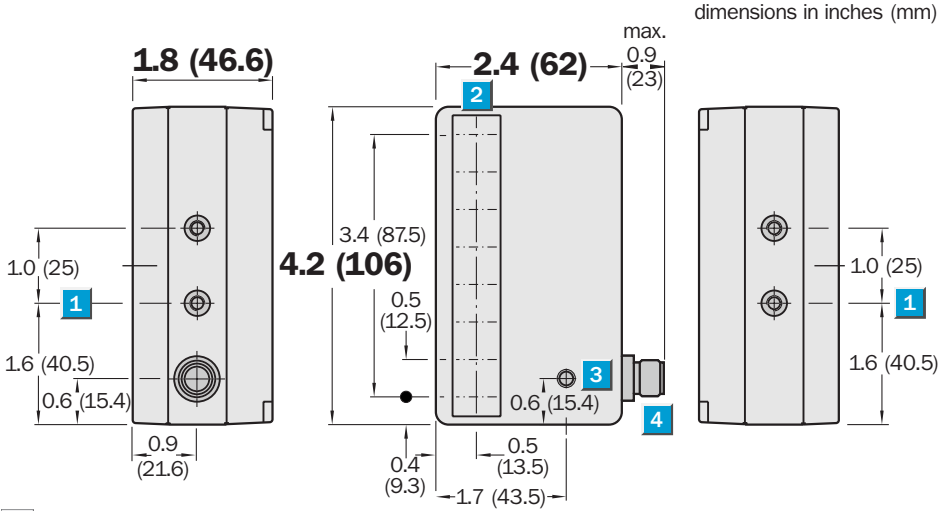
Highlights

- Rugged plastic housing
- Teach-in for easy sensitivity setting and blanking
- Can detect objects as small as 6 mm in diameter
- Alarm output
- Eight light senders to cover a wide range
- Polarizing filters prevent false readings on shiny objects

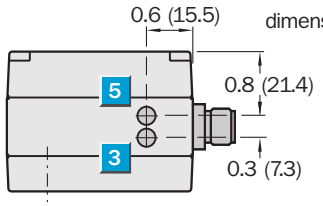
WLG 12

Dimensional Drawing

dimensions in inches (mm)



1 M5 threaded mounting hole, 6 mm deep
2 Optics
3 Multi-function indicators at front and top: output indicator, contamination indicator, teach-in error
4 M12 plug or 2 m cable
5 Power indicator
6 Potentiometer for sensitivity adjustment



dimensions in inches (mm)

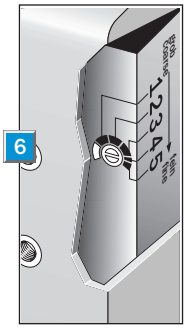
Teaching

The WLG 12-G137, -V537 and -P537 are equipped with a non-volatile memory. A teach-in should be done when the unit is first set up. This setting will be remembered even if power is removed.

.

Notes

The sensitivity range should be selected in a voltage-free condition. In the event of temperature fluctuations > 15 °C, adjustment or contamination, a new teach-in process must be done. The switching threshold that has been taught is maintained on loss of voltage.



Sensitivity Setting			
Potentiometer Setting	**Resolution**	**Sensing Range**	**Reflector**
1	> 12.5 mm	1.5 m	2 x PL 80 A/PL 40 A
2	> 10 mm	1.2 m	2 x PL 80 A/PL 40 A
3	> 9 mm	1.0 m	PL 180 E01
4	> 7 mm	0.8 m	PL 180 E01
5	> 6 mm	0.4 m	PL 180 E01

For metric to English conversions see page 1012

Order Information	
Type	**Part no.**
WLG 12-G 137	1 016 046
WLG 12-V 537	1 016 045
WLG 12-P 537	1 015 798

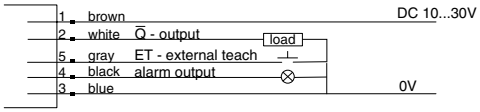
Accessories	page
Cables and connectors	909
Mounting brackets	927
Reflectors	936

Technical Data	WLG 12-	G137	V537	P537
Sensing range, on reflector	5 ft (1.5 m)/to 2 x PL 40 A or 2 x PL 80 A	■	■	■
Light source[1]**, light type**	Red light, pulsed	■	■	■
Resolution, adjustable	0.2...0.5 in (6…12.5 mm)	■	■	■
	(see table of settings)			
Light spot diameter	0.4 in (10 mm)	■	■	■
Distance to optic axis	0.5 in (12.5 mm)	■	■	■
Divergence of adjacent channels	Approx. 0.2 °	■	■	■
Angle of divergence	Approx. 0.4 °	■	■	■
Supply voltage V_S	18…30 V DC [2]	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■
Current consumption[4]	Approx. 80 mA	■	■	■
Switching outputs	PNP, 8 x $\overline{Q}$ and alarm	■		
	PNP, $\overline{Q}$ and alarm		■	
	PNP, $\overline{Q}$ and Q			■
Output current I_A max.	Total 100 mA + 100 mA for alarm	■		
	100 mA per output		■	■
Output voltage HIGH	V_S – (≤ 2 V, at I max.)	■	■	■
Output voltage LOW	0 V	■	■	■
Response time[5]	0.6 ms	■	■	■
Max. switching frequency[6]	850 Hz	■	■	■
Alarm output	Alarm is activated acc. to teach-in procedure	■	■	
	if at least one of the light beams			
	is damped such that the required			
	level of functional safety is not achieved.			
Teach-in (TI)		■	■	■
Teach-in minimum time	Approx. 10 ms	■	■	■
Teach-in activation time	Approx. 200 ms	■	■	■
Connection type	2 m, 12-wire cable[7]	■		
	Plug, M12 5-pin		■	■
VDE protection class[8]	⧈	■	■	■
Circuit protection[9]	A, B, C	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■
	Storage -13...167°F (-25...75°C)	■	■	■
Approximate weight	8.1 oz (230 g)	■	■	■
Polarization filter		■	■	■
Housing material	Fiberglass reinforced plastic	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

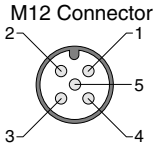
Connection Diagram

WLG 12-V537

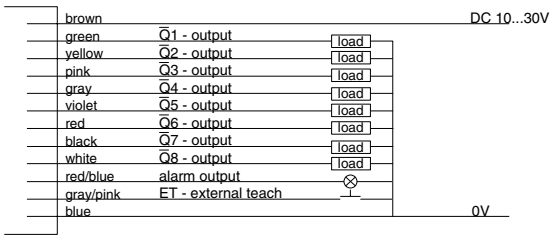


wire colors refer to standard cable, not included with WLG 12-V537
*This is Q-output on P537

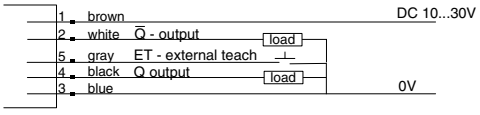
M12 Connector



WLG 12-G137



WLG 12-P537



wire colors refer to standard cable, not included with WLG 12-V537
*This is Q-output on P537

SICK

MLG Standard

Light Grid Sensors

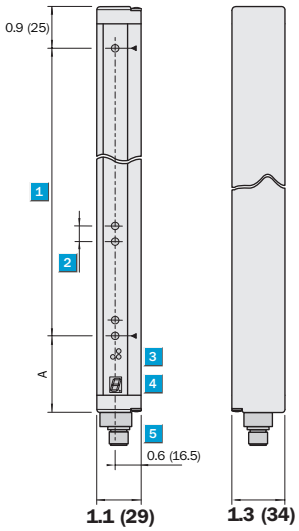
0...16.4 ft (0...5 m)
0...27.9 ft (0...8.5 m)
sensing range

Highlights

- High modularity: beam spacing, detection height, scanning range, interface
- Compact housing
- Short response time
- Teach-in for optimal sensitivity adjustment

MLG

Dimensional Drawing



dimensions in inches (mm)

Distance: MLG edge – first beam

Dimensions (mm)	A
Beam spacing 10 mm	49
Beam spacing 20 mm	59
Beam spacing 30 mm	69
Beam spacing 50 mm	89

1 Detection height (see optical performance)
2 Beam spacing (10, 20, 30, 50 mm)
3 Status indicator: LED green/LED yellow/LED red
4 Indicator panel, 7-segment display
5 M12 plug, 8-pin/M12 plug, 5-pin

Optical Performance

	Detection Height			Minimum Detectable Object (MDO)	
	Minimum	**Increment**	**Maximum**	**Beam Spacing**	**MDO** [9]
MLG 1:	140 mm	150 mm	2390 mm	10 mm	15[10]/20[11] mm
MLG 2:	140 mm	140 mm, 160 mm	3140 mm	20 mm	25[10]/30[11] mm
MLG 3:	120 mm	150 mm	3120 mm	30 mm	35[10]/40[11] mm
MLG 5:	100 mm	150 mm	3100 mm	50 mm	55[10]/60[11] mm

9) MDO for non-moving objects measured in a direction parallel to the MLG
10) Scanning range: 5 m
11) Scanning range: 8.5 m

Order Information

See selection guide on page 497 and check www.sickusa.com for product availability.

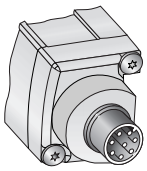
Accessories	page
Cables and connectors	909, 910
Mounting brackets	929
Alignment aid	952

Technical Data	MLG-	x-xxxx x8x1	x-xxxx x5x1							
Beam spacing[1]	0.4 in (10 mm)/0.8 in (20 mm)/1.2 in (30 mm)/2 in (50 mm)	■	■							
Maximum number of beams	240 beams	■	■							
Sensing range	0...16.4 ft (0...5 m) (max. 7 m) / 0...39.4 ft (0...8.5 m) (max. 12 m)	■	■							
Synchronization[2]	By cable sync A/sync B	■	■							
Light source	LED, infrared light	■	■							
Supply voltage V_S[3]	15…30 V DC	■	■							
Current consumption sender	< 140 mA + 2 mA/beam	■	■							
Current consumption receiver[4]	< 100 mA + 3 mA/beam	■	■							
Connections	M12 plug, 8-pin	■								
	M12 plug, 5-pin		■							
Teach-in (ET)	PNP: Teach > 10 V...< V_S	■								
Teach-in (ET)	External Teach-in input	■								
	Automatic by each Power on		■							
Output current I_A max.	100 mA per output	■	■							
Output load	Capacitive load: 100 nF/output	■	■							
	Inductive load: 1H/output	■	■							
Outputs/Operating mode	Q dark-switching	■	■							
	$\overline{Q}$ light-switching	■								
Alarm output (contamination)		■								
Response time[5]	Max. 3x (50 µs per beam + 2 ms)[6]	■	■							
Immunity to ambient light	50,000 lx (continuous light)	■	■							
VDE protection class	III	■	■							
Circuit protection[7]	A, B, C	■	■							
Enclosure rating	IP 65	■	■							
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■							
	Storage -40...158°F (-40...70°C)	■	■							
Mechanical resistance	Vibration: 5 g/10-55/s – IEC 68-2-6	■	■							
	Shock: 10 g/ 10 ms – IMC 68-2-29	■	■							
Approximate weight	52.2 oz (1480 g)[8]	■	■							
Material	Housing: Alu., anodized; optics: PMMA	■	■							

1) Further beam spacing possible
2) Sender (MLG S) and receiver (MLG E)
3) Limit values
4) Without load at V_S = 24 V
5) With resistive load
6) Depends on selected basic function
7) A = V_S connection, reverse polarity protected
   B = Outputs short-circuit protected
   C = Interference pulse suppression
8) For 1200 mm detection height, increment 160 g per 150 mm detection height

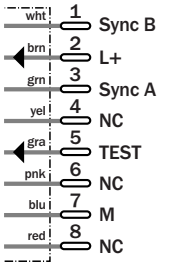
Connection Diagram

MLG x-xxxxx8x1

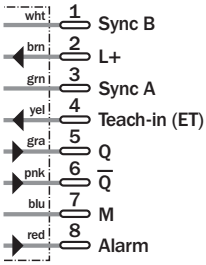


8-pin, M12

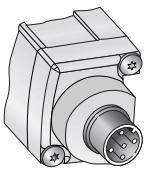
Sender



Receiver

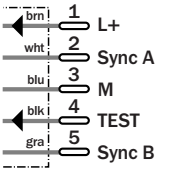


MLG x-xxxxx5x1

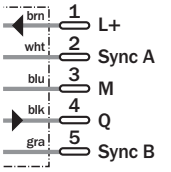


5-pin, M12

Sender



Receiver



SICK

MLG Programmable

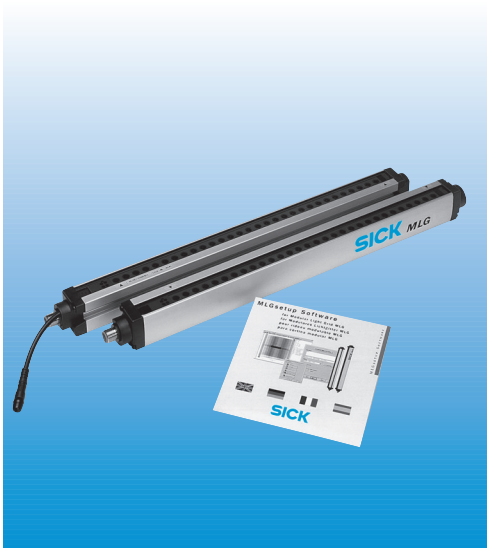
Light Grid Sensors

0...16.4 ft (0...5 m)
0...27.9 ft (0...8.5 m)
sensing range

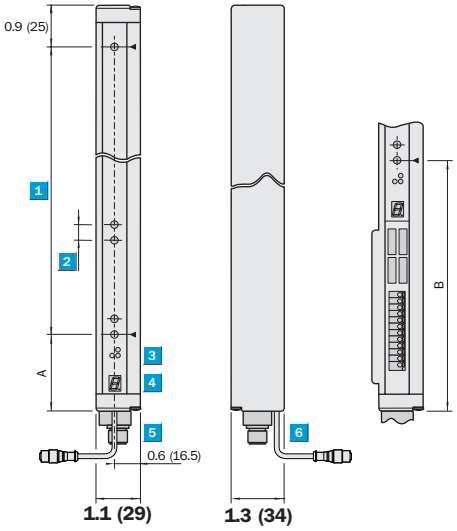
Highlights

- High modularity: beam spacing, detection height, scanning range and interface
- Compact housing
- Short response time
- Teach-in for optimal sensitivity adjustment
- MLG setup software for visualization and parameterization (included)

MLG



Dimensional Drawing



dimensions in inches (mm)

Distance: MLG edge – first beam

Dimensions (mm)	A	B
MLG 1 10 mm	49	160
MLG 2 20 mm	59	170
MLG 3 30 mm	69	180
MLG 5 50 mm	89	200

1 Detection height (see optical performance)
2 Beam spacing 10, 20, 30, 50 mm
3 Status indicator: LED green/LED yellow/LED red
4 Indicator panel, 7-segment display
5 PG 9/M12 plug, 8-pin
6 Programming cable M8 plug, 4-pin

Optical Performance

	Detection Height			Minimum Detectable Object (MDO)		
	Minimum	Increment	Maximum	Beam Spacing	MDO[14]	MDO[14] with Multiple Scan[15]
MLG 1:	140 mm	150 mm	2390 mm	10 mm	15[16]/20[17] mm	< 10[16]/< 15[17] mm
MLG 2:	140 mm	140 mm, 160 mm	3140 mm	20 mm	25[16]/30[17] mm	< 15[16]/< 20[17] mm
MLG 3:	120 mm	150 mm	3120 mm	30 mm	35[16]/40[17] mm	< 20[16]/< 25[17] mm
MLG 5:	100 mm	150 mm	3100 mm	50 mm	55[16]/60[17] mm	< 30[16]/< 35[17] mm

14) MDO for non-moving objects measured in a direction parallel to the MLG
15) Multiple scan MDO sizes are determined at the mid point between the sender and receiver. Scanning range: Multiple scan usage will reduce scanning range and prolong response time.
16) Scanning range: 5 m
17) Scanning range: 8.5 m

Order Information

See selection guide on page 497
and check www.sickusa.com for product availability.

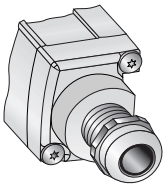
Accessories	page
Connectors	909, 910
Mounting systems	929
Analog converter	952
Parametering cable	952

Technical Data	MLG-	[1]								
Maximum number of beams	240 beams									
Scanning range	0...16.4 ft (0...5 m)/0...27.9 ft (0...8.5 m)									
Synchronization mode[2]	Synchronized by cable sync A/sync B									
Supply voltage V_S[3]	15...30 V DC									
Current consumption sender	< 140 mA + 2 mA/beam									
Current consumption receiver [4]	< 100 mA + 3 mA/beam									
Teach-in (ET)	PNP: Teach > 10...< V_S									
Teach-in (ET)	External teach-in input									
Output current I_A max.	100 mA per output[5]									
Output load	Capacitive load: 100 nF/output									
	Inductive load: 1H/output									
Operating mode outputs	Configurable with MLG setup									
Response time[6]	Max. 3x (50 µs per beam + 2 ms)[7]									
Alarm output (contamination)	Configurable with MLG setup[8]									
Data interface	RS 485[9]									
Configuration plug[10]	4-pin, M8 plug, RS 232: 9.6 kBaud fix[11]									
Immunity to ambient light	50,000 lx (continuous light)									
VDE protection class	III									
Circuit protection[12]	A, B, C									
Enclosure rating	IP 65									
Ambient temperature T_A	Operation -13...131°F (-25...55°C)									
	Storage -40...158°F (-40...70°C)									
Mechanical resistance	Vibration: 5 g/10-55/s – IEC 68-2-6									
	Shock: 10 g/10 ms – IMC 68-2-29									
Approximate weight (with PG 9)	52.2 oz (1480 g) [13]									
Material	Housing: Alu., anodized; optics: PMMA									

1) See selection table (page 497)
2) Sender (MLG S) and receiver (MLG E)
3) Limit values
4) Without load at $V_S = 24$ V
5) Max. $\sum = 550$ mA
6) With resistive load
7) Depends on selected basic function
8) Default setting on Q3
9) Baud Rate, reporting mode configurable per MLG setup
10) Plug built on receiver (MLG E)
11) Configurable with MLG setup
12) A = V_S connection, reverse polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
13) For 1200 mm detection height, increment 160 g per 150 mm detection height

Connection Diagram

MLG x-xxxxx2x2



PG 9, terminals

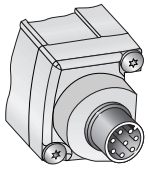
Sender

1	L+
2	M
3	Sync A
4	Sync B
5	TEST
6	NC
7	NC
8	NC
8	NC
10	NC
11	NC
12	NC

Receiver

1	L+
2	M
3	Sync A
4	Sync B
5	Teach-in (ET)
6	In-Sig. 2
7	Q_1
8	Q_2
8	Q_3
10	Q_4
11	Q_5/RS 485 A
12	Q_6/RS 485 B

MLG x-xxxxx8x2



8-pin, M12

Sender

wht	1	Sync B
brn	2	L+
grn	3	Sync A
yel	4	NC
gra	5	TEST
pnk	6	NC
blu	7	M
red	8	NC

Receiver

wht	1	Sync B
brn	2	L+
grn	3	Sync A
yel	4	Teach-in (ET)
gra	5	Q_1
pnk	6	Q_2/RS 485 A
blu	7	M
red	8	Q_3/RS 485 B

MLG Multiple Scan

Light Grid Sensors

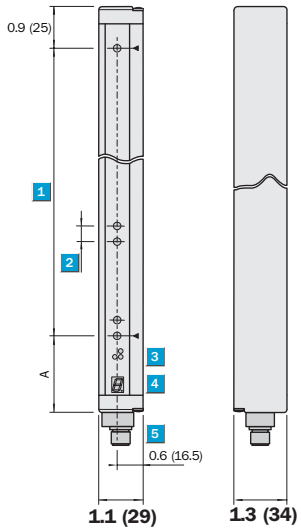
1.6...16.4 ft (0.5...5 m)
sensing range

Highlights

- Wide selection of detection heights
- Short response time
- Teach-in for optimal sensitivity adjustment

MLG

Dimensional Drawing



dimensions in inches (mm)

Distance: MLG edge – first beam	
Dimensions (mm)	A
Beam spacing 30 mm	69
Beam spacing 50 mm	89

1 Detection height (see optical performance)
2 Beam spacing 30 mm, 50 mm
3 Status indicator: LED green/LED yellow/LED red
4 Indicator panel, 7-segment display
5 M12 plug, 5-pin

Optical Performance

* additional types on request

	Detection Height (mm)			Minimum Detectable Object (MDO)		
	Min.	Inc.	Max.	Beam Spacing	MDO[7]	MDO[7] with Multiple Scan[8]
MLG 3:	120	150	3120	30 mm	35 mm	< 20 mm
MLG 5:	100	150	3100	50 mm	55 mm	< 30 mm

7) MDO for non-moving objects measured in a direction parallel to the MLG

8) Multiple scan MDO sizes are determined at the mid point between the sender and receiver

Order Information

Type	Part no.
MLG 5-0250F513	1 022 646
MLG 5-0550F513	1 022 647
MLG 5-0700F513	1 022 648
MLG 5-1000F513	1 022 649
MLG 5-1150F513	1 022 650
MLG 5-1450F513	1 022 642
MLG 5-1750F513	1 022 651
MLG 5-1900F513	1 022 652
MLG 5-2050F513	1 022 653
MLG 3-2220F513	1 022 870

* additional types on request
See selection guide on page 497 and check www.sickusa.com for product availability.

Accessories	page
Cables and connectors	909, 910
Mounting systems	929
Alignment aid	952

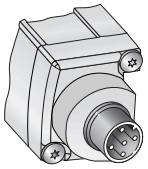
Technical Data		MLG-	5-0250 F513	5-0550 F513	5-0700 F513	5-1000 F513	5-1150 F513	5-1450 F513	5-1750 F513	5-1900 F513	5-2050 F513	3-2220 F513
Beam spacing[1]	2 in (50 mm)		■	■	■	■	■	■	■	■	■	
	1.2 in (30 mm)											■
Number of beams/												
Detection height	6 beams/9.8 in (250 mm)		■									
	12 beams/21.7 in (550 mm)			■								
	15 beams/27.6 in (700 mm)				■							
	21 beams/39.4 in (1000 mm)					■						
	24 beams/45.3 in (1150 mm)						■					
	30 beams/57.1 in (1450 mm)							■				
	36 beams/68.9 in (1750 mm)								■			
	39 beams/74.8 in (1900 mm)									■		
	42 beams/80.7 in (2050 mm)										■	
	75 beams/87.4 in (2220 mm)											■
Sensing range	1.6...16.4 ft (0.5...5 m)		■	■	■	■	■	■	■	■	■	■
Synchronization mode[2]	Synchronized by cable sync A/sync B		■	■	■	■	■	■	■	■	■	■
Light source	LED, infrared light		■	■	■	■	■	■	■	■	■	■
Supply voltage V_S[3]	15...30 V DC		■	■	■	■	■	■	■	■	■	■
Ripple	< 5 V_{PP} within V_S tolerances		■	■	■	■	■	■	■	■	■	■
Current consumption sender	< 140 mA + 2 mA/beam		■	■	■	■	■	■	■	■	■	■
Current consumption receiver[4]	< 100 mA + 3 mA/beam		■	■	■	■	■	■	■	■	■	■
Connection	M12 plug, 5-pin		■	■	■	■	■	■	■	■	■	■
Switching output	PNP, Q_1 dark switching		■	■	■	■	■	■	■	■	■	■
Teach-in (learn)	Automatic by each Power on		■	■	■	■	■	■	■	■	■	■
Output current I_A max.	100 mA		■	■	■	■	■	■	■	■	■	■
Output load	Capacitive load: 100 nF/output		■	■	■	■	■	■	■	■	■	■
	Inductive load: 1 H/output		■	■	■	■	■	■	■	■	■	■
Response time[5]	6...35 ms		■	■	■	■	■	■	■	■	■	■
Immunity to ambient light	50,000 lx (continuous light)		■	■	■	■	■	■	■	■	■	■
VDE protection class	III		■	■	■	■	■	■	■	■	■	■
Circuit protection[6]	A, B, C		■	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 65		■	■	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25...55°C)		■	■	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)		■	■	■	■	■	■	■	■	■	■
Mechanical resistance	Vibration: 5 g/10-55/s – IEC 68-2-6		■	■	■	■	■	■	■	■	■	■
	Shock: 10 g/10 ms – IMC 68-2-29		■	■	■	■	■	■	■	■	■	■
Approximate weight	20.4...81.1 oz (580 ... 2300 g)		■	■	■	■	■	■	■	■	■	■
Material	Housing: Alu., anodized; optics: PMMA		■	■	■	■	■	■	■	■	■	■

1) Further beam spacing possible
2) Sender (MLG S) and receiver (MLG E)
3) Limit values
4) Without load at V_S = 24 V
5) With resistive load

12) A = V_S connection, reverse polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Connection Diagram

MLG x-xxxxF513



5-pin, M12

Sender		Receiver	
brn	1 L+	brn	1 L+
wht	2 Sync A	wht	2 Sync A
blu	3 M	blu	3 M
blk	4 TEST	blk	4 Q
gra	5 Sync B	gra	5 Sync B

SICK

Theory of Operation...Fork Sensors

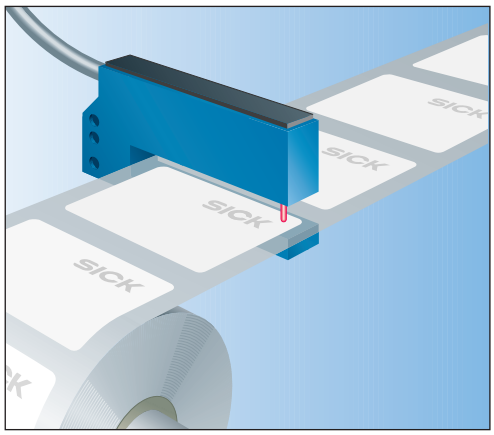


Fig. 1 Fork sensor

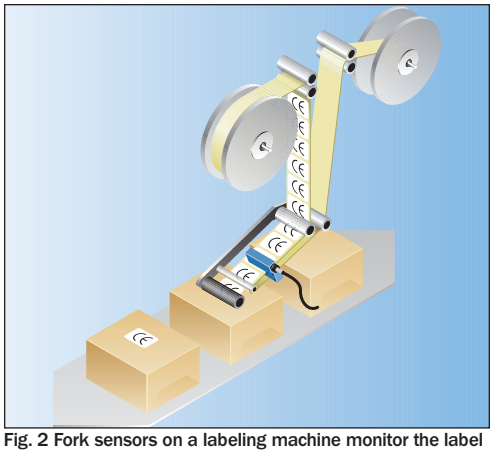


Fig. 2 Fork sensors on a labeling machine monitor the label strip to ensure that a label is attached to every package

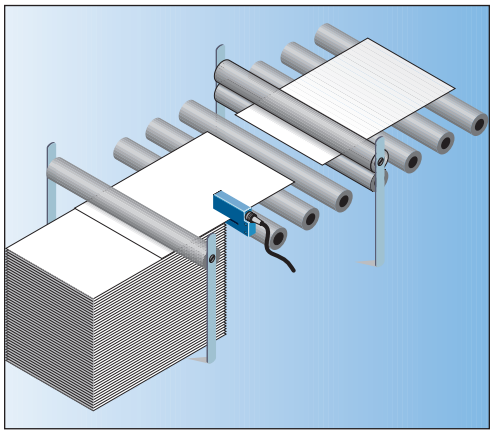


Fig. 3 The fork sensor detects double sheets of paper on conveyor belts carrying material to a paper cutter

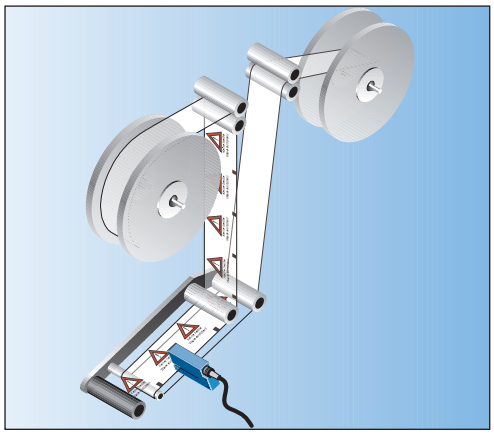


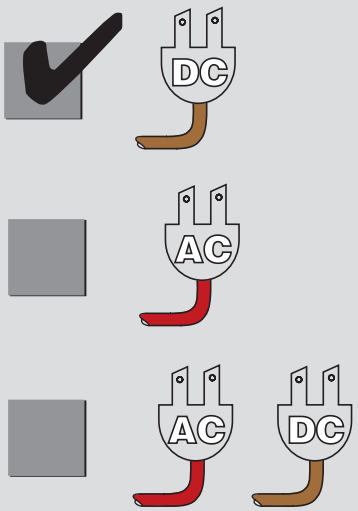
Fig. 4 Fork sensor detects registration marks

About Fork Sensors

Fork sensors, also called slot sensors, look different than any other sensor family SICK manufactures because the sender and receiver share a single housing. The distance between the sender and receiver is determined by the shape of the housing and is referred to as the fork width. The emitted light, in the form of a highly concentrated beam and the high detection accuracy means that the fork sensor can detect even minute differences in light attenuation.

Fork sensors excel in applications in the printing and paper industries. Fork sensors are also ideal for label detection because they can sense labels on thick backing and cellophane does not present a problem either. Fork sensor models include the WF series and WF T series.

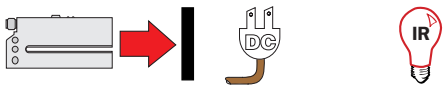
Fork Sensors



Sensors	Page
WF 3T/5T	510
WF	512

WF 3T/5T

Fork Sensors



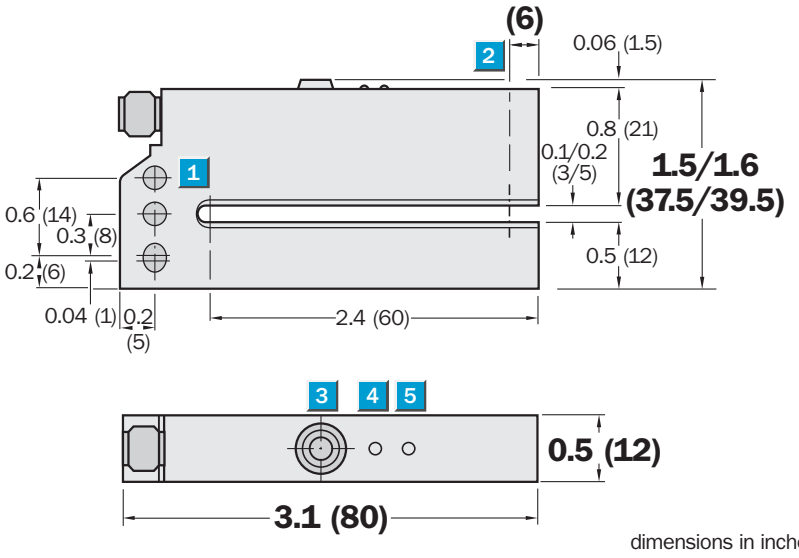
0.1 in (3 mm)/0.2 in (5 mm) sensing range/fork width

Highlights

- Rugged metal housing
- Push button teach for easy application setup
- "Standard" and "fine" modes using teach-in process
- Immune to ambient light
- PNP and NPN in the same switch
- Perfect for label detection and mark detection

WF 3T/5T

Dimensional Drawing



dimensions in inches (mm)

Teach-in Procedure

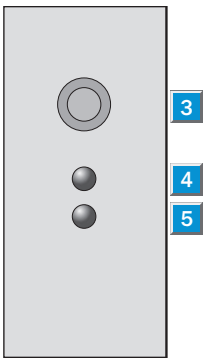
The switching threshold is set for this slot sensor by a simple teach-in procedure. This can be set via push button on the unit or the "ET" (External Teach) input line.

Procedure

1. Place the background material in the light spot.
2. For standard adjustments: push the teach button once (approx. 1..3 seconds); red LED flashes.
3. For fine adjustment with small switching hysteresis:
   a. push teach button (approx. 1..3 seconds)
   b. wait one second.
   c. push teach button (approx. 1..3 seconds); yellow LED flashes.

Adjustments

All types



1 Mounting holes, Ø 4.2 mm (3x)
2 Optical axis
3 Teach-in button
4 Teach indicator, LED red
5 Output indicator, LED yellow

Notes

- To lock teach function: push teach button for approx. 6 seconds, red LED lights.
- To release teach function: push teach button for approx. 6 seconds, red LED switches off.
- Teach-in value is stored in non-volatile memory.

Order Information

Type	Part no.
WF 3T-B4210	6 020 874
WF 5T-B4210	6 021 220

Accessories

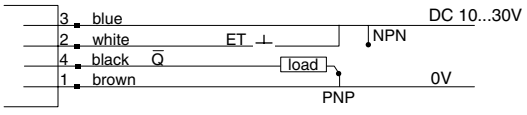
Accessories	page
Cables and connectors	908

Technical Data		WF- 3T-B4210	5T-B4210
Sensing range/fork width	0.1 in (3 mm)	■	
	0.2 in (5 mm)		■
Light source[1], **light type**	LED, infrared light, incandescent light	■	■
Supply voltage V_S[1]	10…30 V DC	■	■
Current consumption[2]	40 mA	■	■
Ripple[3]	< 10%, < 5 V_S	■	■
Switching outputs	PNP/NPN, light/dark switching	■	■
Signal voltage HIGH at I_A max.	V_S – (< 2 V) PNP, Q	■	■
Signal voltage LOW at I_A max.	Approx. 0 V PNP, Q	■	■
Output current I_A max.	100 mA	■	■
Response time[4]	50 µs	■	■
Max. switching frequency[5]	10 kHz	■	■
Teach-in through switch			
Teach-in with ET input	ET to V_S	■	■
Standard setting	1 pulse 1…4 s	■	■
Fine setting	1 pulse 1…4 s + pause 1…1.3 s + 1 pulse .3…4 s	■	■
Connection type	Plug, M8 4-pin	■	■
Ambient light safety	3,000 lux	■	■
VDE protection class[6]	□	■	■
Enclosure rating	IP 65/NEMA 4	■	■
Circuit protection[7]	B, C	■	■
Ambient temperature	Operation -4...140°F (-20…60°C)	■	■
	Storage -4...176°F (-20…80°C)	■	■
Approximate weight	2.1 oz (60 g)	■	■
Housing material	Aluminum	■	■

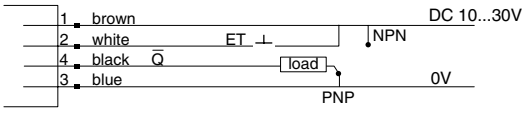
1) Limit values
2) Without load
3) May not exceed or fall short of V_S tolerances
4) Signal transit time with resistive load
5) With light/dark ratio 1:1; no time delay
6) Reference voltage 50 V DC
7) B = Outputs short-circuit protected
C = Interference pulse suppression

Connection Diagram

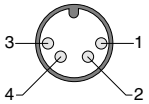
Dark Switching



Light Switching



M8 Connector



SICK

WF

Fork Sensors

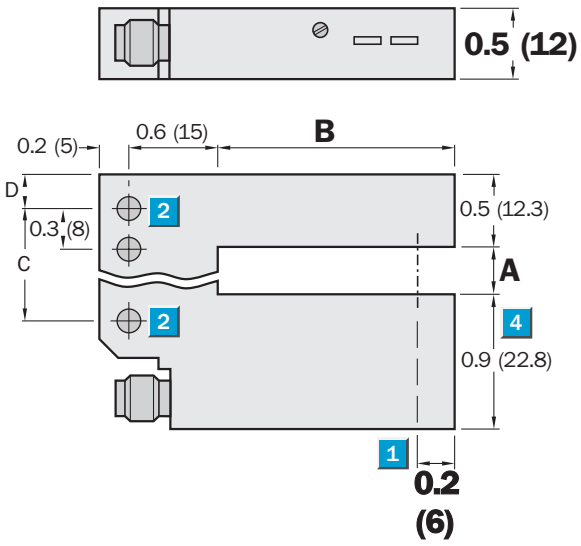
0.08...4.7 (2...120 mm)
sensing range/fork width

Highlights

- Perfect for label detection and mark detection
- PNP and NPN in the same switch
- Light or dark switching
- Rugged aluminum housing
- Sensitivity adjustment
- High switching frequency
- Immune to ambient light

WF

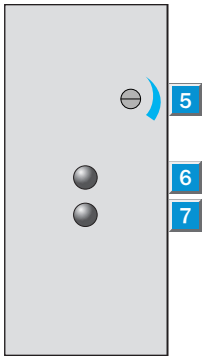
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Mounting holes, Ø 4.2 mm
2 Mounting holes, Ø 4.2 mm, not on WF 120
3 Optical axis
4 With WF-B 4210 = 25.8 mm
5 Sensitivity adjustment
6 Output indicator (red)
7 Power indicator (yellow)

Dimensions	A (mm)	B (mm)	C (mm)	D (mm)
	Fork width	**Fork depth**		
WF 2	**2**	40	14	6.25
WF 15	**15**	40	27	6.25
WF 30	**30**	40	42	6.25
WF 50	**50**	57	40	17.25
WF 80	**80**	57	70	17.25
WF 120	**120**	57	110	17.25

For metric to English conversions see page 1012

Order Information

Type	Part no.
WF 2-B4150	6 012 063
WF 15-B4150	6 012 064
WF 30-B4150	6 012 065
WF 50-B4150	6 012 066
WF 80-B4150	6 012 067
WF 120-B4150	6 012 068
WF 2-B4210	6 012 062

Accessories

	page
Cables and connectors	908

Technical Data		WF-	2-B4150	15-B4150	30-B4150	50-B4150	80-B4150	120-B4150	2-B4210		
Sensing range/fork width	0.1 in (2 mm)		■						■		
	0.6 in (15 mm)			■							
	1.2 in (30 mm)				■						
	2.0 in (50 mm)					■					
	3.2 in (80 mm)						■				
	4.7 in (120 mm)							■			
Light source	LED, infrared light, pulsed		■	■	■	■	■	■			
	LED, infrared light, continuous								■		
Supply voltage V_S[1]	10…30 V DC		■	■	■	■	■	■	■		
Current consumption2)	30 mA		■	■	■	■	■	■			
	40 mA								■		
Ripple[3]	< 10%		■	■	■	■	■	■	■		
Switching outputs	PNP/NPN, light/dark switching		■	■	■	■	■	■	■		
Signal voltage HIGH at I_A max.	V_S – (< 2 V) PNP, Q		■	■	■	■	■	■	■		
Signal voltage LOW at I_A max.	Approx. 0 V PNP, Q		■	■	■	■	■	■	■		
Output current I_A max.	100 mA		■	■	■	■	■	■	■		
Response time[4]	1 ms		■	■	■	■	■	■			
Max. switching frequency[5]	500 Hz		■	■	■	■	■	■			
Response time[4]	30 µs								■		
Max. switching frequency[5]	10 kHz								■		
Ambient light immunity	3,000 Lux		■	■	■	■	■	■	■		
Connection type	Plug, M8 4-pin		■	■	■	■	■	■	■		
VDE protection class	⏀		■	■	■	■	■	■	■		
Circuit protection[6]	B, C		■	■	■	■	■	■	■		
Enclosure rating	IP 65/NEMA 4		■	■	■	■	■	■	■		
Ambient temperature	Operation -4...140°F (-20…60°C)		■	■	■	■	■	■	■		
	Storage -4...176°F (-20…80°C)		■	■	■	■	■	■	■		
Approximate weight	1.3 to 4.1 oz (36 g to 116 g) depending		■	■	■	■	■	■	■		
	on fork width										
Housing material	Aluminum		■	■	■	■	■	■	■		

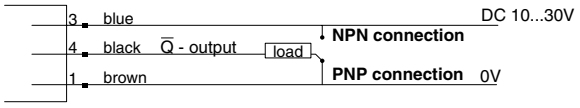
1) Limit values
2) Without load
3) May not exceed or fall short of V_S tolerances
4) Signal transit time with resistive load
5) With light/dark ratio 1:1; no time delay
6) B = Outputs short-circuit protected
C = Interference pulse suppression

Output Function

Switching type:	Light switching (Q)		Dark switching ($\bar{Q}$)	
Light path free	Yes	No	Yes	No
NPN output	LOW	HIGH	HIGH	LOW
PNP output	HIGH	LOW	LOW	HIGH

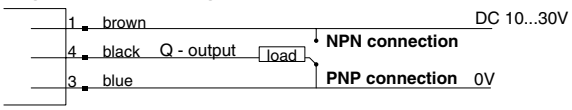
Connection Diagram

Dark Switching Mode



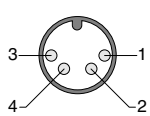
Wire colors refer to standard cable, not included

Light Switching Mode



Wire colors refer to standard cable, not included

M8 Connector



SICK

Theory of Operation...Fiber Optic Sensors

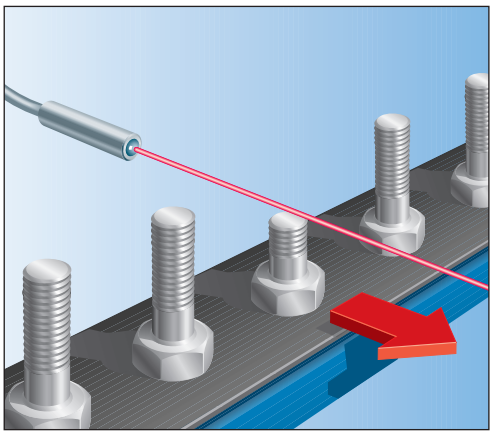


Fig. 1 Photoelectric sensor with a fiber optic cable

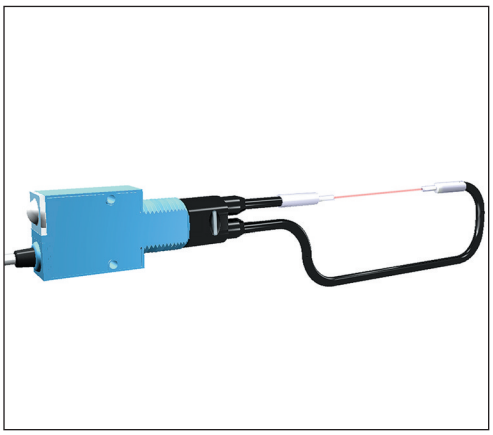


Fig. 2 Photoelectric fiber optic sensor

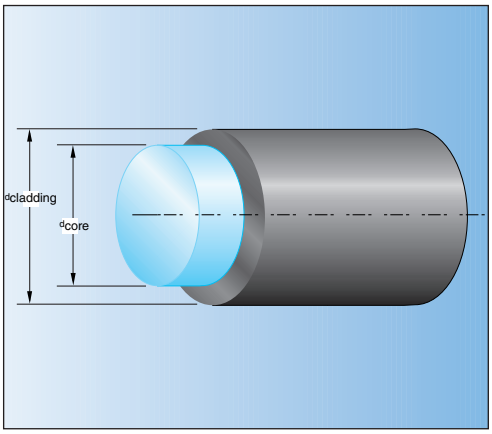


Fig. 3 Fiber optic cable cross-section

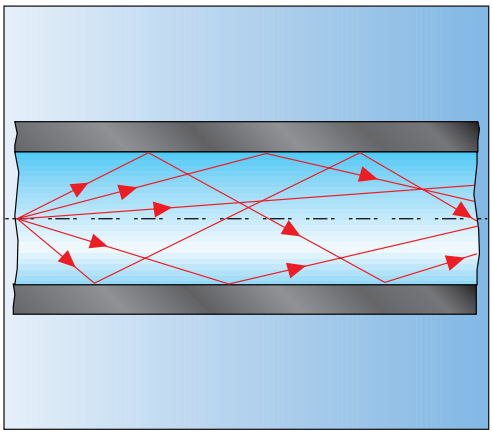
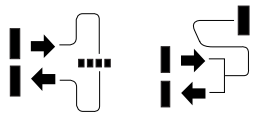


Fig. 4 Light propagation in a fiber optic cable



About Fiber Optic Sensors

Photoelectric fiber optic sensors (designated by an "LL," as in the WLL 1000), include the sender and receiver in the same housing. By using flexible plastic or glass fiber optic cables, the sensor can reach application areas that are inaccessible to standard photoelectric sensors. Fiber optic cables can be used in harsh environments that might be damaging to some photoelectric devices, for instance at temperatures as high as 300°C (572°F), or in areas with heavy vibration or corrosive substances.

Fiber optic cables consist of a high-refractive-index core with a low-refractive-index coating, also referred to as the "cladding". Propagation of light in the transparent core takes place on the principle of total reflection.

Light beams meeting the core/cladding boundary at an angle greater than the limiting angle of total reflection are reflected back into the core. They are therefore propagated to the other end of the fiber following a kind of zigzag path.

To allow fiber optic cables to be flexible on the one hand and still transmit large beam cross-sections, fiber optic cables often consist of bundles of individual fibers.

Fiber optic sensors are ideal in applications that require large sensing arranges, simple handling and system flexibility. Fiber optic sensors can be used for general detection tasks as well as complicated applications, such as the detection of minute objects, parts with background interference and color markers and transparent objects. Fiber optic sensors are widely used in the semi conductor industry, electronic component assembly and packaging industry as well as in the construction of special purpose machines and precision engineering.

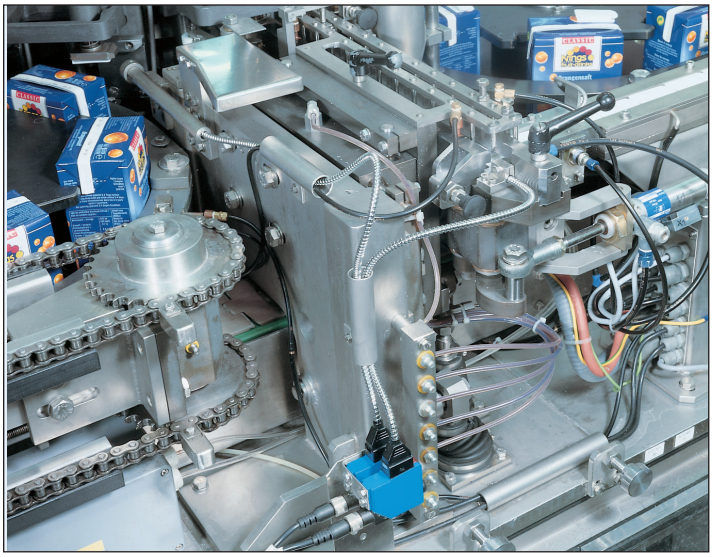


Fig. 5 Object detection using fiber optic cables; checks presence of spout on containers

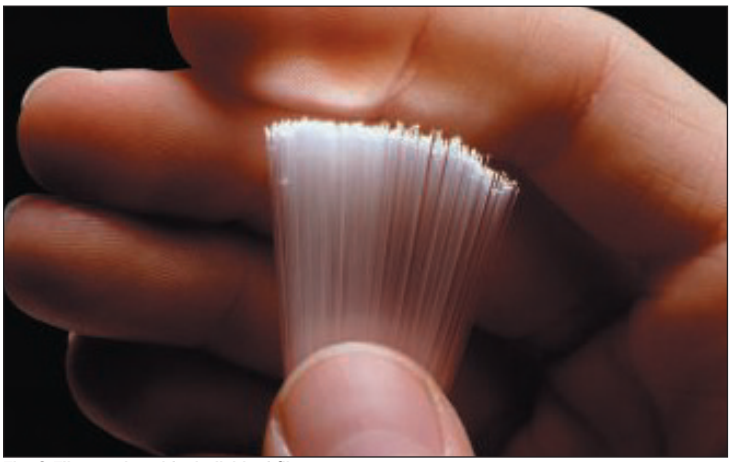


Fig. 6 Fiber optic cable, individual fibers

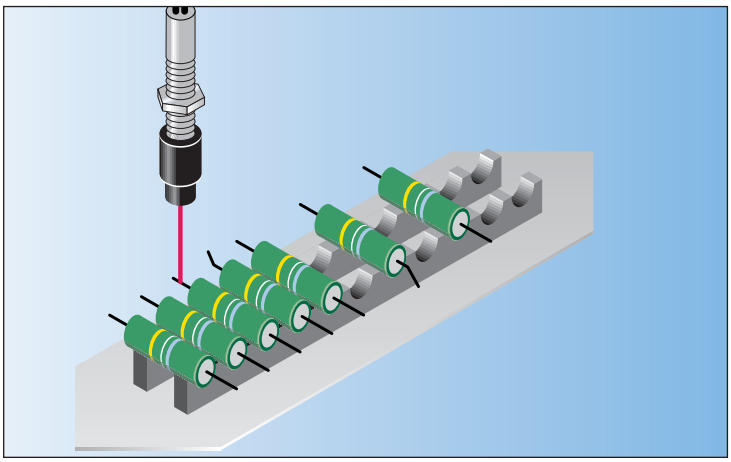


Fig. 7 Detection of thin wires in resistor production

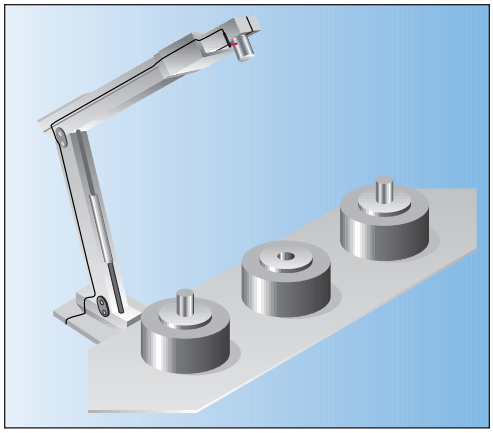


Fig. 8 Monitors presence or position of minute objects

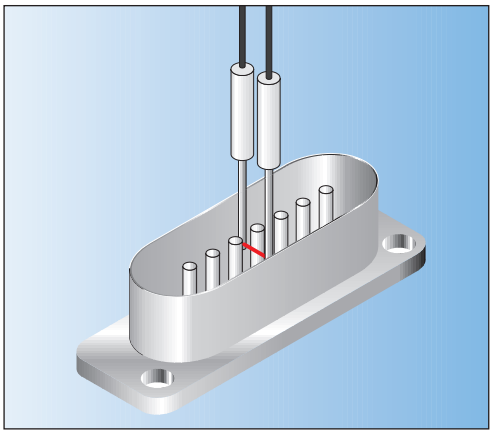


Fig. 9 Detects contact pins in areas where space is restricted

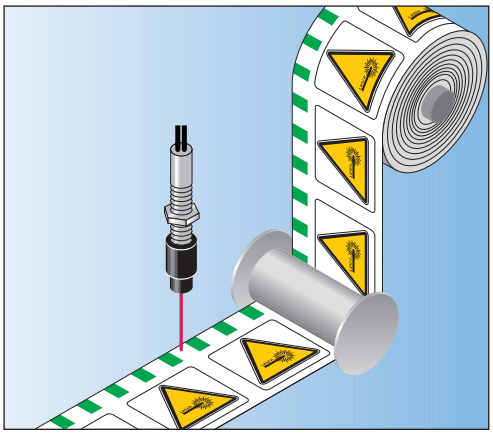


Fig. 10 Detects print marks on labeling machines

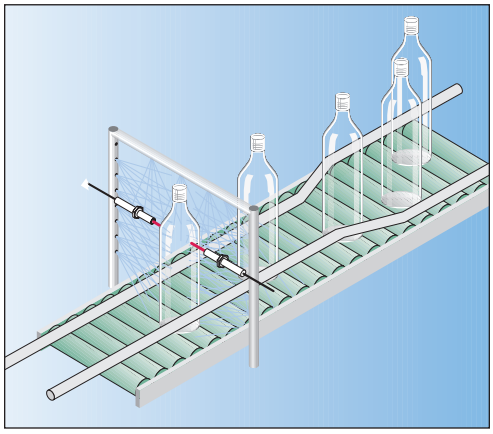
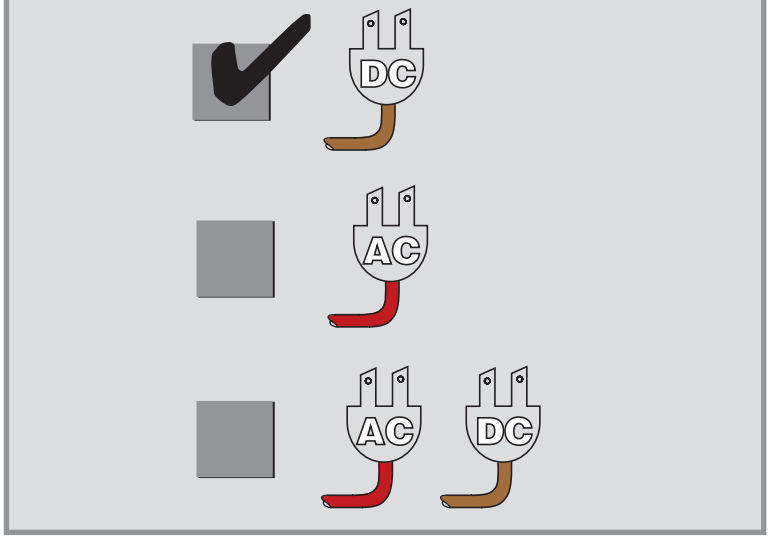


Fig. 11 Verification in harsh environments

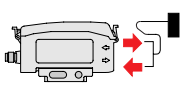
Fiber Optic Sensors

Fiber Optic Sensors



WLL 170

Fiber Optic Sensors



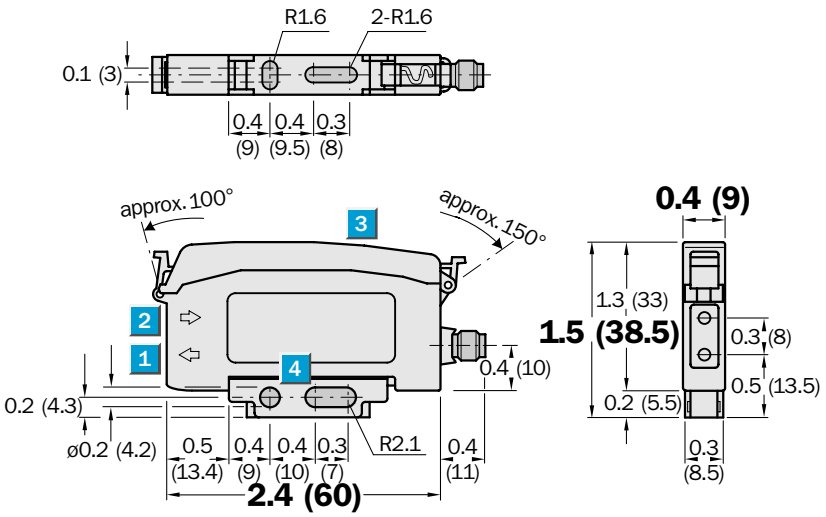

dependent on fiber
sensing range

Highlights

- Rugged plastic housing
- Manual sensitivity adjustment
- Simple installation and alignment
- Super slim housing, only 9 mm thick
- Signal strength indicator
- Glass or plastic fibers available with many tip configurations

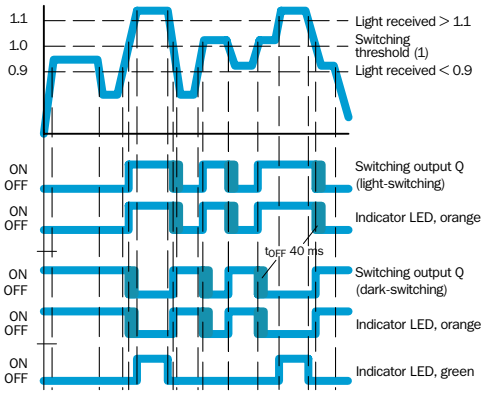
WLL 170

Dimensional Drawing



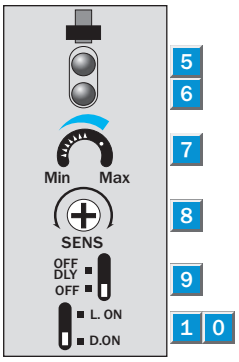
dimensions in inches (mm)

LED Function Diagram



Adjustments

All types



1 Sender LED
2 Receiver
3 Protective hood: can be raised at both ends, removable
4 Mounting bracket, included (see Accessories)
5 Output indicator, (orange)
6 LED signal strength indicator, (green)
7 Sensitivity scale
8 Sensitivity control (7 revolutions)
9 OFF delay switch
10 Light/dark switch

WLL 170

Orange LED:
Lights up when switching output Q is active (depending on setting of light/dark selector switch).

Green LED:
Lights up when light received > 1.1 (based on the switching threshold Q, switching threshold = 1).

Order Information

Type	Part no.
WLL 170-P132	6 011 716
WLL 170-P430	6 011 718
WLL 170-N132	6 011 719
WLL 170-N430	6 011 721
WLL 170-N330	6 021 959
WLL 170-P430	6 021 958

Accessories	page
Cables and connectors	908
Mounting brackets*	921
Fiber optic cables	982, 984

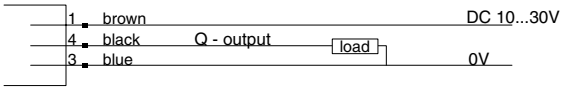
* included with delivery

Technical Data	WLL 170-	P132	P430	N132	N430	P330	N330
Sensing range	Depends on fiber optic cable used, see page 982, 984	■	■	■	■	■	■
Typical range (through beam)	0...18.1 in (0…460 mm)	■	■	■	■	■	■
	[with tip adapters 0...98.4 in (0…2500 mm)]	■	■	■	■	■	■
Typical range (proximity)	0...3.5 in (0…90 mm)[1]	■	■	■	■	■	■
Sensitivity adjustment	Potentiometer, 7 turns[2]	■	■	■	■	■	■
Light source[3], light type	LED, visible red light	■	■	■	■	■	■
Light spot diameter of LL 3	Depends on sensing range	■	■	■	■	■	■
Divergence angle of LL 3 fiber optic	Approx. 65°[4]	■	■	■	■	■	■
Supply voltage V_S[5]	10…30 V DC	■	■	■	■	■	■
Ripple[6]	10 %	■	■	■	■	■	■
Current consumption[7]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP: open collector: Q	■	■			■	
	NPN: open collector: Q			■	■		■
Output current I_A max.	100 mA	■	■	■	■	■	■
Operation mode	Light/dark switching[8]	■	■	■	■	■	■
Response time[9]	≤ 0.35 ms	■	■	■	■	■	■
Max. switching frequency[10]	1.4 kHz	■	■	■	■	■	■
Time delay T_{OFF} (OFF-delay)	40 ms fixed, selectable via switch	■	■	■	■	■	■
Connection types	Cable[11], PVC, 2 m; 3 x 0.2 mm², Ø 4.0 mm	■		■			
	Plug, M8 4-pin		■		■		
	Plug, M8 3-pin					■	■
Circuit protection[12]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 50/NEMA 4	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■		■			
	0.7 oz (20 g)		■		■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

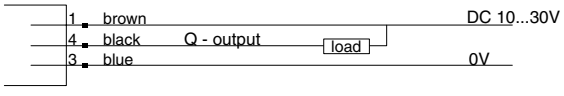
1) Object with 90% remission (based on standard white to DIN 5033)
2) Sensitivity scale 270°
3) Average service life 100,000 h at T_A = 25°C
4) Deviations, see data for LL 3
5) Limit values
6) May not exceed or fall short of V_S tolerances
7) Without load
8) Via sliding switch
9) With light/dark ratio 1:1, without time delay
10) Signal transit time with resistive load
11) Do not bend below 0°C
12) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

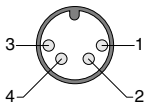


NPN Models

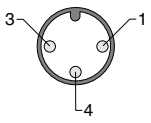


wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector

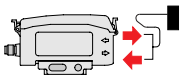


M8 Connector



WLL 170 High Speed

Fiber Optic Sensors



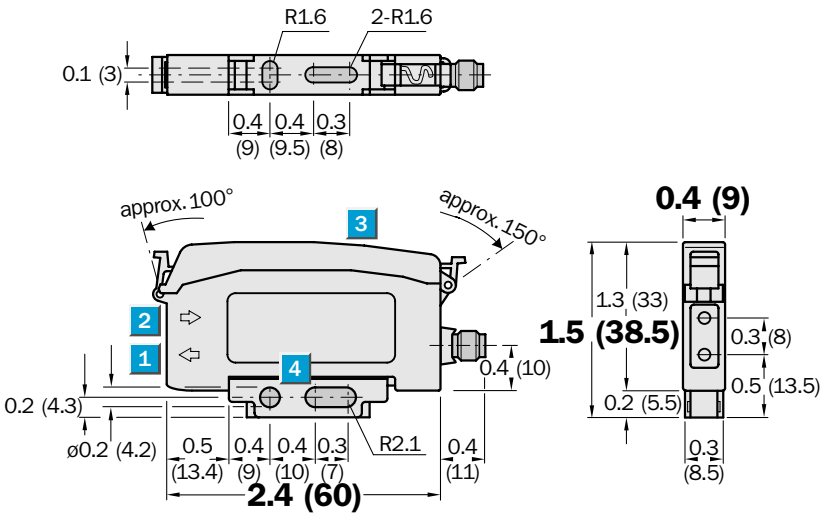

dependent on fiber sensing range

Highlights

- Rugged plastic housing
- Super slim housing, only 9 mm thick
- Special model designed for applications requiring the fastest sensor, 10 kHz
- Selectable time delays
- Glass or plastic fibers available with many tip configurations

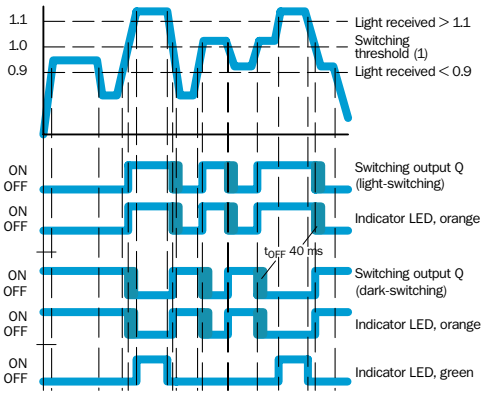
WLL 170

Dimensional Drawing



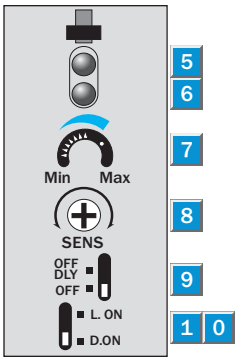
dimensions in inches (mm)

LED Function Diagram



Adjustments

All types



1 Sender LED
2 Receiver
3 Protective hood: can be raised at both ends, removable
4 Mounting bracket, included (see Accessories)
5 Output indicator LED, (orange)
6 LED signal strength indicator, (green)
7 Sensitivity scale
8 Sensitivity control (7 revolutions)
9 OFF delay switch
10 Light/dark switch

WLL 170

Orange LED:
Lights up when switching output Q is active (depending on setting of light/dark selector switch).

Green LED:
Lights up when light received > 1.1 (based on the switching threshold Q, switching threshold = 1).

Order Information

Type	Part no.
WLL 170-P162	6 020 801
WLL 170-P460	6 020 803
WLL 170-N162	6 020 804
WLL 170-N460	6 020 806
WLL 170-P360	6 021 960
WLL 170-N360	6 021 961

Accessories	page
Cables and connectors	908
Mounting brackets*	921
Fiber optic cables	982, 984

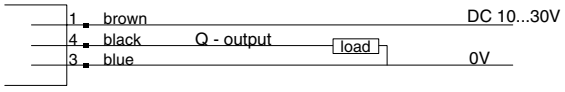
* included with delivery

Technical Data	WLL 170-	P162	P360	P460	N162	N360	N460
Sensing range	Depends on fiber optic cable used, see page 982, 984	■	■	■	■	■	■
Typical range (through beam)	0...5.1 in (0…130 mm)	■	■	■	■	■	■
	[with tip adapters 0...19.7 in (0…500 mm)]	■	■	■	■	■	■
Typical range (proximity)	0...1.0 in (0…25 mm)[1]	■	■	■	■	■	■
Sensitivity adjustment	Potentiometer, 7 turns[2]	■	■	■	■	■	■
Light source[3], light type	LED, visible red light	■	■	■	■	■	■
Light spot diameter of LL 3	Depends on sensing range	■	■	■	■	■	■
Divergence angle of LL 3 fiber optic	Approx. 65°[4]	■	■	■	■	■	■
Supply voltage V_S[5]	10…30 V DC	■	■	■	■	■	■
Ripple[6]	10 %	■	■	■	■	■	■
Current consumption 7)	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP: open collector: Q	■	■	■			
	NPN: open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Operation mode	Light/dark switching[8]	■	■	■	■	■	■
Response time[9]	≤ 50 µs	■	■	■	■	■	■
Max. switching frequency[10]	10 kHz	■	■	■	■	■	■
Time delay T_{OFF} (OFF-delay)	40 ms fixed, selectable via switch	■	■	■	■	■	■
Connection types	Cable[11], PVC, 2 m; 3 x 0.2 mm², Ø 4.0 mm	■			■		
	Plug, M8 4-pin			■			■
	Plug, M8 3-pin		■			■	
Circuit protection[12]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 50/NEMA 4	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

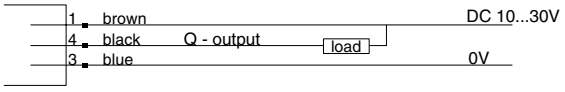
1) Object with 90% remission (based on standard white to DIN 5033)
2) Sensitivity scale 270°
3) Average service life 100,000 h at T_A = 25°C
4) Deviations, see data for LL 3
5) Limit values
6) May not exceed or fall short of V_S tolerances
7) Without load
8) Via sliding switch
9) With light/dark ratio 1:1, without time delay
10) Signal transit time with resistive load
11) Do not bend below 0°C
12) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

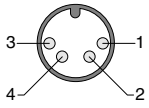


NPN Models



wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



WLL 12

Fiber Optic Sensors

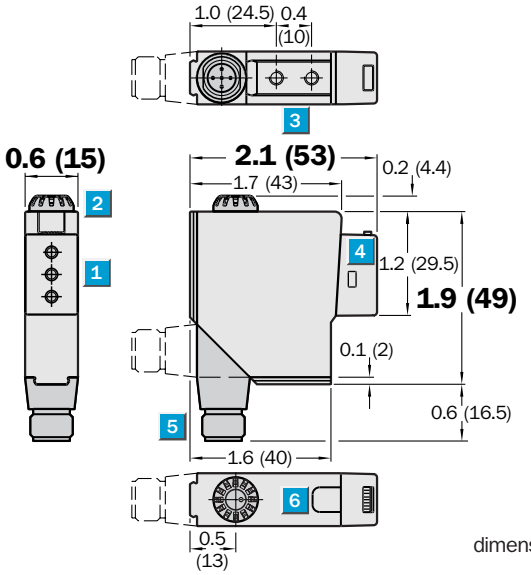
dependent on fiber sensing range

Highlights

- Rugged die cast metal housing
- Red, infrared or green light
- Signal strength indicator
- Special version with adjustable background suppression
- Adjustable sensitivity
- Glass or plastic fibers available with many tip configurations

WLL 12

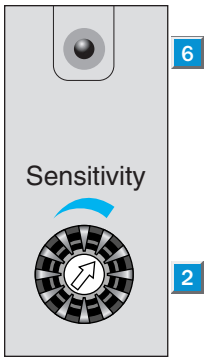
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Connector for fiber optic cable
2 Sensitivity control
3 M4 threaded mounting hole – 4 mm deep
4 Adapter
5 Plug not rotatable
6 LED signal strength indicator

Order Information

Type	Part no.
WLL 12-B5181	1 011 677
WLL 12-B5281	1 011 687
WLL 12-B5381	1 011 688
WLL 12-B5481	1 011 965

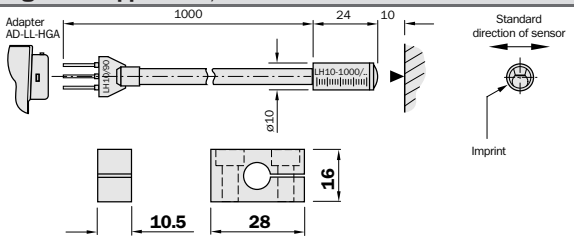
Accessories	page
Cables and connectors	909
Clamps*	921
Mounting brackets	922
Fiber optic cables, adapters	1004

* 2 pieces included with delivery

Technical Data	WLL 12-	B5181	B5281	B5381	B5481
Sensing range	Dependent on fibers used, see page 1004	■	■	■	■
Fiber optic adapters	See adapter selection table on page 1004	■	■	■	
Sensitivity	Adjustable	■	■	■	■
Sensing range[1] (bgs model)	0.4 in (10 mm) ± 1 mm, fixed				■
Light source[2], **light type**	LED, red light[3]	■			■
	Infrared light[4]		■		
	Green light[5]			■	
Supply voltage V_S	10…30 V DC[6]	■	■	■	■
Ripple[7]	≤ 5 V_{SS}	■	■	■	■
Current consumption[8]	≤ 35 mA	■	■	■	■
Switching outputs	PNP: Q/NPN: Q	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■
Switching cycles	1300/s	■	■	■	■
Response time[9]	360 µs	■	■	■	■
Max. switching frequency[10]	1.3 kHz	■	■	■	■
Operation mode	Light/dark switching via L/D control wire	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■
VDE protection class[12]	⧈	■	■	■	■
Circuit protection[13]	A, B, C	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■
	Storage -13...158°F (-25…70°C)	■	■	■	■
Approximate weight	4.6 oz (130 g)	■	■	■	■
Housing material	Die cast zinc	■	■	■	■

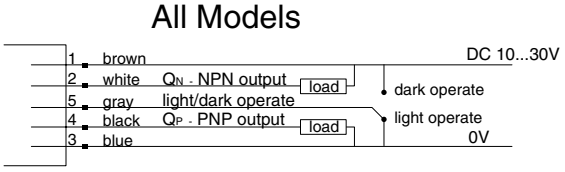
1) With LH 10-1000 fiber optic cable
2) Average service life 100,000 h at T_A = 25°C
3) Preferably LL 3 fiber optic cable
4) Preferably LM/LT fiber optic cable
5) Preferably contrast detection
6) Limit values
7) May not exceed or fall short of V_S tolerances
8) Without load
9) Signal transit time with resistive load
10) With light/dark ratio 1:1
11) Plug facing backwards on request
12) Reference voltage 50 V DC
13) A = V_S connections reverse-polarity protected
B = Output Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression

Proximity system with background suppression, WLL 12-B 5481 with LH 10-1000 fiber optic cable

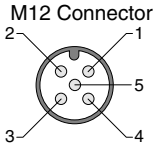


Sensing range:	10 mm (–1 mm), fixed
Light spot diameter:	approx. 2.5 x 3.5 mm
Switching hysteresis :	≤ 0.3 mm, based on standard white 90% to standard black 6%

Connection Diagram



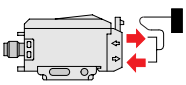
wire colors refer to standard cable, not included



SICK

WLL 160

Fiber Optic Sensors



dependent on fiber

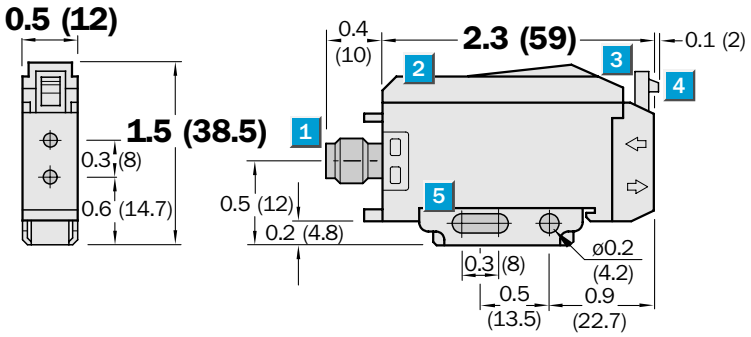
sensing range

Highlights

- Rugged plastic housing
- Sensitivity adjustment
- High switching frequency
- Signal strength indicator
- Signal strength also shown at fiber tip: red = strong, orange = weak
- Alarm output and test input
- Glass or plastic fibers available with many tip configurations

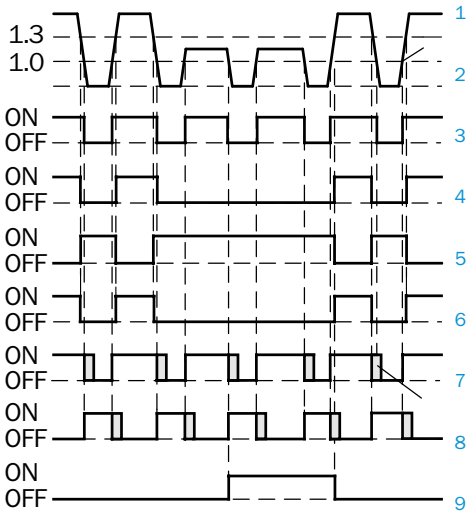
WLL 160

Dimensional Drawing



dimensions in inches (mm)

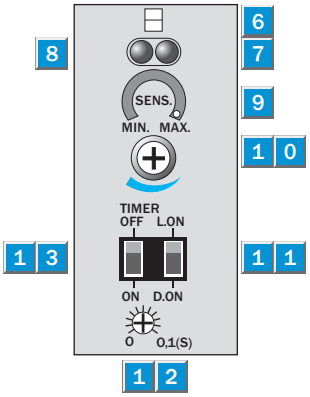
LED Function Diagram



1 Light reception 1.3
2 Switching threshold (1)
3 Red LED indicator(from switching threshold)
4 Green LED indicator(from switching threshold with reserve)
5 Transmitter-LED orange(reception without reserve)
6 Transmitter-LED red (from switching threshold with reserve)
7 Switching output Q (light-switching)
8 Switching output Q(dark-switching)
9 Alarm output (VMA)

Adjustments

All types



1	Plug, M8 4-pin or connection cable
2	Protective hood
3	Fiber optic cable lock (press down)
4	Fiber optic cable release (press lug)
5	Mounting bracket, included (see accessories)
6	Fiber insertion indicator
7	LED output indicator (red)
8	LED signal strength indicator (green)
9	Sensitivity scale
10	Sensitivity control (4 turns)
11	Light/dark switch
12	OFF delay adjustment
13	OFF delay switch

Order Information

Type	Part no.
WLL 160-F122	6 009 989
WLL 160-E122	6 009 981
WLL 160-F420	6 009 990
WLL 160-E420	6 009 982

Accessories

	page
Cables and connectors	908
Mounting brackets*	918
LL 3 fiber optic cables	982, 984

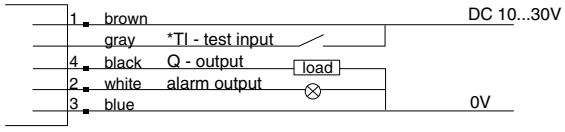
* included with delivery

Technical Data	WLL 160-	F122	F420	E122	E420
Sensing range	Depends on fiber optic cable used, see page 982, 984	■	■	■	■
Typical range (through beam)	0...19.7 in (0…500 mm)	■	■	■	■
	[with tip adapter 0...6.6 ft (0…2 m)]	■	■	■	■
Typical range (proximity)	0…2.8 in (0…70 mm)[1]	■	■	■	■
Adjustable sensitivity	Potentiometer, 4 turns with scaling 270°	■	■	■	■
Light source[2], **light type**	LED, red light (high excess gain)	■	■	■	■
	LED, red-orange light (low excess gain)	■	■	■	■
Light spot diameter	Depends on sensing range	■	■	■	■
Divergence angle of LL3 fiber optic	Approx. 65°	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Ripple[4]	± 10%	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■
Response time[6]/max. switching freq.[7]	≤ 0.35 ms / 1.5 kHz	■	■	■	■
Alarm output (VMA)	100 mA, static	■	■	■	■
Test input "TE"[8]	Sender off; PNP: TE to +V	■			
	Sender off; NPN: TE to 0 V			■	
Time delay T_{OFF} (OFF-delay)	Selectable, per slide switch	■	■	■	■
Time range	Adjust., 0…100 ms; potentiometer 270°	■	■	■	■
Connection types	Cable, PVC, 2m[9]; 5 x 0.2 mm², Ø 4.2 mm	■		■	
	Plug, M8 4-pin		■		■
VDE protection class[10]		■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 66/NEMA 4	■	■	■	■
	□				
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■
Approximate weight	2.8 oz (80 g)	■		■	
	1.1 oz (30 g)		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■

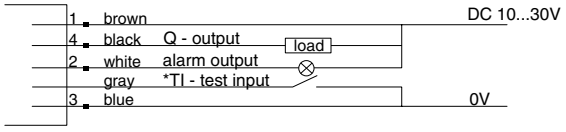
1) Scanned material with 90% remission (based on standard white according to DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) TE not with plug model
9) Do not bend below 0°C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram

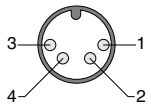
PNP Models



NPN Models



M8 Connector

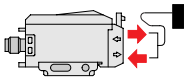


*test input available on cable models only
wire colors refer to standard cable, not included with quick disconnect models

SICK

WLL 160T

Fiber Optic Sensors




dependent on fiber

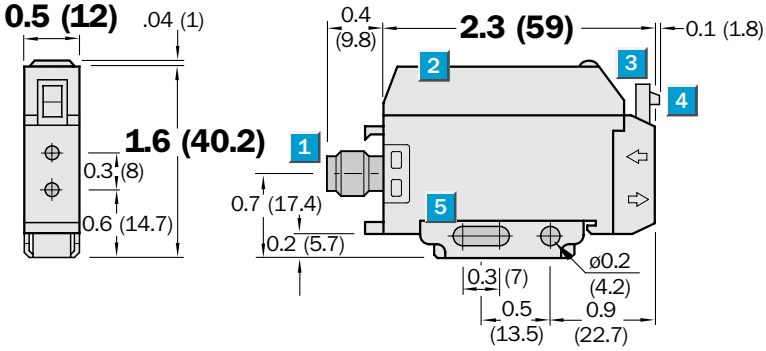
sensing range

Highlights

- Rugged plastic housing
- Push button teach-in for easy setup
- High switching frequency
- Signal strength indicator
- Alarm output
- Glass or plastic fibers available with many tip configurations

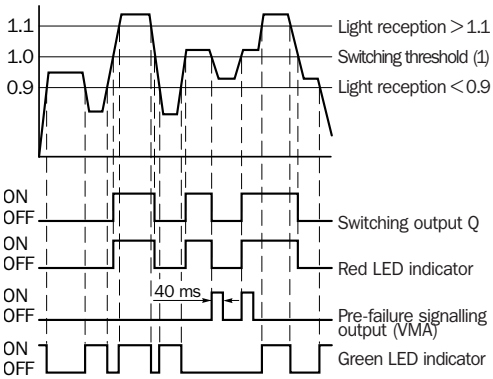
WLL 160T

Dimensional Drawing



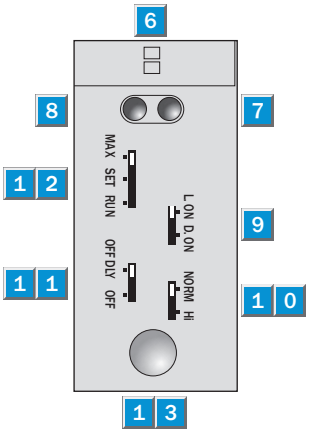
dimensions in inches (mm)

LED Function Diagram



Adjustments

All types



1	Plug, 4-pin M8 or connection cable
2	Protective hood
3	Fiber optic cable lock (press down)
4	Fiber optic cable release (press lug)
5	Mounting bracket, included (see accessories)
6	Indication of correct fiber optic cable mounting
7	LED output indicator, red
8	LED signal strength indicator, green
9	Light/dark-switch
10	Response time, selector switch NORM (600 µs)/HI (300 µs)
11	OFF delay switch
12	Set/Run switch
13	Teach button

Order Information

Type	Part no.
WLL 160T-F132	6 010 650
WLL 160T-F430	6 010 651
WLL 160T-E132	6 010 648
WLL 160T-E430	6 010 649

Accessories

	page
Cables and connectors	908
Mounting brackets*	918
LL 3 fiber optic cables	982, 984

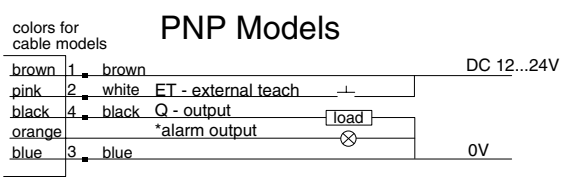
* included with delivery

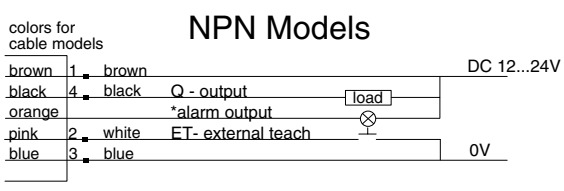
Technical Data	WLL 160T-	F132	F430	E132	E430
Sensing range	Depends on fiber optic cable used, see page 982, 984				
Typical range (through beam)	0...19.7 ft (0...500 mm)				
	[with tip adapter 0...6.6 ft(0..2 m)]				
Typical range (proximity)	0...2.8 in (0…70 mm)[1]				
Adjustable sensitivity	Automatic, via TEACH-IN key or “MAX” mode				
Mode selector “Max”	Max. range, set permanently				
“Set”	Teach-in active (Push button)				
“Run”	Teach-in inactive (Push button)				
TEACH-IN manual	Via button (switch in “SET” position)				
external TEACH-IN	Only active if mode switch is in “RUN” position				
	PNP: control wire + V				
	NPN: control wire 0 V				
Light source[2], **light type**	LED, red light				
Light spot diameter	Depends on sensing range				
Divergence angle of LL3 fiber optic	Approx. 65°				
Supply voltage V_S	12…24 V DC				
Ripple[3]	≤ 5 V_{SS}				
Current consumption[4]	≤ 50 mA				
Switching outputs	PNP, open collector: Q				
	NPN, open collector: Q				
Output current I_A max.	100 mA				
Operation mode	Light/dark switching via switch				
Response time[5]/max. switching freq.[6]	≤ 0.6 ms/830 Hz, (Norm mode)				
	≤ 0.3 ms/1660 Hz[7] (Hi mode)				
Alarm output (VMA)	30 mA, one shot, pulse length 40 ms				
Time delay T_{OFF} (Off delay)	40 ms fixed, selectable, via slide switch				
Connection types	Cable, PVC, 2 m[8]; 5 x 0.18 mm², Ø 4.0 mm				
	Plug, M8 4-pin				
VDE protection class[9]	⧈				
Circuit protection[10]	A, B, C, D				
Enclosure rating	IP 66/NEMA 4				
Ambient temperature T_A	Operation -13...131°F (-25…55°C)				
	Storage -40...158°F (-40…70°C)				
Approximate weight	2.8 oz (80 g)				
	1.1 oz (30 g)				
Housing material	Glass fiber reinforced ABS				

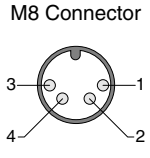
1) Scanned material with 90% remission (based on standard white according to DIN 5033)
2) Average service life 100.000 h at T_A = 25°C
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit period with resistive load
6) With light/dark ratio 1:1
7) Sensing distance reduction approx. 30%
8) Do not bend below 0°C
9) Reference voltage 50 V DC
10) A=V_S connections reverse-polarity protected

B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Connection Diagram





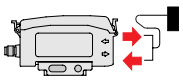


*alarm output available on cable models only
wire colors refer to standard cable, not included with quick disconnect models

SICK

WLL 170 Analog

Fiber Optic Sensors



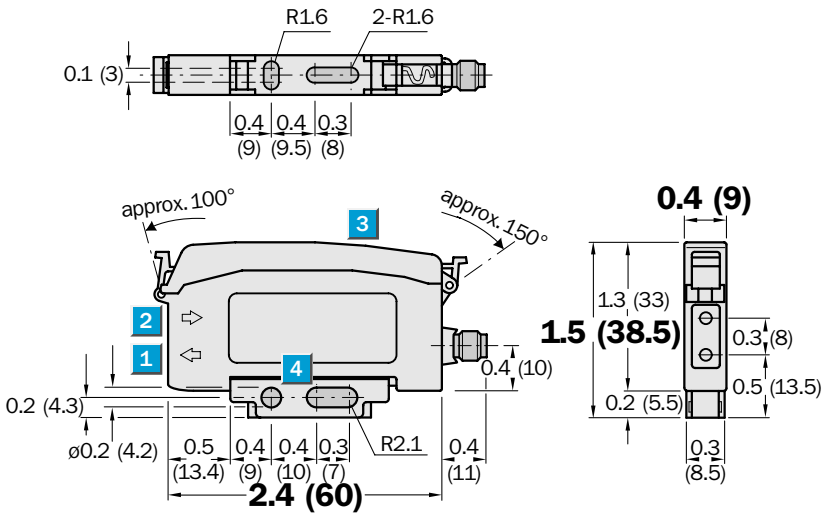

dependent on fiber
sensing range

Highlights

- Rugged plastic housing
- Output voltage (1…5 V) solves more applications
- Glass or plastic fibers available with many tip configurations
- Saturation indicator for easy sensitivity adjustment
- Super slim housing, only 9 mm thick

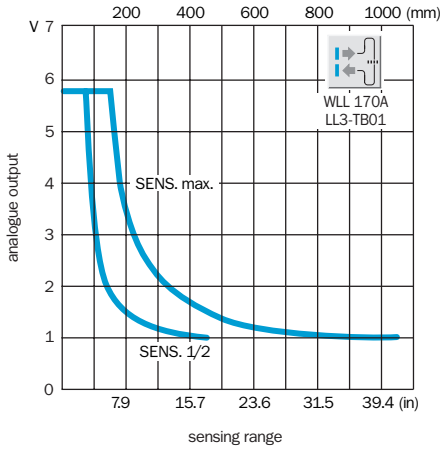
WLL 170 Analog

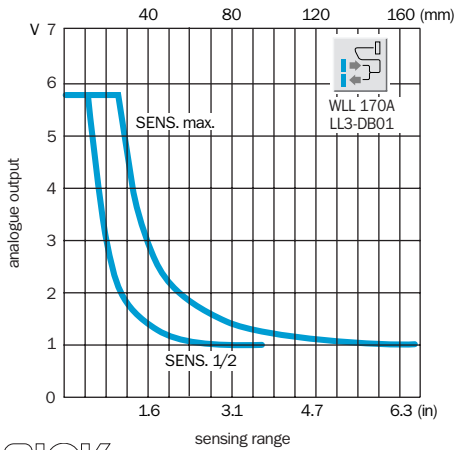
Dimensional Drawing



dimensions in inches (mm)

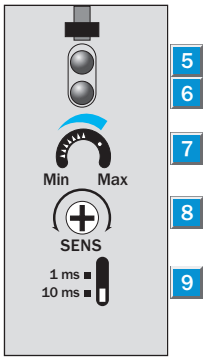
WLL 170A, Analog, Typical Curves





Adjustments

All types



1 Sender LED
2 Receiver
3 Protective hood: can be raised at both ends, removable
4 Mounting bracket, included (see Accessories)
5 Indicator LED, orange: analog output with saturation (≥ 5 V)
6 In/out of range indicator (green)
7 Sensitivity scale
8 Sensitivity control (7 revolutions)
9 Response time switch

Order Information

Type	Part no.
WLL 170A-V132	6 021 078
WLL 170A-V430	6 021 080
WLL 170A-V330	6 021 962

Accessories

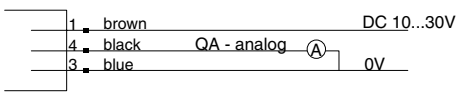
	page
Cables and connectors	908
Mounting brackets*	921
Fiber optic cables	982, 984

* included with delivery

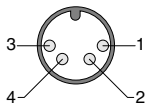
Technical Data	WLL 170A-	V132	V430	V330
Sensing range[1]	Depends on fiber optic cable used, see page 982, 984			
Typical range[1] (through-beam)	0...35.4 in (0…900 mm)			
	[with tip adapters 0…23.6 in (0…3200 mm)]			
Typical range[1] (proximity)	0...3.9 in (0…100 mm)[2]			
Light source[3], **light type**	LED, visible red light			
Light spot diameter of LL 3	Depends on sensing range			
Divergence angle of LL3 fiber optic	Approx. 65°[4]			
Supply voltage V_S[5]	10…30 V DC			
Ripple[6]	10%			
Current consumption[7]	≤ 40 mA			
Analog output				
Voltage output	1…5 V			
	1 V = no light received			
	5 V = saturation			
Load current (max.)	10 mA			
Output resistance (Ri)	47 Ω			
Load resistance	≥ 5 kΩ (recommended)			
Response time, selectable[8]	1 ms/10 ms			
Sensitivity, adjustable	Potentiometer, 7 turns[9]			
Connection types	Cable[10], PVC, 2 m; 3 x 0.2 mm², Ø 4.0 mm			
	Plug, M8 4-pin			
	Plug, M8 3-pin			
Cable extension	max. 100 m;			
	signal loss to be expected			
Circuit protection[11]	A, C, D			
Enclosure rating	IP 50/NEMA 4			
Ambient temperature T_A	Operation -13...131°F (-25…55°C)			
	Storage -40...158°F (-40…70°C)			
Approximate weight	2.1 oz (60 g)			
	0.7 oz (20 g)			
Housing material	Glass fiber reinforced ABS			

1) See Accessories; selection table for LL 3 fiber optic cables
2) Object with 90% remission (based on standard white to DIN 5033)
3) Average service life 100,000 h at T_A = 25°C
4) Deviations, see data for LL 3
5) Limit values
6) May not exceed or fall short of V_S tolerances
7) Without load
8) Delay time: change in received light/ change in analog output, (90% of upper range value)
9) Scale 270°
10) Do not bend below 0°C
11) A = V_S connections reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

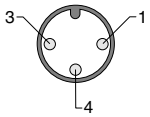
Connection Diagram



M8 Connector



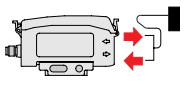
M8 Connector



SICK

WLL 170T

Fiber Optic Sensors



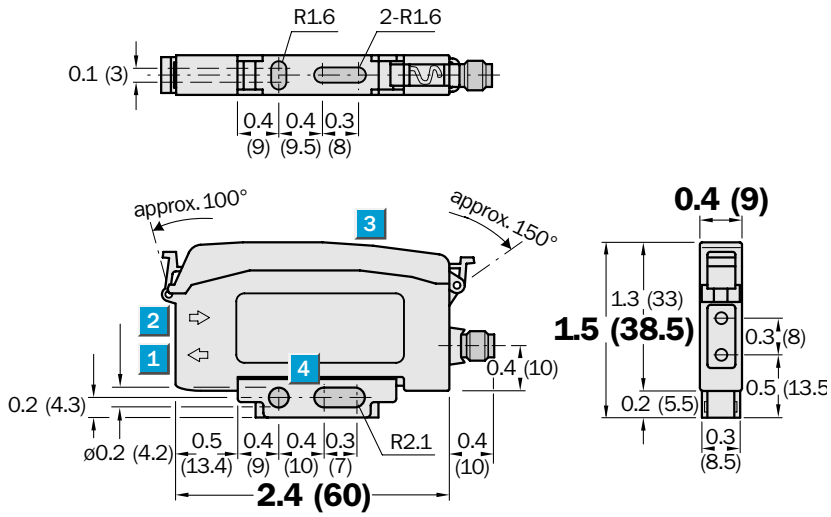

dependent on fiber sensing range

Highlights

- Rugged plastic housing
- Super slim housing, only 9 mm thick
- Push button teach for easy setup
- Available with sensitivity adjustment for micro adjustments after teach
- Signal strength indicator
- Available with alternate modulation frequency to eliminate crosstalk in tight setups
- Glass or plastic fibers available with many tip configurations

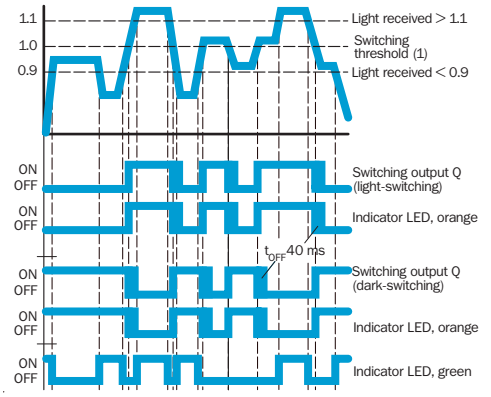
WLL 170T

Dimensional Drawing



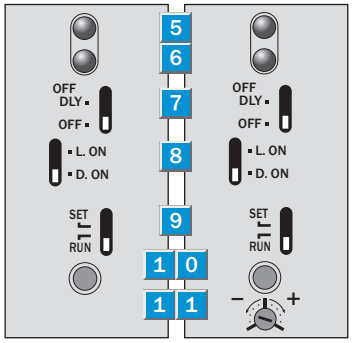
dimensions in inches (mm)

LED Function Diagram



Adjustments

WLL 170T-P132	WLL 170T-F132
WLL 170T-P430	WLL 170T-F430
WLL 170T-N132	WLL 170T-E132
WLL 170T-N430	WLL 170T-E430
WLL 170T-N330	WLL 170T-E430
WLL 170T-P330	WLL 170T-F330



1 LED sender
2 Receiver
3 Protective hood, can be raised at both ends, removable
4 Mounting bracket, included (see Accessories)
5 Output indicator (orange)
6 Signal strength indicator (green)
7 OFF delay switch
8 Light/dark switch
9 Set/run switch
10 Teach button
11 Sensitivity adjustment

WLL 170T in sensor mode

Operating mode selector switch in RUN mode (after setting the switching threshold by means of teach-in).

Orange LED:
Lights up when switching output Q is active (depending on setting of light/dark selector switch).

Green LED:
Lights up when light received is < 0.9 or > 1.1 (based on the switching threshold Q, switching threshold = 1).

LED display in teach-in mode:
See Teach-in page.

Order Information

Type	Part no.
WLL 170T-P132	6 011 722
WLL 170T-P430	6 011 724
WLL 170T-N132	6 011 725
WLL 170T-N430	6 011 727
WLL 170T-F132	6 020 420
WLL 170T-F430	6 020 422
WLL 170T-E132	6 020 423
WLL 170T-E330	6 021 966
WLL 170T-E430	6 020 425
WLL 170T-P330	6 021 963

Order Information

Type	Part no.
WLL 170T-N330	6 021 964
WLL 170T-F330	6 021 965

Accessories	page
Cables and connectors	908
Mounting brackets*	921
Fiber optic cables	982, 984

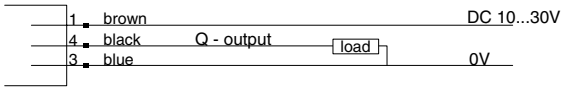
* included with delivery

Technical Data	WLL 170T-	P132	P430[2] P330	N132	N430[2] N330	F132	F430[2] F330	E132	E430[2] E330
Sensing range	Depends on fiber optic cable used, see pg 982	■	■	■	■	■	■	■	■
Typical range (through-beam)	0…23.6 in (0…600 mm)	■	■	■	■	■	■	■	■
	[with auxiliary lens 0…126 in (0…3200 mm)]								
Typical range (proximity)	0…3.9 in (0…100 mm)[3]	■	■	■	■	■	■	■	■
Sensitivity setting									
Automatically, by teach-in button	Mode switch at pos. "SET"[4]	■	■	■	■	■	■	■	■
Additional fine adjustment, manual	Optional[5]					■	■	■	■
Mode selector switch position "SET"	Teach-in button active	■	■	■	■	■	■	■	■
position "RUN"	Teach-in button inactive[6]	■	■	■	■	■	■	■	■
WLL 170T Anti-interference[7]	See WLL 170T selection table page 984								
Light source[8], **light type**	LED, red light	■	■	■	■	■	■	■	■
Light spot diameter LL 3	Depends on sensing range	■	■	■	■	■	■	■	■
Divergence angle of LL3 fiber optic	Approx. 65°[9]	■	■	■	■	■	■	■	■
Supply voltage V_S[10]	10…30 V DC	■	■	■	■	■	■	■	■
Ripple[11]	10%	■	■	■	■	■	■	■	■
Current consumption[12]	≤ 50 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP: open collector: Q	■	■			■	■		
	NPN: open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching[13] via switch	■	■	■	■	■	■	■	■
Response time[14]	≤ 0.5 ms	■	■	■	■	■	■	■	■
Switching frequency max.[15]	1000 Hz	■	■	■	■	■	■	■	■
Time delay t_{OFF} (OFF delay)	40 ms fix, selectable via sliding switch	■	■	■	■	■	■	■	■
Connection types	Cable[16], PVC, 2 m; 3 x 0.2 mm², Ø 4.0 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Plug, M8 3-pin		■		■		■		■
Circuit protection[17]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 50/NEMA 4	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■		■		■		■	
	0.7 oz (20 g)		■		■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

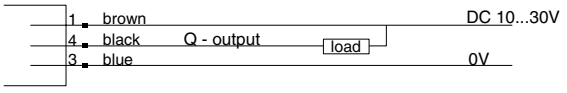
1) Plug, M8 3-pin
2) Plug, M8 4-pin
3) Object with 90% remission (based on standard white to DIN 5033)
4) Teach-in active
5) Change of switching threshold at approx. ±35%, with potentiometer ± 90°
6) Equipment in sensor mode
7) Optional, no opposing interference of basic WLL 170T and WLL 170T Anti-interference
8) Average service life 100,000 h at T_A = 25°C
9) See LL 3 data for deviations
10) Limit values
11) May not exceed or fall short of V_S tolerances
12) Without load
13) By sliding switch
14) With light/dark ratio 1:1 without time delay
15) With resistive load
16) Do not bend below 0°C
17) A = V_S connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

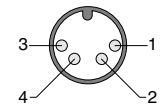


NPN Models

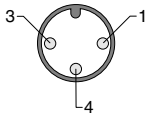


wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



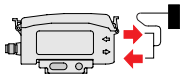
M8 Connector



SICK

WLL 170T Green

Fiber Optic Sensors



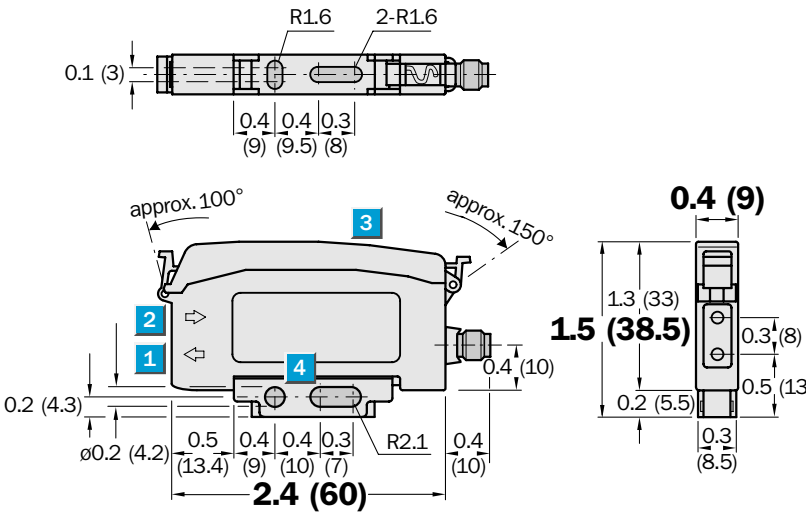

dependent on fiber sensing range

Highlights

- Rugged plastic housing
- Super slim housing, only 9 mm thick
- Blue-green light source specifically designed for mark detection
- Sensitivity adjustment available for micro adjustments after teach
- Push button teach for easy setup
- Signal strength indicator
- Available with alternate modulation frequency to eliminate crosstalk
- Glass or plastic fibers available with many tip configurations

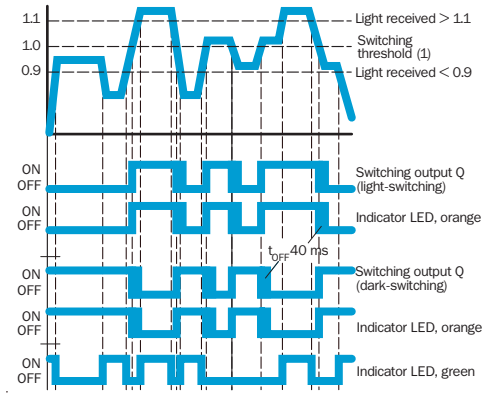
WLL 170T Green

Dimensional Drawing



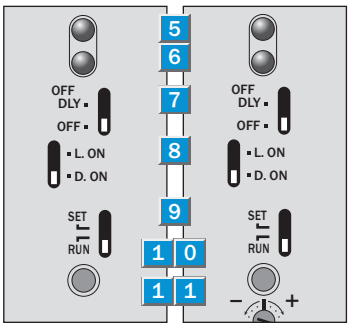
dimensions in inches (mm)

LED Function Diagram



Adjustments

WLL 170T-P192	WLL 170T-F192
WLL 170T-P490	WLL 170T-F490
WLL 170T-N192	WLL 170T-E192
WLL 170T-N490	WLL 170T-E490
WLL 170T-N390	WLL 170T-E490
WLL 170T-P390	WLL 170T-F390



1 LED sender
2 Receiver
3 Protective hood, can be raised at both ends, removable
4 Mounting bracket, included in delivery (see Accessories)
5 Output indicator (orange)
6 Signal strength indicator (green)
7 OFF delay switch
8 Light/dark switch
9 Set/run switch
10 Teach button
11 Sensitivity adjustment

WLL 170T in sensor mode

Operating mode selector switch in RUN mode (after setting the switching threshold by means of teach-in).

Orange LED:
Lights up when switching output Q is active (depending on setting of light/dark selector switch).

Green LED:
Lights up when light received is < 0.9 or > 1.1 (based on the switching threshold Q, switching threshold = 1).

LED display in teach-in mode: see Teach-in page.

Order Information

Type	Part no.
WLL 170T-P192	6 011 728
WLL 170T-P490	6 011 730
WLL 170T-N192	6 011 731
WLL 170T-N490	6 011 733
WLL 170T-F192	6 020 426
WLL 170T-F490	6 020 428
WLL 170T-E192	6 020 429
WLL 170T-E490	6 020 431
WLL 170T-E490	6 021 970
WLL 170T-P390	6 021 967

Order Information

Type	Part no.
WLL 170T-N390	6 021 968
WLL 170T-F390	6 021 969

Accessories

	page
Cables and connectors	908
Mounting brackets*	921
Fiber optic cables	982, 984

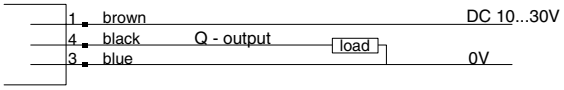
* included with delivery

Technical Data	WLL 170T-	P192	P490[2] / P390	N192	N490[2] / N390	F192	F490[2] / F390	E192	E490[2] / E390
Sensing range	Depends on fiber optic cable used, see pg 982	■	■	■	■	■	■	■	■
Typical range (through beam)	0…6.7 in (0…170 mm)	■	■	■	■	■	■	■	■
	[with auxiliary lens 0…25.6 in (0…650 mm)]								
Typical range (proximity)	0…1.2 in (0…30 mm)[3]	■	■	■	■	■	■	■	■
Sensitivity setting									
Automatically, by teach-in button	Mode switch at pos. "SET"[4]	■	■	■	■	■	■	■	■
Additional fine adjustment, manual	Optional[5]					■	■	■	■
Black & white resolution[6]	8 grey levels	■	■	■	■	■	■	■	■
Mode selector switch position "SET"	Teach-in button active	■	■	■	■	■	■	■	■
position "RUN"	Teach-in button inactive[7]	■	■	■	■	■	■	■	■
WLL 170T Anti-interference[8]	See selection table WLL 170T page 984								
Light source[9], **light type**	LED, green light	■	■	■	■	■	■	■	■
Light spot diameter LL 3	Depends on sensing range	■	■	■	■	■	■	■	■
Divergence angle of LL3 fiber optic	Approx. 65°[10]	■	■	■	■	■	■	■	■
Supply voltage V_S[11]	10…30 V DC	■	■	■	■	■	■	■	■
Ripple[12]	10%	■	■	■	■	■	■	■	■
Current consumption[13]	≤ 50 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP: open collector: Q	■	■			■	■		
	NPN: open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Operation mode	Light/dark switch[14]	■	■	■	■	■	■	■	■
Response time[15]	≤ 0.5 ms	■	■	■	■	■	■	■	■
Switching frequency max.[16]	1000 Hz	■	■	■	■	■	■	■	■
Time delay t_{OFF} (OFF delay)	40 ms fix, selectable via switch	■	■	■	■	■	■	■	■
Connection types	Cable[17], PVC, 2 m; 3 x 0.2 mm², Ø 4.0 mm	■		■		■		■	
	Plug, M8 4-pin		■		■		■		■
	Plug, M8 3-pin		■		■		■		■
Circuit protection[18]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 50/NEMA 4	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■		■		■		■	
	0.7 oz (20 g)		■		■		■		■
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■	■	■

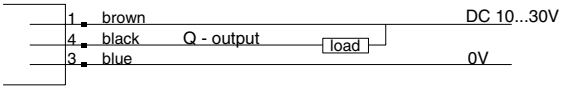
1) Plug, M8 3-pin
2) Plug, M8 4-pin
3) Object with 90% remission (based on standard white to DIN 5033)
4) Teach-in active
5) Change of switching threshold at approx. ± 35%, with potentiometer ± 90°
6) With LL 3-DT01 proximity fiber optic cable, sensing distance 3 mm
7) Equipment in sensor mode
8) Optional, no opposing interference of Basic WLL 170T and WLL 170T Anti-Interference
9) Average service life 100,000 h at $T_A = 25°C$
10) See LL 3 data for deviations
11) Limit values
12) May not exceed or fall short of V_S tolerances
13) Without load
14) By sliding switch
15) With light/dark ratio 1:1 without time delay
16) With resistive load
17) Do not bend below 0°C
18) A = V_s connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

PNP Models

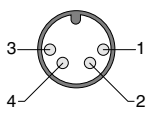


NPN Models

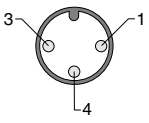


wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



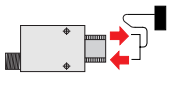
M8 Connector



SICK

WLL 1000

Fiber Optic Sensors



dependent on fiber

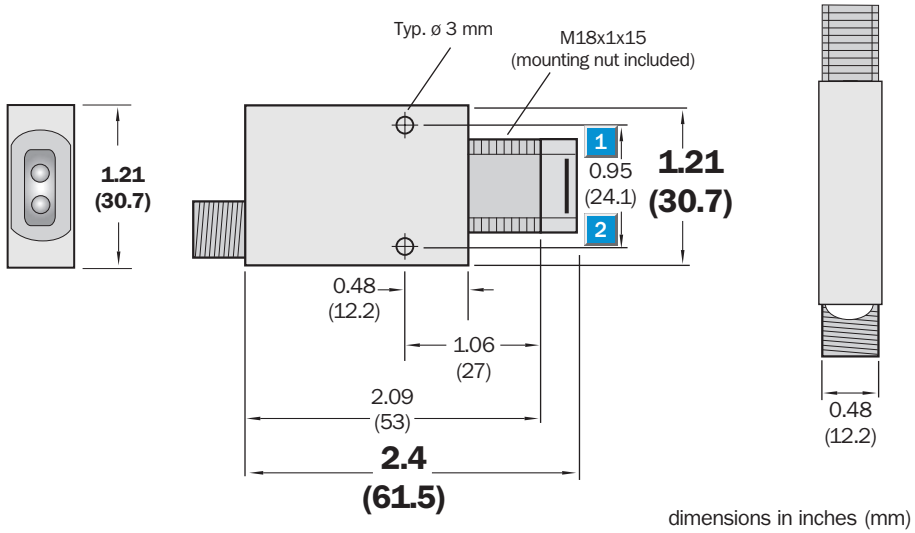
sensing range

Highlights

- Fiber optic sensor with teach-in
- Teach-in modes for easy detection
- Works with glass and plastic style fibers with included adapter
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

WLL 1000

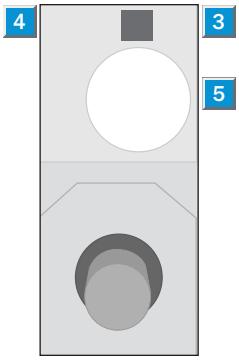
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 LED sender
2 Receiver
3 Output indicator
4 Signal strength indicator
5 Teach button

Order Information

Type	Part no.
WLL 1000-P132	7 025 881
WLL 1000-P430	7 025 883
WLL 1000-P431	7 025 884
WLL 1000-N132	7 025 885
WLL 1000-N430	7 025 887
WLL 1000-N431	7 025 888

Accessories

	page
Cables and connectors	909
Mounting brackets	925, 926
Fiber optic cables	1000, 1001

Technical Data	WLL 1000-	P132	P430	P431	N132	N430	N431
Sensing range, fixed	Depends on fiber optic cable used, see page 1000, 1001	■	■	■	■	■	■
Typical range (through beam)	3.3 ft (1 m)	■	■	■	■	■	■
Typical range (proximity)	5.9 in (150 mm)	■	■	■	■	■	■
Sensitivity adjustment	Adjustable via teach button	■	■	■	■	■	■
Light source[1], light type	LED, red, 660 nm	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC	■	■	■	■	■	■
Ripple[2]	≤ 5 V peak to peak	■	■	■	■	■	■
Current consumption[3]	≤ 50 mA	■	■	■	■	■	■
Switching outputs	PNP	■	■	■			
	NPN				■	■	■
Max. output current I_A	100 mA	■	■	■	■	■	■
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■
Response time[4]	600 µs	■	■	■	■	■	■
Max. switching frequency[5]	840 Hz	■	■	■	■	■	■
Connection types	Cable 2 m	■			■		
	Plug, M12 4-pin		■			■	
	Cable 150 mm, with 4-pin plug			■			■
VDE protection class[6]	□	■	■	■	■	■	■
Circuit protection[7]	A, B, C	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■
Approximate weight	3.5 oz (100 g)	■		■	■		■
	1.1 oz (30 g)		■			■	
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■

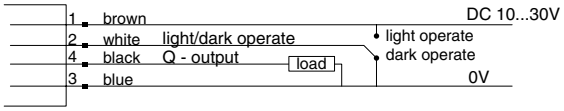
1) Average service life 50,000 h where $T_A = 25°C$
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

Teach-in Function

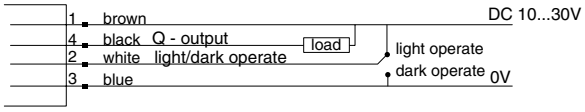
- **Programming via Teach-in button.**
- **Simple programming:**
  Align through beam fibers with no object present; or for proximity sensing, place object in front of fiber.
  Push button: finished.
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram

PNP Models

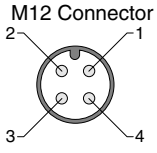


NPN Models



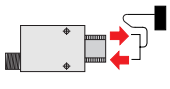
wire colors refer to standard cable, not included with quick disconnect models

M12 Connector



WLL 1000

Fiber Optic Sensor



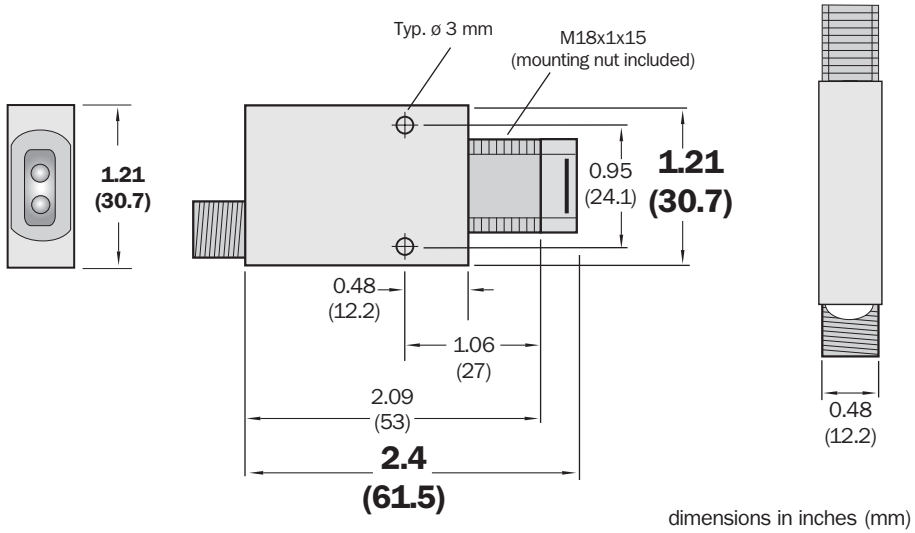
dependent on fiber
sensing range

Highlights

- Fiber optic sensor with teach-in
- Teach-in modes for easy detection
- Works with glass and plastic style fibers with included adapter
- Signal strength indicator
- Digital signal evaluation provides exceptional ambient light immunity
- Plastic housing is ultrasonically welded for outstanding durability
- Cable or quick disconnect versions available

WLL 1000

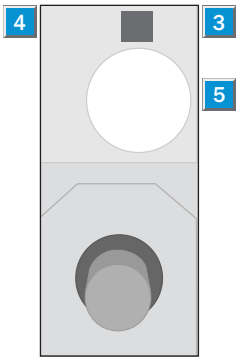
Dimensional drawing



dimensions in inches (mm)

Adjustments

All types



1 LED sender
2 Receiver
3 Output indicator
4 Signal strength indicator
5 Teach button

Order Information

Type	Part no.
WLL 1000-P112	7 023 835
WLL 1000-P410	7 023 836
WLL 1000-P411	7 024 624
WLL 1000-N112	7 023 837
WLL 1000-N410	7 023 838
WLL 1000-N411	7 024 625

Accessories	page
Cables and connectors	909
Mounting brackets	925, 926
Fiber optic cables	1000, 1001

Technical Data	WLL 1000-	P112	P410	P411	N112	N410	N411			
Sensing range, fixed	Depends on fiber optic cable used, see page 1000, 1001	■	■	■	■	■	■			
Typical range (through beam)	3.3 ft (1 m)	■	■	■	■	■	■			
Typical range (proximity)	5.9 in (150 mm)	■	■	■	■	■	■			
Sensitivity adjustment	Adjustable via teach button	■	■	■	■	■	■			
Light source[1], light type	LED, infrared, 880 nm	■	■	■	■	■	■			
Supply voltage V_S	10…30 V DC	■	■	■	■	■	■			
Ripple[2]	≤ 5 V peak to peak	■	■	■	■	■	■			
Current consumption[3]	≤ 50 mA	■	■	■	■	■	■			
Switching outputs	PNP	■	■	■						
	NPN				■	■	■			
Max. output current I_A	100 mA	■	■	■	■	■	■			
Switching mode[6]	Light or dark switching selectable via control wire L/D	■	■	■	■	■	■			
Response time[4]	600 µs	■	■	■	■	■	■			
Max. switching frequency[5]	840 Hz	■	■	■	■	■	■			
Connection types	Cable 2 m	■			■					
	Plug, M12 4-pin		■			■				
	Cable 150 mm, with 4-pin plug			■			■			
VDE protection class[6]	□	■	■	■	■	■	■			
Circuit protection[7]	A, B, C	■	■	■	■	■	■			
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■			
Ambient temperature T_A	Operation -40...140°F (-40...60°C)	■	■	■	■	■	■			
	Storage -40...167°F (-40…75°C)	■	■	■	■	■	■			
Approximate weight	3.5 oz (100 g)	■		■	■		■			
	1.1 oz (30 g)		■			■				
Housing material	Glass fiber reinforced ABS	■	■	■	■	■	■			

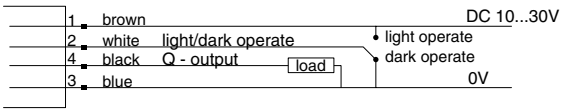
1) Average service life 50,000 h where $T_A = 25°C$
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression

Teach-in Function

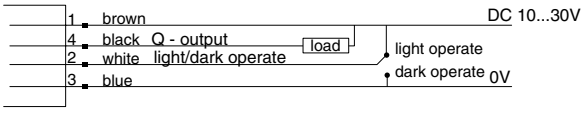
- **Programming via Teach-in button.**
- **Simple programming:**
  Align through beam fibers with no object present; or for proximity sensing, place object in front of fiber.
  Push button: finished.
  LED confirms the Teach-in procedure.
- **Teach-in values can be stored.**
- **Two operating modes:**
  Default setting: short Teach-in time (< 8 s);
  for standard applications;
  approx. double reserve via switching threshold;
  LED lights continuously.
  Precise setting: long Teach-in time (> 8 s);
  for precise applications;
  small switching hysteresis;
  LED blinks.

Connection Diagram

PNP Models

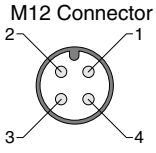


NPN Models



wire colors refer to standard cable, not included with quick disconnect models

M12 Connector



WLL 24 Exi

Fiber Optic Sensors

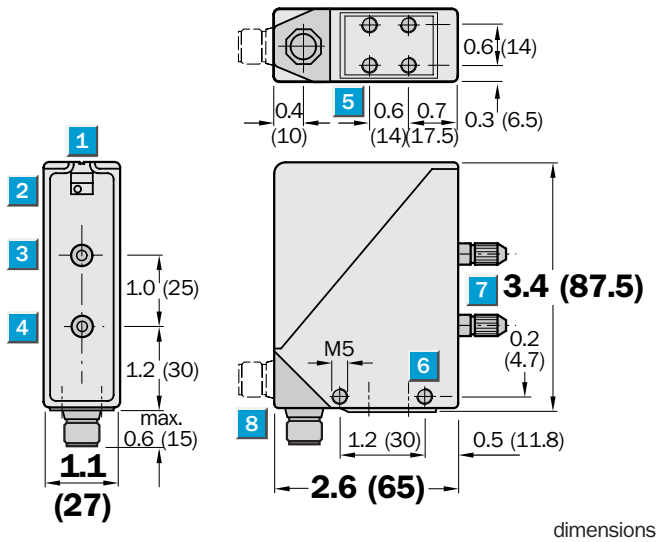
39.4 in (1000 mm) / 1.4 in (35 mm)
sensing range

Highlights

- Rugged metal housing
- Red light for easy alignment
- Interchangeable fiber optic cable
- Explosion protection EEx ia IIC T6
- Plug rotatable by 90°
- Terminal chamber for connection flexibility

WLL 24 Exi

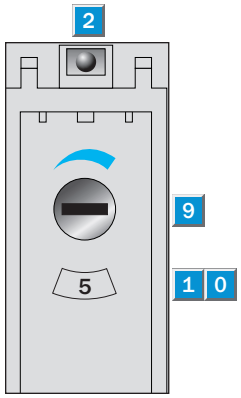
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1	Alignment sight
2	LED signal strength indicator
3	Center of receiver's optical axis
4	Center of transmitter's optical axis
5	M5 threaded mounting hole – 8 mm deep
6	M5 threaded mounting hole
7	Connector for fiber-optic cable
8	PG 9 cable gland or M12 plug, rotatable
9	Sensitivity adjustment
10	Sensitivity indicator

Order Information

Type	Part No.
WLL 24-X2301	1 011 562
WLL 24-X4301	1 012 711

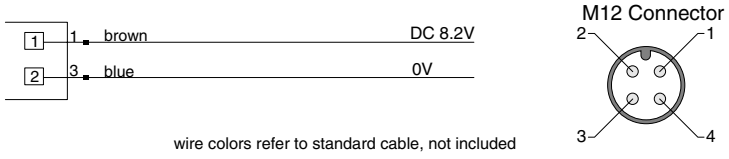
Accessories

	page
Cables and connectors	909
Mounting brackets	923, 935
Fiber optic cables	982, 984
Power supply units	966

Technical Data	WLL 24-	X2301	X4301
Sensing range, through-beam system	4.0 in (100 mm) with LL 3 – TB 02		
	39.4 in (1000 mm) with tip adapter LL 3 – TA 01		
Sensing distance, proximity system	1.4 in (35 mm) with LL 3 – DB 01		
Fiber optic cable	See Accessories, p. 982, 984		
Sensitivity	Adjustable		
Light source[1], **light type**	LED, red light		
Supply voltage V_S[2]	8.2 V DC (5…13.5 V)[3]		
Ripple[4]	0.4 V_{SS}		
Terminal capacitance	≤ 15 nF		
Terminal inductance	≤ 75 µH		
Current consumption[5]			
light beam unbroken	≥ 2.2 mA		
light beam broken	≤ 1 mA		
Switching output	Control current dependent on		
	switching state (to NAMUR EN 50227)		
Switching mode	Light switching		
Response time[6]	≤ 10 ms		
Max. switching frequency[7]	50/s		
Connection types	Plug, M12 4-pin		
	Terminal connection		
Approval	PTB Nr. Ex97 D2036		
VDE protection class[8]	□		
Circuit protection[9]	A, C		
Enclosure rating	IP 65		
Ambient temperature T_A	Operation -4...122vF (-20…50°C)		
	Storage -13...158°F (-25…70°C)		
Approximate weight	11.6 oz (330 g)		
Housing material	Die cast zinc		

1) Average service life 100,000 h at T_A = 25°C
2) Supply with disconnector device EN 2 Ex
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
C = Interference pulse suppression

Connection Diagram

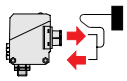


wire colors refer to standard cable, not included

SICK

WLL 260

Fiber Optic Sensors




dependent on fiber

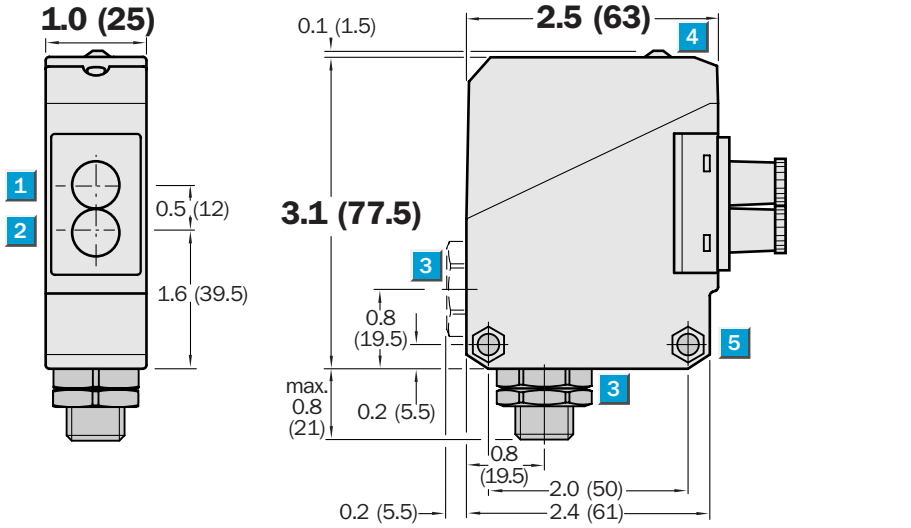
sensing range

Highlights

- Rugged plastic housing
- Signal strength indicator
- Adjustable sensitivity
- Terminal chamber for connection flexibility
- Alarm output and test input
- Glass fibers available with many tip configurations

WLL 260

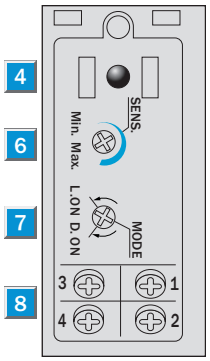
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear; or M12 equipment plug, bottom
4 LED signal strength indicator, red
5 Through hole Ø 5.2 mm on both sides for M5 hex nut
6 Sensitivity adjustment
7 Light/dark rotary switch
L.ON = light switching, D.ON = dark switching
8 Terminals

Order Information

Type	Part no.
WLL 260-F240	6 020 064
WLL 260-F440	6 020 065
WLL 260-E240	6 020 063

Accessories	page
Cables and connectors	909
Mounting brackets*	924, 935
Fiber optic cable	1000, 1001

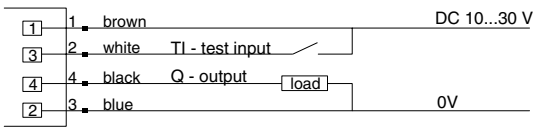
* included with delivery

Technical Data	WLL 260-	F240	F440	E240
Sensing range	Depends on fiber optic cable used, see page 1000, 1001	■	■	■
Typical range[1] (through-beam)	0...31.5 in (0…800 mm)	■	■	■
Typical range (proximity)	0...2.6 in (0…65 mm)	■	■	■
	0...4.3 in (0…110 mm) w. special fiber optic cable	■	■	■
Sensitivity	Adjustable, potentiometer 270°	■	■	■
Light source[2], **light type**	LED, red light	■	■	■
Light spot diameter	Depends on sensing range	■	■	■
Divergence angle of LL3 fiber optic	Approx. 65°	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■
Ripple[4]	≤ 5 V_{SS}	■	■	■
Current consumption[5]	≤ 35 mA	■	■	■
Switching outputs	PNP, open collector: Q	■	■	
	NPN, open collector: Q			■
Output current I_A max.	100 mA	■	■	■
Operation mode	Light/dark switching via rotary switch	■	■	■
Response time[6]	≤ 0.7 ms	■	■	■
Max. switching frequency[7]	700 Hz	■	■	■
Test input "TE" sender off	PNP: TE to + V_S	■	■	
	NPN: TE to 0 V			■
Connection types	Terminal chamber	■		■
	Plug, M12 4-pin		■	
VDE protection class[8]	⧈	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■
Enclosure rating	IP 66/NEMA 4	■	■	■
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■
	Storage -40...158°F (-40…70°C)	■	■	■
Approximate weight	2.8 oz (120 g)	■	■	■
Housing material	Glass fiber reinforced ABS	■	■	■

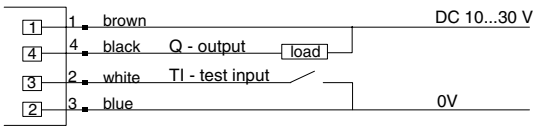
1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) With resistive load
7) With light/dark ratio 1:1
8) Reference voltage 50 V DC
9) A = V_s connections reverse-polarity protected
B = Inputs/outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected

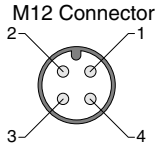
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included

WLL 2000

Fiber Optic Sensors

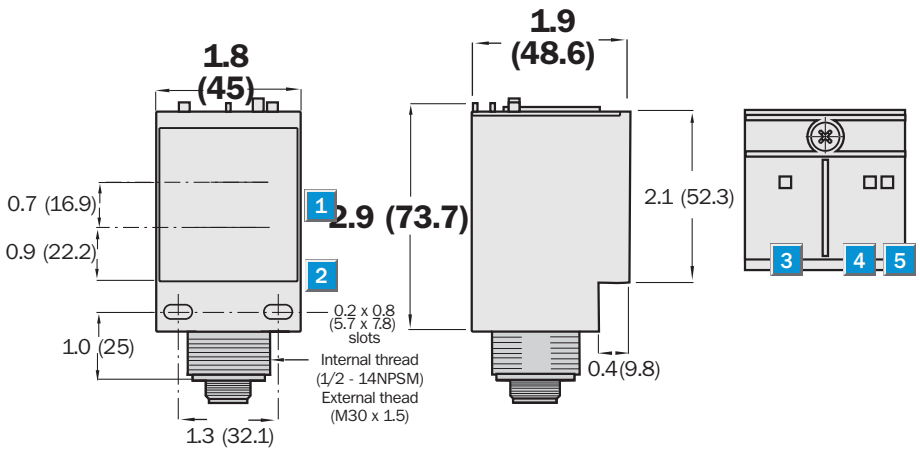
dependent on fiber sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Compatible with industry standard plastic and glass fibers
- Signal strength indicator
- Crosstalk immunity
- Immune to ambient light
- Red light for easy alignment
- Cable or M12 quick disconnect versions

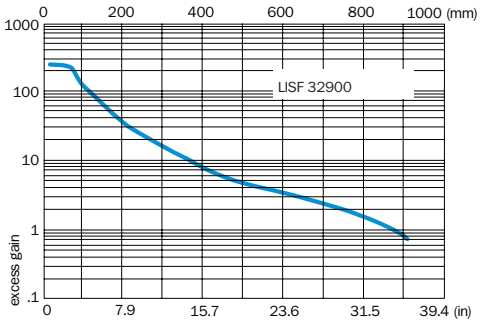
WLL 2000

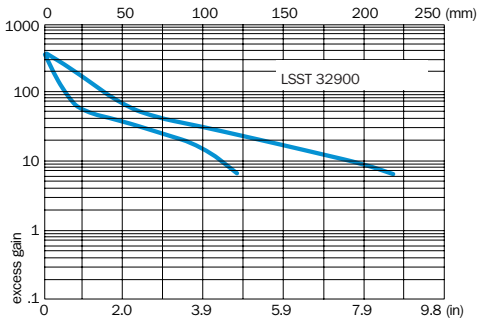
Dimensional Drawing



dimensions in inches (mm)

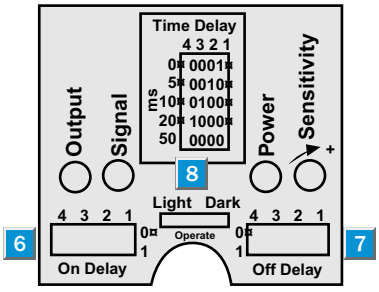
Excess Gain





Adjustments

All types



1. LED sender
2. Receiver
3. Power indicator
4. LED signal strength indicator
5. Output indicator
6. On delay switch
7. Off delay switch
8. Light/dark switch

Order Information

Type	Part no.
WLL 2000-B1302	7 023 068
WLL 2000-B1312	7 023 069
WLL 2000-B1322	7 023 070
WLL 2000-B5300	7 023 071
WLL 2000-B5310	7 023 072
WLL 2000-B5320	7 023 073
WLL 2000-B4320	7 024 462

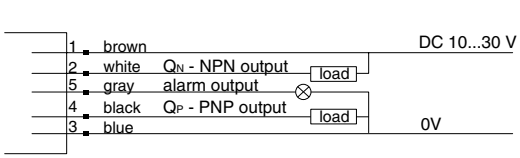
Accessories

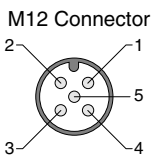
	page
Cables and connectors	909
Reflectors	936
Mounting brackets	927
Fiber optic cables	1000, 1001

Technical Data	WLL 2000-	B1302	B1312	B1322	B5300	B5310	B5320	B4300
Sensing range, adjustable	Depends on fiber optic cable used, see page 1000, 1001	■	■	■	■	■	■	■
Light source[1], **light type**	LED, red, 660 nm	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC	■	■	■	■	■	■	■
Ripple[3]	≤ 5 V	■	■	■	■	■	■	■
Current consumption[4]	≤ 80 mA	■	■	■	■	■	■	■
Switching outputs	PNP or NPN, Q and $\overline{Q}$	■	■	■	■	■	■	■
Voltage drop (Max.)	2 V	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■
Response time[5]	≤ 1 ms	■	■	■	■	■	■	■
Max. switching frequency[6]	500 Hz	■	■	■	■	■	■	■
Alarm output	PNP	■	■	■	■	■	■	
Time delay settings	0, 5, 10, 20 or 50 ms		■	■		■	■	
OFF delay			■			■		
ON/OFF delay				■			■	
Connection types	Cable 2 m, PVC	■	■	■				
	Plug, M12 5-pin				■	■	■	
	Plug, M12 4-pin							■
VDE protection class[8]	□	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■	■

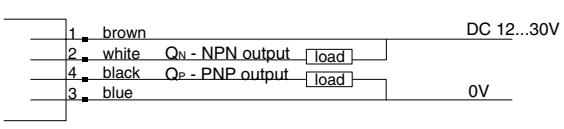
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

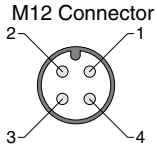
Connection Diagram





wire colors refer to standard cable, not included with quick disconnect models





SICK

VLL 18

Fiber Optic Sensor

0...7.9 in (0...200 mm)
0...2 in (0...50 mm)

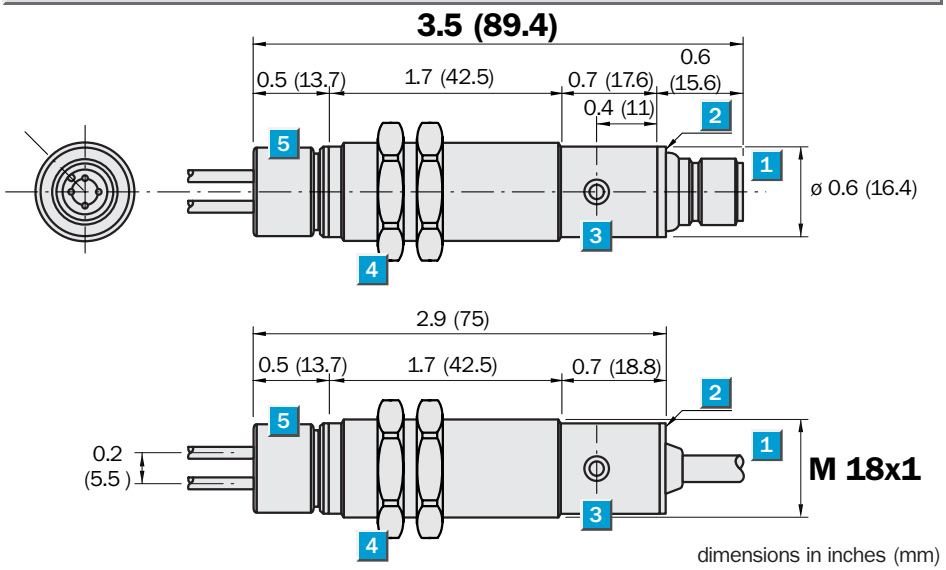
sensing range

Highlights

- Appropriate for the LL 3 fiber optic cable series
- Adjustable sensitivity: per teach-in at the “push of a button” or per control input C
- Simplest handling

VLL 18

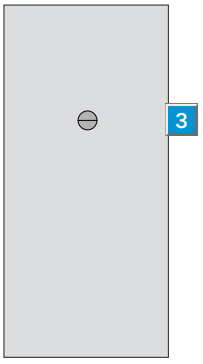
Dimensional drawing



dimensions in inches (mm)

Setting options

All types



1 Connection cable or plug M 12, 4-pin
2 Yellow LED indicator:
– lights continuously:
reception signal > reserve factor 2
– blinks: reception signal < reserve factor 2
but > switching threshold 1
3 Sensitivity control (Teach-in button)
4 Fastening nuts (2x); SW 24, metal
5 Locking nut, fiber-optic cable mounting:
turn left = unlock; turn right = lock.
Insert LL 3 fiber-optic cable until it catches.
Caution: Only loosen nut; do not remove it.
IP protection only with adapted fiber-optic cable!

Order information

Type	Part no.
VLL 18T-4P3212	6 026 482
VLL 18T-4P3240	6 026 483
VLL 18T-4N3212	6 026 480
VLL 18T-4N3240	6 026 481

Accessories

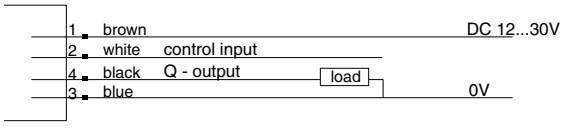
	page
Connectors	909
Mounting systems	925, 926
LL 3 fiber-optic cables	982, 984

Technical Data	VLL 18T-4	P 3212	P 3240	N 3212	N 3240
Suitable fiber optic cables	LL3 plastic fiber optic cable series	■	■	■	■
Scanning ranges SR	Dependent on fiber optic cable used see pg. 982, 984	■	■	■	■
Recommended operating range	0...7.9 in (0...200 mm) (through beam system) [1]	■	■	■	■
Recommended operating distance [2]	0...2 in (0 ... 50 mm) (proximity system)	■	■	■	■
Sensitivity setting	Manual, per Teach in button	■	■	■	■
	Electronic, per control input C (0 V)[3]	■	■	■	■
Light source[4], light type	LED, visible red light	■	■	■	■
Light spot diameter LL 3	Dependent on scanning range SR	■	■	■	■
Dispersion angle LL 3 fiber-optic cable	Approx. 65° [5]	■	■	■	■
Supply voltage V_S	10 ... 30 V DC[6]	■	■	■	■
Ripple[7]	≤ 10 %	■	■	■	■
Current consumption[8]	≤ 20 mA	■	■	■	■
Switching outputs	Q: PNP	■	■		
	Q: NPN			■	■
Output current I_A max.	≤ 100 mA	■	■	■	■
Switching mode [3]	Light/dark switching, selectable	■	■	■	■
Response time[9]	≤ 625 µs	■	■	■	■
Switching frequency max.[10]	800/s	■	■	■	■
Connection type	Cable[11] PVC, 2 m, 4 x 0.34 mm², Ø 4.7 mm	■		■	
	Plug, M12 4-pin		■		■
VDE protection class [12]	□	■	■	■	■
Enclosure rating [13]	IP 67	■	■	■	■
Circuit protection[14]	A, B, C, D	■	■	■	■
Ambient temperature T_A	Operation -13...158°F (-25...70°C)	■	■	■	■
	Storage -13...158°F (-25...70°C)	■	■	■	■
Approximate weight	4.9 oz (140 g)	■		■	
	2.3 oz (65 g)		■		■
Housing material	Nickel-plated brass/PBT	■	■	■	■

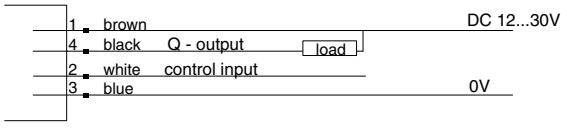
1) With front lenses 0 ... 2000 mm
2) Object with 90 % remission (based on standard white to DIN 5033); 100 x 100 mm
3) Control input C, programming:
– Switching type L.ON/D.ON and
– External Teach-in
C = open (not assigned): light-switching L.ON
C = + V_S: dark-switching D.ON
C = 0 V: sensitivity setting per "external Teach-in" active
4) Average service life 100.000 h at T_A = +25 °C
5) See LL 3 data for deviations
6) Limit values
7) May not exceed or fall short of V_S tolerances
8) Without load
9) With resistive load
10) With light/dark ratio 1:1
11) Do not bend below 0 °C
12) Reference voltage 50 V
13) Only with correct adaptation of the LL 3 fiber-optic cable
14) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

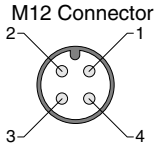
Connection type

PNP



NPN





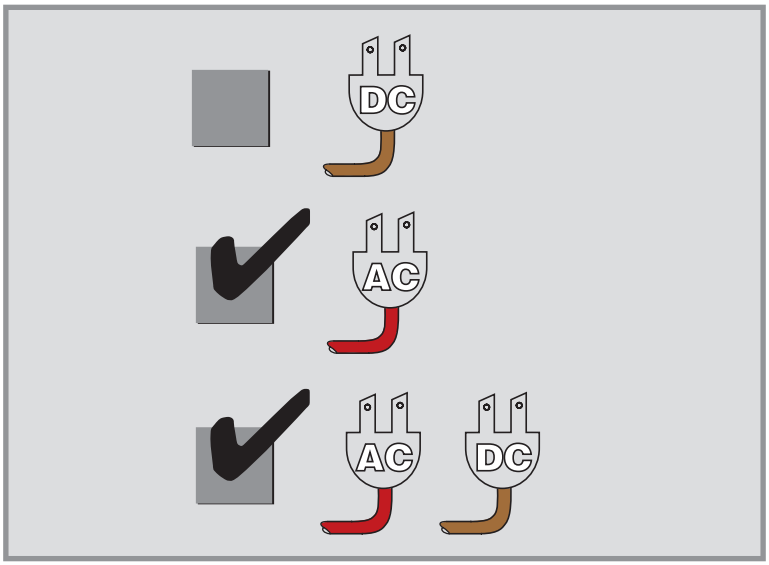
wire colors refer to standard cable, not included

C = not connected L.ON
C = + V_S D.ON
C = 0 V teach-in active

SICK

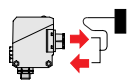
Fiber Optic Sensors

Fiber Optic Sensors



WLL 260

Fiber Optic Sensors



dependent on fiber

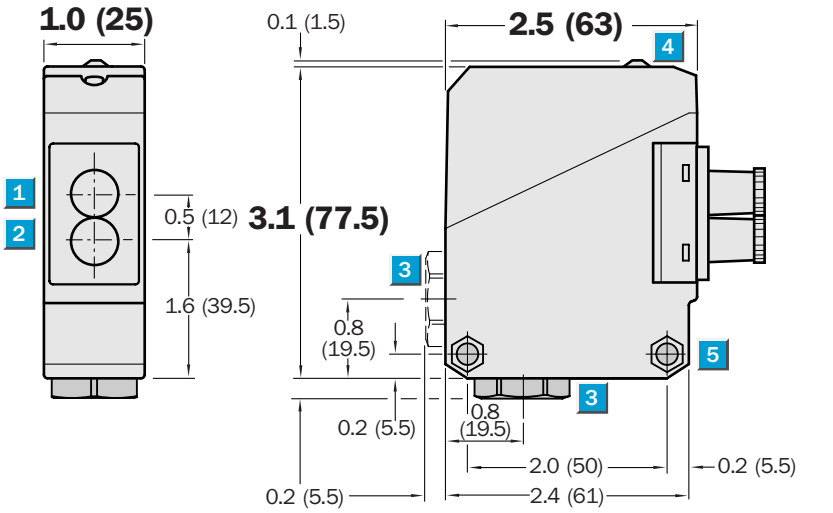
sensing range

Highlights

- Rugged plastic housing
- Signal strength indicator
- Adjustable sensitivity
- Terminal chamber for connection flexibility
- Wide range supply voltage
- Glass fibers available with many tip configurations
- Available with off delay, on delay and one-shot timing

WLL 260

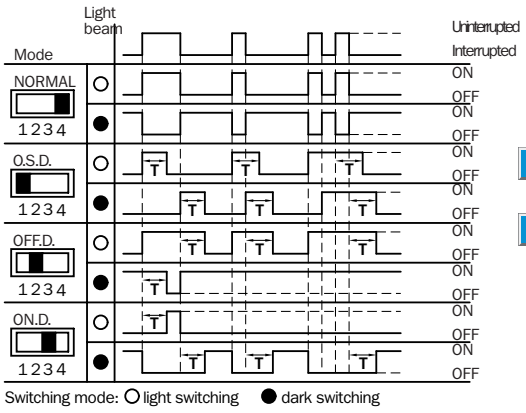
Dimensional Drawing



dimensions in inches (mm)

Time Delay

t = 0.1 – 5 s

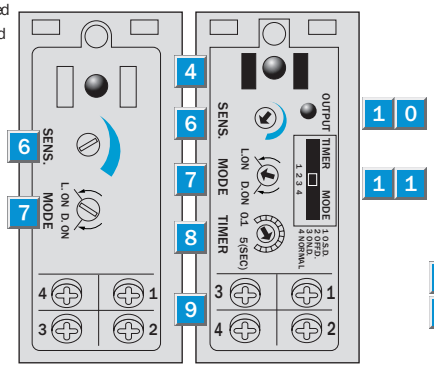


Switching mode: ○ light switching ● dark switching

Switching mode: ○ light switching
● dark switching

Adjustments

WLL 260-S240	WLL 260-R240



1 Center of optical axis, receiver
2 Center of optical axis, sender
3 Cable entry gland 1/2" PF thread for cable diameters from 6 to 10 mm optionally at bottom or rear
LED signal strength indicator, red
4 Through hole Ø 5.2 mm on both sides for M5 hex nut
5 Sensitivity adjustment
6 Light/dark rotary switch
7 L.ON = light switching, D.ON = dark switching
8 Time range control
9 Terminals
10 LED output indicator (red)
11 Time delay selector switch
O.S.D. = One Shot OFF.D. = OFF delay
ON.D. = ON delay Normal = No delay

Order Information

Type	Part no.
WLL 260-S240	6 009 504
WLL 260-R240	6 009 503

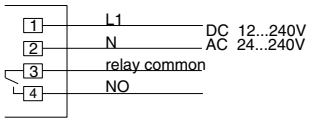
Accessories	page
Mounting brackets*	924
Fiber optic cable	1000, 1001

* included with delivery

Technical Data		WLL 260-	S240	R240
Sensing range		Depends on fiber optic cable used, see page 1000, 1001		
Typical range[1] (Through-beam)		0…31.5 in (0…800 mm)		
Typical range (Proximity)		0…2.6 in (0…65 mm)		
With special fiber optic cable		0…4.3 in (0…110 mm)		
Sensitivity		Adjustable, potentiometer 270°		
Light source[2], **light type**		LED, red light		
Light spot diameter		Depends on sensing range		
Divergence angle of LL3 fiber optic		Approx. 65°		
Supply voltage V_S[3]		12…240 V DC		
		24…240 V AC		
Power consumption		≤ 5 VA		
Switching output		Relay, SPST, electrically isolated		
Switching current I_A max.[4]		3 A/240 V AC; 3 A/30 V DC		
Operation mode		Light/dark switching via rotary switch		
Response time		≤ 20 ms		
Max. switching frequency[5]		25 Hz		
Time delays		With indicator LED: switching		
		output active		
Switch position:	«1 O.S.D.»	1: «One shot»		
	«2 OFF.D.»	OFF delay t_{OFF}		
	«3 ON.D.»	ON delay t_{ON}		
	«4 Normal»	No delay		
Time range		Adjustable, 0.1…5 s;		
		potentiometer 270°		
Connection type		Terminal chamber		
VDE protection class[6]		⧈		
Circuit protection[7]		A, C		
Enclosure rating		IP 66/NEMA 4		
Ambient temperature T_A		Operation -13...131°F (-25…55°C)		
		Storage -40...158°F (-40…70°C)		
Approximate weight		2.8 oz (120 g)		
Housing material		Glass fiber reinforced ABS		

1) Object with 90% remission (based on standard white DIN 5033)
2) Average service life 100,000 h at $T_A = 25°C$
3) ± 10%
4) Provide suitable spark suppression for inductive or capacitive loads
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
C = Interference suppression

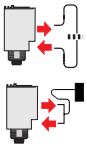
Connection Diagram



SICK

WLL 2000

Fiber Optic Sensors



dependent on fiber

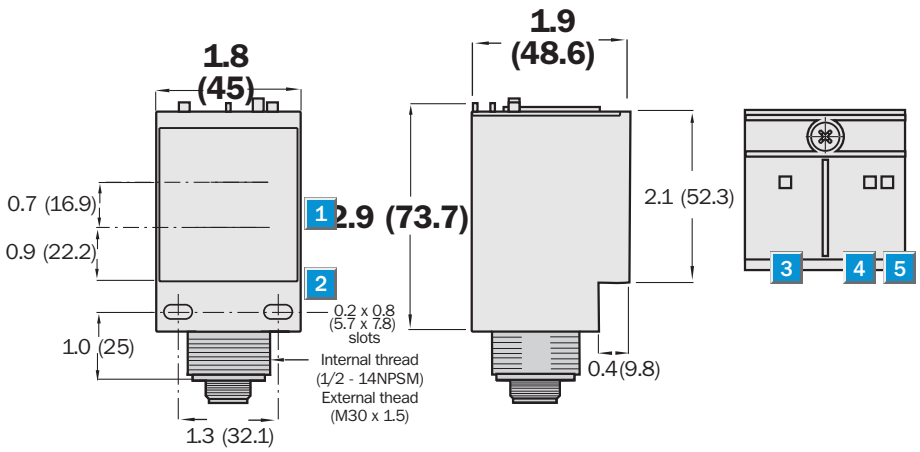
sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Compatible with industry standard glass and plastic fibers
- Signal strength indicator
- Crosstalk immunity
- Selectable time delays
- Red light for easy alignment
- Cable or mini quick disconnect versions

WLL 2000

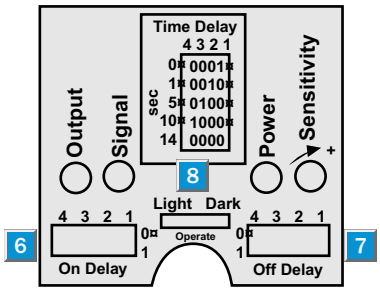
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 LED sender
2 Receiver
3 Power indicator
4 LED signal strength indicator
5 Output indicator
6 On delay switch
7 Off delay switch
8 Light/dark switch

Order Information

Type	Part no.
WLL 2000-R1302	7 023 074
WLL 2000-R1312	7 023 075
WLL 2000-R1322	7 023 076
WLL 2000-R5300	7 023 077
WLL 2000-R5310	7 023 078
WLL 2000-R5320	7 023 079

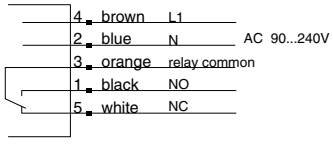
Accessories

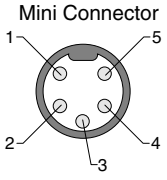
	page
Cables and connectors	911
Reflectors	936
Mounting brackets	927
Fiber optic cables	1000, 1001

Technical Data	WLL 2000-	R1302	R1312	R1322	R5300	R5310	R5320
Sensing range, adjustable	Depends on fiber optic cable used, see page 1000, 1001	■	■	■	■	■	■
Light source[1], light type	LED, red, 660 nm	■	■	■	■	■	■
Supply voltage V_S	90...240 V AC	■	■	■	■	■	■
Current consumption[4]	≤ 6 W	■	■	■	■	■	■
Switching outputs	Relay, SPDT isolated	■	■	■	■	■	■
Switching voltage (Max.)	265 V	■	■	■	■	■	■
Switching current (Max.)	3 A	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[5]	≤ 10 ms	■	■	■	■	■	■
Max. switching frequency[6]	10 Hz	■	■	■	■	■	■
Time delay settings	0, 1, 5, 10 or 14 s	■	■	■	■	■	■
OFF delay			■			■	
ON/OFF delay				■			■
Connection types	Cable 2 m, PVC	■	■	■			
	Plug, mini 5-pin				■	■	■
VDE protection class[8]	□	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■

1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram



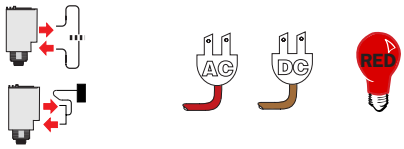


wire colors refer to standard cable, not included with quick disconnect models

SICK

WLL 2000

Fiber Optic Sensor-Solid State



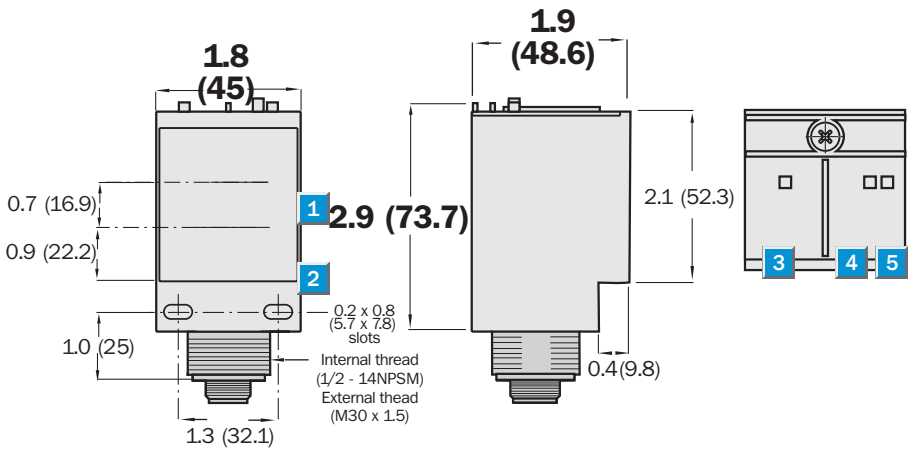
dependent on fiber sensing range

Highlights

- Rugged plastic housing
- Standard mounting for your existing applications
- Compatible with industry standard glass and plastic fibers
- Signal strength indicator
- Crosstalk immunity
- Selectable time delays
- Red light for easy alignment
- Cable or mini quick disconnect versions

WLL 2000

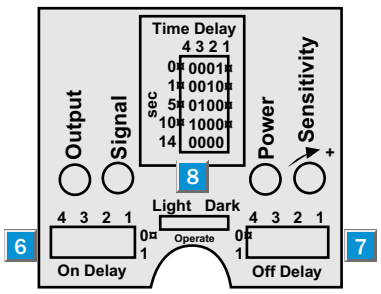
Dimensional drawing



dimensions in inches (mm)

Adjustments

All types



1 LED sender
2 Receiver
3 Power indicator
4 LED signal strength indicator
5 Output indicator
6 On delay switch
7 Off delay switch
8 Light/dark switch

Order Information

Type	Part no.
WLL 2000-M1302	7 023 417
WLL 2000-M1312	7 023 416
WLL 2000-M1322	7 023 415
WLL 2000-M4300	7 023 426
WLL 2000-M4310	7 023 425
WLL 2000-M4320	7 023 424
WLL 2000-M9300	7 023 429
WLL 2000-M9310	7 023 428
WLL 2000-M9320	7 023 427

Accessories

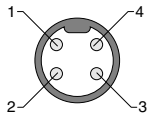
	page
Cables and connectors	910, 911
Reflectors	936
Mounting brackets	927
Fiber optic cables	1000, 1001

Technical data	WLL 2000-	M1302	M1312	M1322	M4300	M4310	M4320	M9300	M9310	M9320
Sensing range, adjustable	Depends on fiber optic cable used, see page 1000, 1001	■	■	■	■	■	■	■	■	■
Light source[1], light type	LED, red, 660 nm	■	■	■	■	■	■	■	■	■
Supply voltage V_S	90...240 V AC	■	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 6 W	■	■	■	■	■	■	■	■	■
Switching outputs	FET	■	■	■	■	■	■	■	■	■
Switching voltage (Max.)	240 V	■	■	■	■	■	■	■	■	■
Switching current (Max.)	150 mA	■	■	■	■	■	■	■	■	■
Operation mode	Light/dark switching via switch	■	■	■	■	■	■	■	■	■
Response time[5]	≤ 2 ms	■	■	■	■	■	■	■	■	■
Max. switching frequency[6]	250 Hz	■	■	■	■	■	■	■	■	■
Time delay settings	0, 1, 5, 10 or 14 s	■	■	■	■	■	■	■	■	■
OFF delay		■	■	■	■	■	■	■	■	■
ON/OFF delay		■	■	■	■	■	■	■	■	■
Connection types	Cable 2 m, PVC				■	■	■	■	■	■
	Plug, mini 4-pin	■	■	■				■	■	■
	Plug, micro 4-pin	■	■	■	■	■	■	■		
VDE protection class[8]	⧈	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13...104°F (-25...40°C)	■	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■	■
Approximate weight	5.3 oz (150 g)	■	■	■	■	■	■	■	■	■
Housing material	Glass fiber reinforced plastic	■	■	■	■	■	■	■	■	■

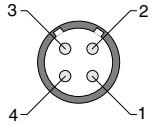
1) Average service life 100,000 h at $T_A = 25°C$
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression

Connection type

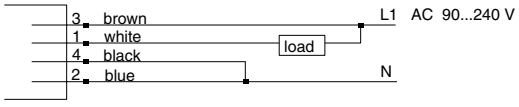
Mini Connector



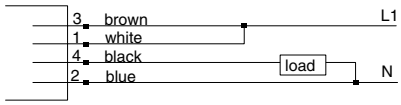
Micro Connector



Mini / Cable Versions

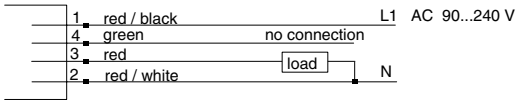


-OR-



wire colors refer to standard cable, not included with quick disconnect models

Micro Versions



SICK

Theory of Operation...Contrast Sensors

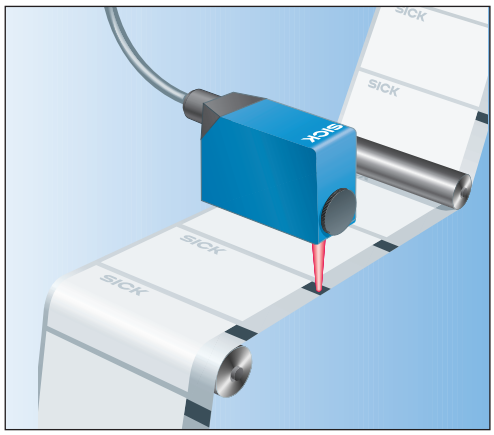


Fig. 1 Contrast sensor

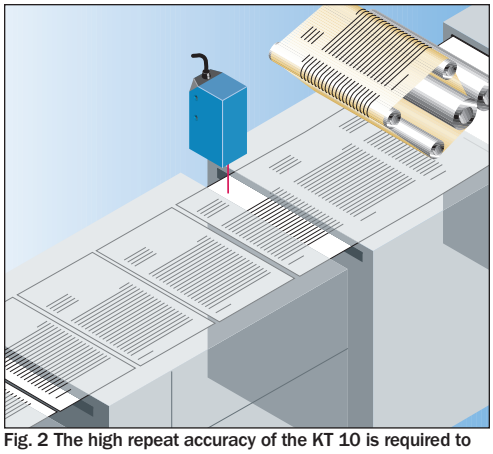


Fig. 2 The high repeat accuracy of the KT 10 is required to ensure precise cutting

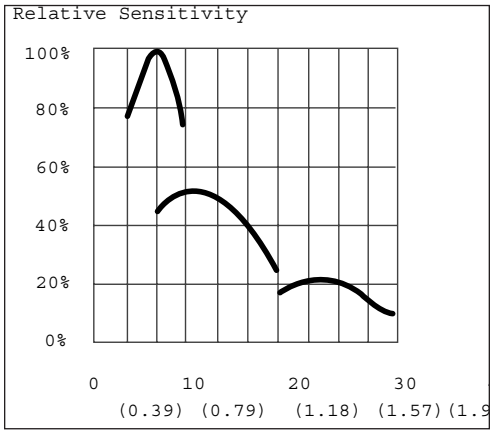


Fig. 3 The sensitivity of the sensor increases as the sensor-to-object distance decreases

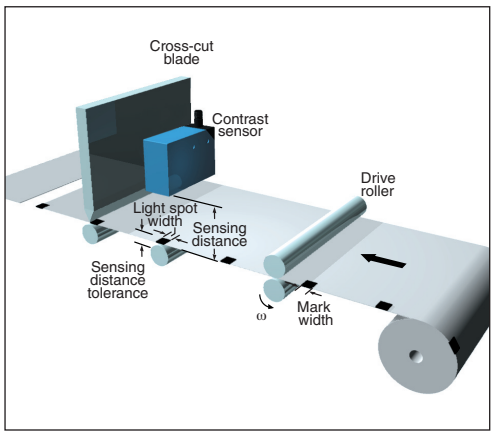


Fig. 4 The sensing distance tolerance is ±3 mm

About Contrast Sensors

Contrast sensors (designated by "KT" or "NT" as in the KT 10), can be used in a variety of applications including positioning data processing forms, positioning labels, cans or tubes, and recognizing codes. The contrast sensor signals the machine control to cut, fold, or fuse material or to stop material feed.

Contrast sensors detect registration marks by monitoring changes in the light reflected by the background and the mark. The mark is the symbol on the object that the contrast sensor must detect; the background is the area around the registration mark and must be in contrast to the mark.

Contrast sensors recognize colors as gray scale values. Therefore, two colors such as red and green that have approximately the same gray scale value may be difficult for a sensor to distinguish. When a sensor lens is chosen to increase the operating range, the contrast between the mark and the background may need to be increased. An ideal contrast is black and white.

The receiver in the contrast sensor detects the reflected light and converts it into an analog voltage. This voltage is dependent on the color or reflectivity of the scanned material, thus allowing the registration mark to be detected. As part of the setup procedure, the voltage level for the lighter color is stored in memory. The switching threshold is then set in relation to the stored level.

Each time the analog voltage from the received light exceeds or drops below the switching threshold, an output from the sensor is triggered.

SENSING DISTANCE

The sensing distance is the distance between the front edge of the lens and the scanned material. This distance is a function of the selected optics. The sensitivity of the contrast sensor increases as the sensor-to-object distance decreases, as shown in Fig. 3.

The sensing distance tolerance is approximately ± 3 mm (± 0.12 in), depending on the contrast level. This is the range within the distance from sensor to material can vary and the sensor will still reliably detect marks. An example is shown in Fig. 4.

LIGHT SPOT ORIENTATION

The light spot may be vertical/parallel to the body of the contrast sensor, or the light spot may be horizontal/perpendicular to it, depending on the model selected. For the most reliable detection, the long side of the light spot should be parallel to the long side of the mark.

LENS POSITION

The lens position of contrast sensors can be changed 90 degrees by moving the lens and the threaded cap. (Not available on KT 2, KT 3 or KT 10.)

INSTALLATION

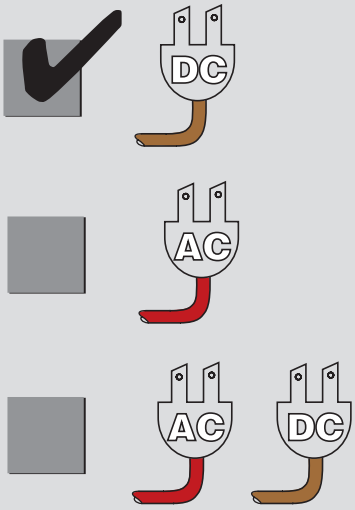
The best location for the KT/NT is where the scanned material experiences the least lateral and vertical movement (flutter). The sensor works best when positioned as close as possible to the designated focal point.

Lateral movement can be compensated for by increasing the length of the mark. However, flutter must remain within the sensing distance tolerance, or the contrast and the operating reliability will be significantly reduced. An optimum arrangement would be to guide the material over a fixed roller with the KT/NT aimed at the surface of the roller.

Mounting brackets should be designed and installed with sufficient stability to prevent strong vibrations from affecting the KT/NT. The selected location should be shielded from extremely bright ambient light. The lens can be installed in either opening depending on the location of the scanning plane.

If the scanned material has a glossy (reflective) surface, the scanner should be mounted at an angle approximately 15 degrees perpendicular to the scanned material.

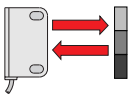
Contrast Sensors



SICK

ST 130

Contrast Sensors



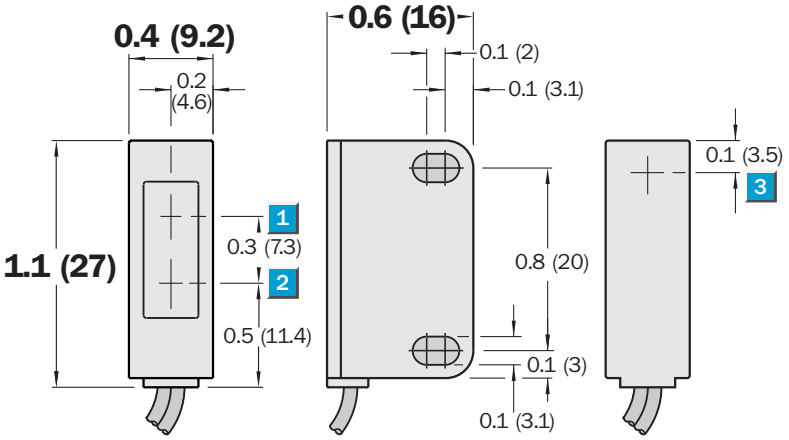
0.7 in (16 mm)
sensing distance

Highlights

- Ultra-miniature housing
- Focused optics, small light spot
- Red or green sender LEDs
- Resolution: 7 gray tones
- Extremely flexible connection cable

ST 130

Dimensional Drawing



dimensions in inches (mm)

1 Center of optical axis, transmitter
2 Center of optical axis, receiver
3 LED indicator, red: light reception

Order Information

Type	Part no.
ST 130-S13	6 011 083
ST 130-S19	6 011 084
ST 130-S23	6 011 085
ST 130-S29	6 011 086

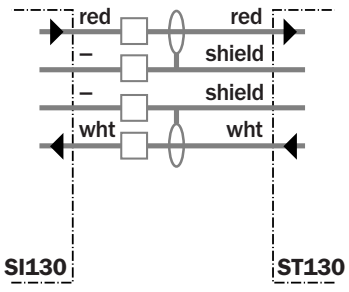
Accessories	page
SI 130	558
Mounting brackets*	918

* included with delivery

Technical Data	ST 130-	S13	S19	S23	S29					
Mark sensor	SI 130 in "MARK" mode, see page 558	■	■	■	■					
Sensing distance	0.7 in (16 mm)	■	■	■	■					
Sensing distance tolerance	±. 0.08 in (2 mm)	■	■	■	■					
Black/white resolution	7 grey tones	■	■	■	■					
Light source[1], light type	LED, visible red light	■		■						
	LED, visible green light		■		■					
Light spot size	Approx. 1 x 4 mm w. focal point 16 mm	■	■							
	Approx. 1 x 1 mm w. focal point 16 mm			■	■					
Angle of divergence, sender	Focused, focal point 16 mm ± 0.5 mm	■	■	■	■					
Power supply and evaluation unit	ST 130 only functional in combination with separate interpreter (SI 130), see page 558	■	■	■	■					
Supply voltage V_S	See SI 130, page 558	■	■	■	■					
Switching outputs	See SI 130, page 558			■	■					
Output current I_A max.	See SI 130, page 558	■	■	■	■					
Operation mode	See SI 130, page 558	■	■	■	■					
Response time[2]	See SI 130, page 558	■	■	■	■					
Max. switching frequency[3]	See SI 130, page 558	■	■	■	■					
Connection types	Cable, PVC, 2 m[4] (screened), (cannot be extended)	■	■	■	■					
VDE protection class	⧫	■	■	■	■					
Circuit protection[5]	A	■	■	■	■					
Enclosure rating	IP 66	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25…55°C)	■	■	■	■					
	Storage -40...158°F (-40…70°C)	■	■	■	■					
Approximate weight	0.8 oz (23 g)	■	■	■	■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

1) Average service life 100,000 h at T_A = 25°C
2) Signal transit time with resistive load
3) With light/dark ratio 1:1
4) Do not bend below 0°C
5) A = V_S connections reverse-polarity protected

Connection Diagram



SICK

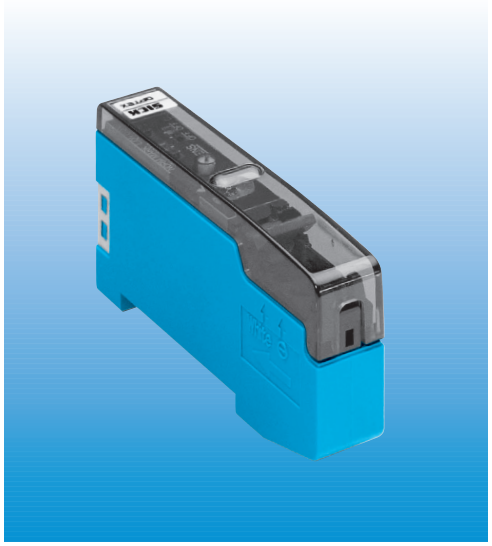
SI 130

Contrast Sensors

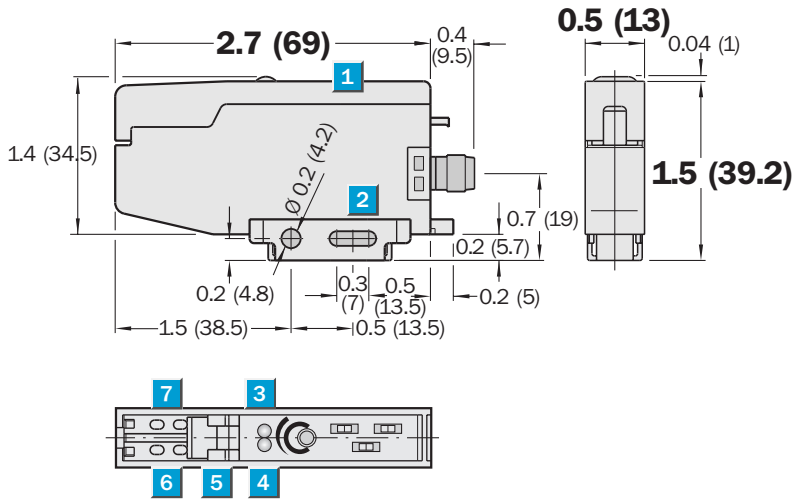
Highlights

- Basic unit for all S 130 sensors
- Simple connection of sensors
- DIN rail mounted
- Selectable off delay
- Selectable light or dark switching

SI 130

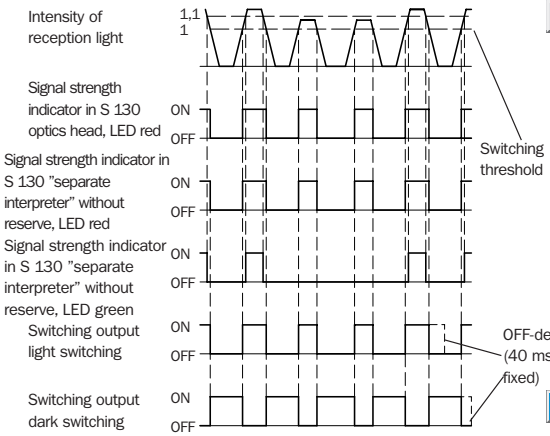


Dimensional Drawing



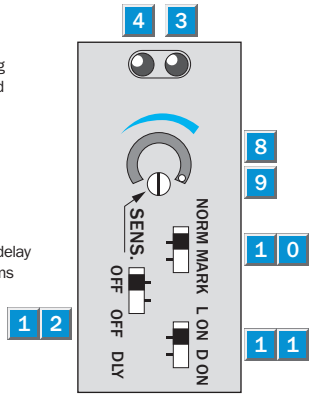
dimensions in inches (mm)

S 130 Function Diagram



Adjustments

All types



1 Protective hood
2 BF-WLL 160 mounting bracket (included)
3 LED signal strength indicator, red
(lights up when switching threshold is exceeded)
4 LED signal strength indicator, green
(lights up with reception reserve > 10%)
5 For releasing/locking connection wires of S 130 photoelectric switches/photoelectric proximity switches
6 Sender terminals (red), screen (–)
7 Receiver terminals (white), screen (–)
8 Sensitivity scale (270°)
9 Sensitivity control (2 revolutions)
10 Selector switch for "NORM"/"MARK" detection (t = 0.5 ms/t ≤ 0.2 ms)
11 Selector switch for light- ("L.ON")/ dark- ("D.ON") switching
12 Selector switch for OFF-delay "OFF"/ "OFF DLY", 40 ms fixed

Order information

Type	Part no.
SI 130-P12	6 011 089
SI 130-P40	6 011 090
SI 130-N12	6 011 087
SI 130-N40	6 011 088

Accessories	page
Cable receptacles	908
Mounting brackets*	918

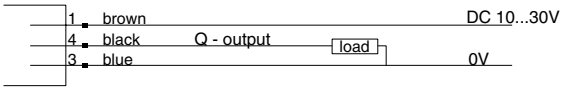
* included with delivery

Technical Data	SI 130-	P12	P40	N12	N40					
Power supply and evaluation unit	S 130 photoelectric switch series	■	■	■	■					
	in ultra-miniature housing,									
	see pages 556 to 557									
Operating mode										
"NORM" mode	All S 130 optics heads in	■	■	■	■					
	photoelectric switch mode									
"MARK" mode	Optics heads ST 130-S 13,	■	■	■	■					
	ST 130-S 19, ST 130-S 23,									
	ST 130-S 29 in									
	contrast scanner mode									
Sensitivity, adjustable	Potentiometer, 2 turns	■	■	■	■					
	with sensitivity scale 270°									
Time delay										
OFF-delay t_{OFF}	40 ms fixed, selectable via sliding switch	■	■	■	■					
Supply voltage V_S	10...30 V DC [1]	■	■	■	■					
Ripple[2]	± 10%	■	■	■	■					
Current consumption[3]	≤ 35 mA	■	■	■	■					
Switching outputs	PNP, open collector: Q	■	■							
	NPN, open collector: Q			■	■					
Output current I_A max.	100 mA	■	■	■	■					
Light receiver, switching mode	Light/dark switching	■	■	■	■					
	selectable via sliding switch									
Response time[4]/										
Max. switching frequency[5]										
"NORM" mode	≤ 0.5 ms/1000/s	■	■	■	■					
"MARK" mode	≤ 0.2 ms/2500/s	■	■	■	■					
Connection types	Cable, PVC, 2 m[6]	■		■						
	Plug, M 8 4-pin		■		■					
VDE protection class	⧫	■	■	■	■					
Circuit protection[7]	A, B, C, D	■	■	■	■					
Enclosure rating	IP 50	■	■	■	■					
Ambient temperature T_A	Operation -13...131°F (-25...55°C)	■	■	■	■					
	Storage -40...158°F (-40...70°C)	■	■	■	■					
Approximate weight	2.5 oz (70 g)	■		■						
	1.1 oz (30 g)		■		■					
Housing material	ABS	■	■	■	■					

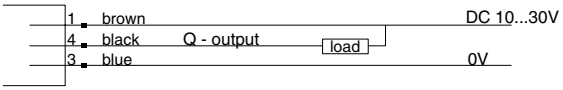
1) Limit values
2) May not exceed or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Do not bend below 0 °C
7) A = V_S connections reverse-polarity protected
= Inputs/outputs reverse-polarity protected
B C = Interference pulse suppression
D = Outputs overcurrent and short-circuit protected

Connection Diagram

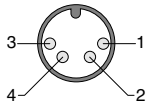
PNP Models



NPN Models



M8 Connector

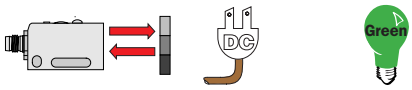


wire colors refer to standard cable, not included with quick disconnect models.

SICK

WTM 160T

Contrast Sensor



0.4 in (10 mm)
sensing distance

CE

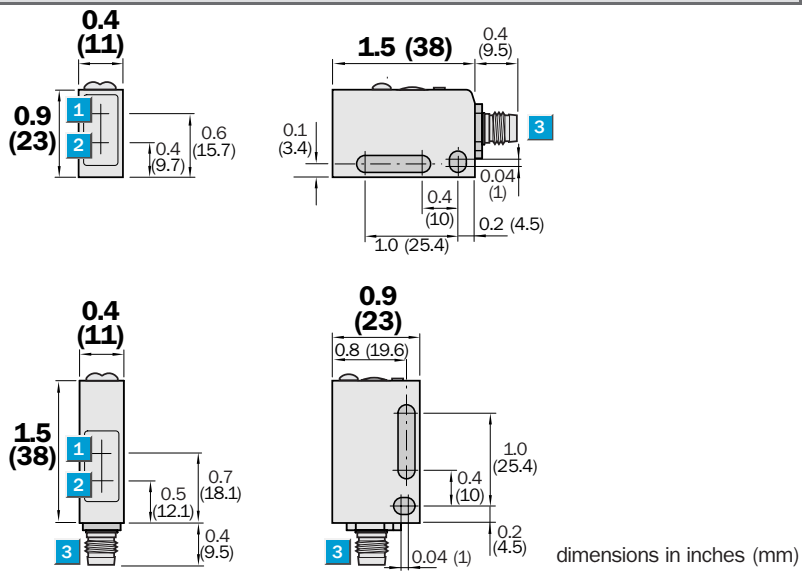
cULus

Highlights

- Contrast sensor in a small, compact housing
- Signal strength indicator
- Easy mounting with included brackets
- Cable or quick disconnect versions

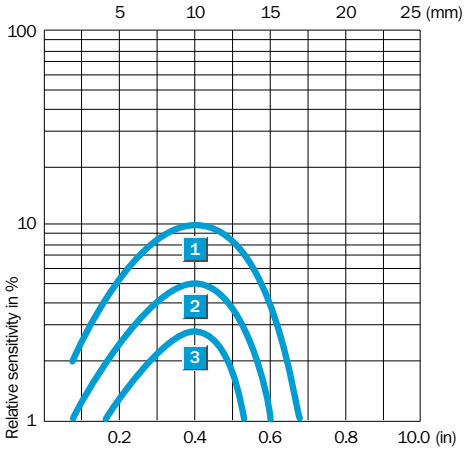
WTM 160T

Dimensional Drawing



dimensions in inches (mm)

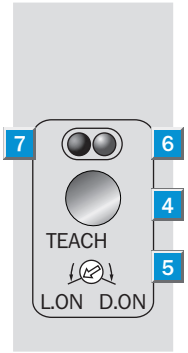
Relative Sensitivity



1	Sensing distance on white, 90% reflectance
2	Sensing distance on gray, 18% reflectance
3	Sensing distance on black, 6% reflectance

Adjustments

All types



1	Center of optical axis, receiver
2	Center of optical axis, sender
3	Plug, 3-pin/4-pin, M8 or cable
4	Teach-In button
5	Light/dark rotary switch: L = light switching, D = dark switching
6	Output indicator, orange
7	Signal strength indicator, green

Order Information

Type	Part no.
WTM 160T-P292	6 020 493
WTM 160T-P391	6 021 506
WTM 160T-P492	6 020 495
WTM 160T-N292	6 020 492
WTM 160T-N391	6 021 382
WTM 160T-N492	6 020 494
WTM 160T-F292	6 020 671
WTM 160T-F391	6 021 351
WTM 160T-F492	6 020 785
WTM 160T-E292	6 020 667
WTM 160T-391	6 021 505
WTM 160T-E492	6 020 695

Accessories

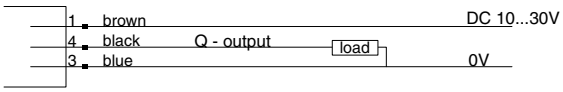
	page
Cables and connectors	908
Mounting brackets	919

Technical Data	WTM 160T-	P[1]/F[2] 292	P[1]/F[2] 391	P[1]/F[2] 492	N[1]/E[2] 292	N[1]/E[2] 391	N[1]/E[2] 492
Sensing distance	0.4 in ±0.08 in (10 mm ±2 mm)	■	■	■	■	■	■
Sensitivity control	External Teach (ET)	■		■	■		■
Light source[3]	LED, green light	■	■	■	■	■	■
Light spot diameter	Approx. 0.08 x 0.2 in at 0.4 in (2 x 5 mm at 10 mm)	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC[4]	■	■	■	■	■	■
Ripple[5]	± 10%	■	■	■	■	■	■
Current consumption[6]	≤ 40 mA	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■	■			
	NPN, open collector: Q				■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■
Switching mode	Light/dark switching via switch	■	■	■	■	■	■
Response time[7]/switching freq. max.[8]	≤ 0.2 ms / 2.5 kHz	■	■	■	■	■	■
Connection type:	Cable, PVC, 2 m[9]; 4 x 0.2 mm², I 4.2 mm	■			■		
	Plug, M8 3-pin		■			■	
	Plug, M8 4-pin			■			■
VDE protection class	⧫	■	■	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...131°F (-25...55°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Approximate weight	2.1 oz (60 g)	■			■		
	0.7 oz (20 g)		■	■		■	■
Housing material	PBT	■	■	■	■	■	■

1) Housing form: horizontal
2) Housing form: vertical
3) Average service life 100,000 h at $T_U = 25°C$
4) Limit values
5) Must be within V_S tolerances
6) Without load
7) With resistive load
8) With light/dark ratio 1:1
9) 5 m are available on request, do not bend cable below 0°C
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference suppression
D = Outputs overcurrent and short-circuit protected
11) HKS ≙ Hostmann-Steinberg, K+E printing inks, Schminke & Co. HKS colors are printing inks, which were developed by the above-mentioned companies, to guarantee the precise reproducibility of a color. They are standard in the graphic arts industry. HKS-N stands for uncoated paper in offset and letterpress printing with a col-or spectrum of 1 (yellow) to 97 (black). The color scale is available from SICK upon request. Order no.: 8 006 387.

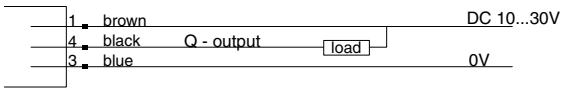
Connection Diagram

PNP Models

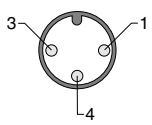


wire colors refer to standard cable, not included with quick disconnect models.

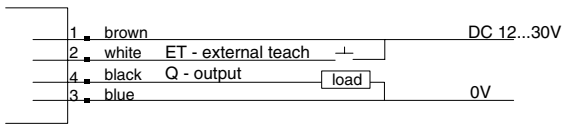
NPN Models



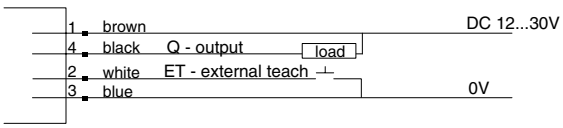
M8 Connector



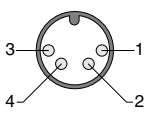
PNP



NPN



M8 Connector

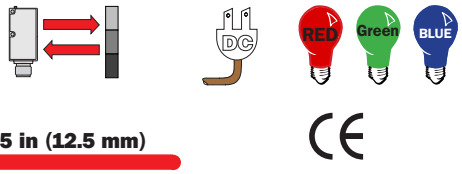


wire colors refer to standard cable, not included

SICK

KT 3

Contrast Sensors



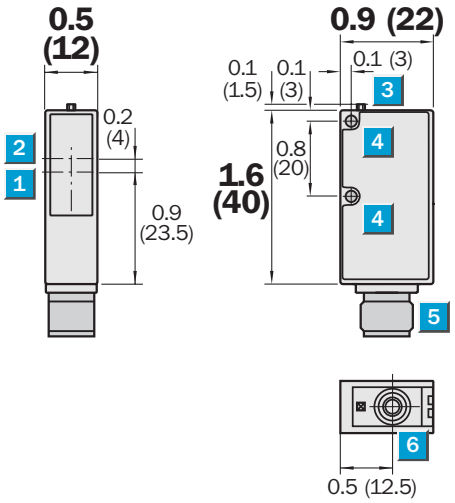
0.5 in (12.5 mm)
sensing distance

Highlights

- Green or red/green/blue light source
- Integrated switching threshold adjustment for detection of extremely shiny objects
- Teach-in sensitivity adjustment, mark and background
- Small, compact housing
- High switching frequency

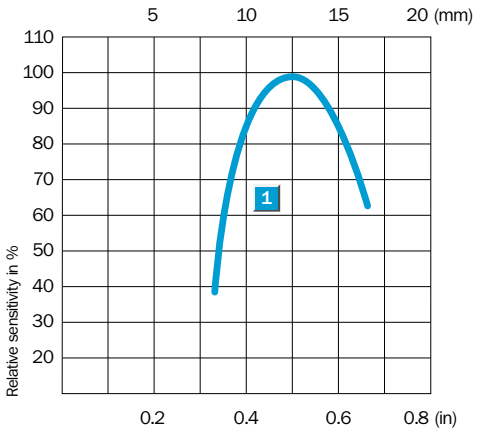
KT 3

Dimensional Drawing



dimensions in inches (mm)

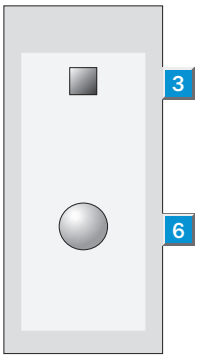
Relative Sensitivity



1 Sensing distance 12.5 mm

Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 LED signal strength indicator
4 Mounting hole Ø 0.1 in (3 mm)
5 Plug, M12 4-pin
6 Operating components

Order Information

Type	Part no.
KT 3W-P1116	1 019 338
KT 3W-N1116	1 019 337
KT 3G-P1116	1 019 446
KT 3G-N1116	1 019 445

Accessories	page
Cables and connectors	909
Mounting systems	933

Technical Data	KT 3-	W-P 1116	W-N 1116	G-P 1116	G-N 1116					
Sensing distance	0.5 in ±0.08 in (12.5 mm ±2 mm)	■	■	■	■					
Light spot dimensions	0.06 x 0.26 in (1.5 x 6.5 mm)	■	■							
	0.06 x 0.14 in (1.5 x 3.5 mm)			■	■					
Light source[1], light type	Red, green, blue	■	■							
	Green			■	■					
Supply voltage V_S	24 V DC ± 20%	■	■	■	■					
Ripple[2]	< 5 V_{PP}	■	■	■	■					
Current consumption[3]	< 35 mA	■	■	■	■					
Switching outputs	NPN: HIGH = V_S / LOW = < 2 V		■		■					
	PNP: HIGH = V_S- < 2 V/ LOW = approx. 0 V	■		■						
Output current I_A max.	100 mA	■	■	■	■					
Response time[4]	50 µs	■	■	■	■					
Switching frequency[5]	10 KHz	■	■	■	■					
Teach-in input ET	PNP: Teach > 10 V...< V_S	■		■						
	NPN: Teach 0 V		■		■					
Connection type	Plug, M12 4-pin	■	■	■	■					
VDE protection class[6]	⧈	■	■	■	■					
Enclosure rating	IP 67	■	■	■	■					
Circuit protection[7]	A, B, C	■	■	■	■					
Ambient temperature	Operation 14...131°F (-10... 55°C)	■	■	■	■					
	Storage -13...167°F (-20... 75°C)	■	■	■	■					
Shock/vibration	To IEC 68	■	■	■	■					
Approximate weight	0.7 oz (20 g)	■	■	■	■					
Housing material	Glass fiber reinforced ABS	■	■	■	■					

1) Average service life 100,000 h at T_A = 25°C
2) May not exceeded or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

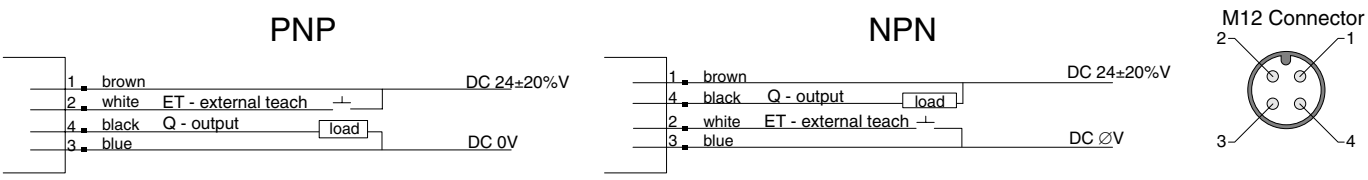
Static Teach-in

Static Teach-in KT 3 via control panel:
1. Place mark in light spot.
2. Press the Teach-in button on the equipment for >1 s, then trigger the first Teach-in procedure.
3. Place the light spot on the background, and then trigger the second Teach-in procedure.

Teach-in via control wire:
1. Place mark in light spot.
2. Trigger the first Teach-in procedure via the control wire.
3. Place the light spot on the background, and then trigger the second Teach-in procedure via the control wire.

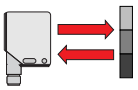
The KT 3W selects transmission light from among red, blue and green automatically.
Confirmation: After the first Teach-in procedure, the red transmitter light blinks with the KT 3W and the green with the KT 3G, and the status indicator blinks slowly and signals that a second Teach-in procedure must be triggered.
LED and status indicator blink rapidly = insufficient contrast.
LED and status indicator do not blink = Teach-in procedure completed.

Connection Diagram



KT 2

Contrast Sensors



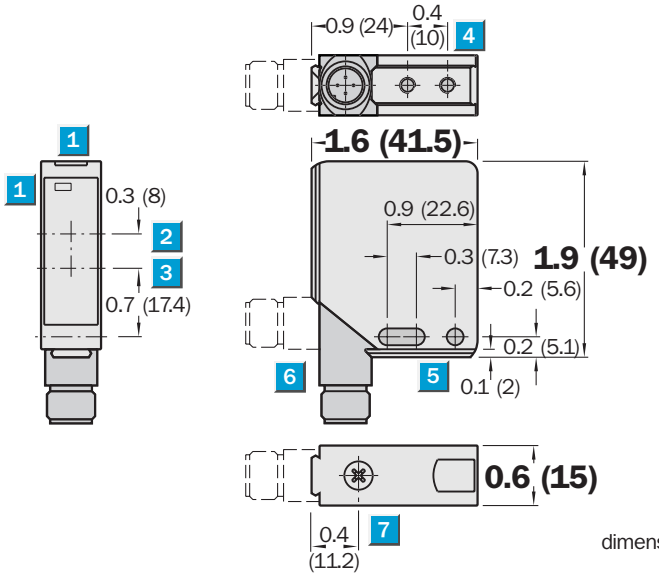

0.5 in (13.5 mm)
sensing distance

Highlights

- Rugged die cast metal housing
- Red or green light transmitter
- Light or dark switching selectable via control cable
- High switching frequency
- PNP and NPN switching output
- Rotatable quick disconnect

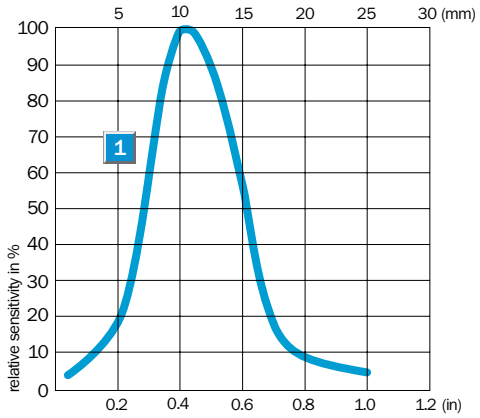
KT 2

Dimensional Drawing



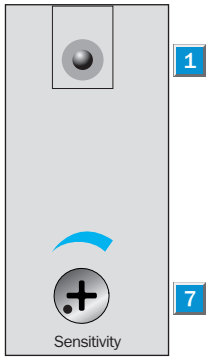
dimensions in inches (mm)

Relative Sensitivity



Adjustments

All types



1 Output indicator
2 Optical axis – receiver
3 Optical axis – sender
4 M4 threaded mounting hole, 4 mm deep
5 Through hole Ø 4.2 mm
6 Plug M12 (rotatable 90°)
7 Sensitivity adjustment

1	Sensing distance	13.5 mm

Order Information

Type	Part no.
KT 2R-2B3711	1 016 115
KT 2G-2B3711	1 016 112
KT 2G-2B3721	1 016 114

Accessories

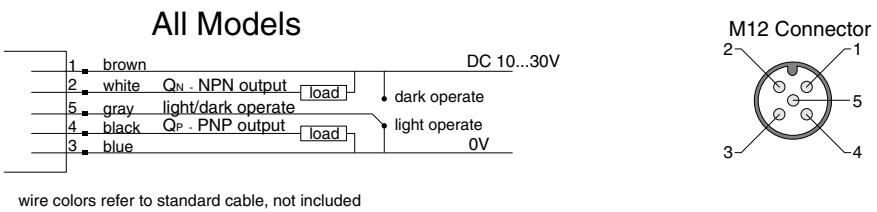
	page
Cables and connectors	909
Dovetail bracket*	921
Mounting brackets	922

* 2 dovetail brackets included with delivery

Technical Data	KT 2-	R-2B 3711	G-2B 3711	R-2B 3721						
Sensing distance	0.5 in (13.5 mm)	■	■	■						
Sensing distance tolerance	± 0.04 in (1 mm)	■	■	■						
Light spot diameter	0.08 in (2 mm)	■	■	■						
Light source[1], **light type**	LED, red	■		■						
	LED, green		■							
Supply voltage V_S	10…30 V DC[2]	■	■	■						
Ripple[3]	< 5 V_{SS}	■	■	■						
Current consumption[4]	< 80 mA	■	■	■						
Switching outputs	Light/dark switching, selectable via wire	■	■	■						
	PNP: HIGH = V_S – < 2.9V/LOW = approx. 0 V	■	■	■						
	NPN: HIGH = V_S/LOW = < 1.5 V	■	■	■						
Output current I_A max.	100 mA	■	■	■						
Response time[5]	≤ 50 µs	■	■	■						
Max. switching frequency[6]	10 kHz	■	■	■						
Timing options	20 ms OFF delay			■						
L/D input, light/dark switching	PNP: dark = > 10 V… < V_S	■	■	■						
	light = 0 V or no connection	■	■	■						
	NPN: dark = > 10 V... < V_S	■	■	■						
	light = 0 V or no connection	■	■	■						
Connection type	Plug, M12 5-pin,	■	■	■						
VDE protection class[7]	□	■	■	■						
Enclosure rating	IP 67/NEMA 6	■	■	■						
Circuit protection[8]	A, B, C	■	■	■						
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■						
	Storage -13...167°F (-25…75°C)	■	■	■						
Shock/vibration	To IEC 68	■	■	■						
Approximate weight	14 oz (400 g)	■	■	■						
Housing material	Die cast zinc	■	■	■						

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

Connection Diagram

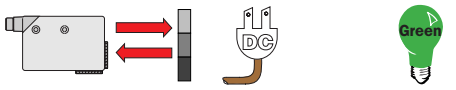


wire colors refer to standard cable, not included

SICK

KT 5G-2

Contrast Sensors

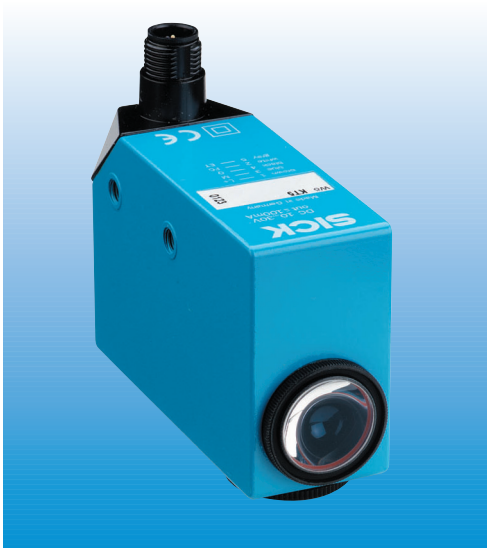


0.4/0.8/1.6 in (10/20/40 mm) sensing distance

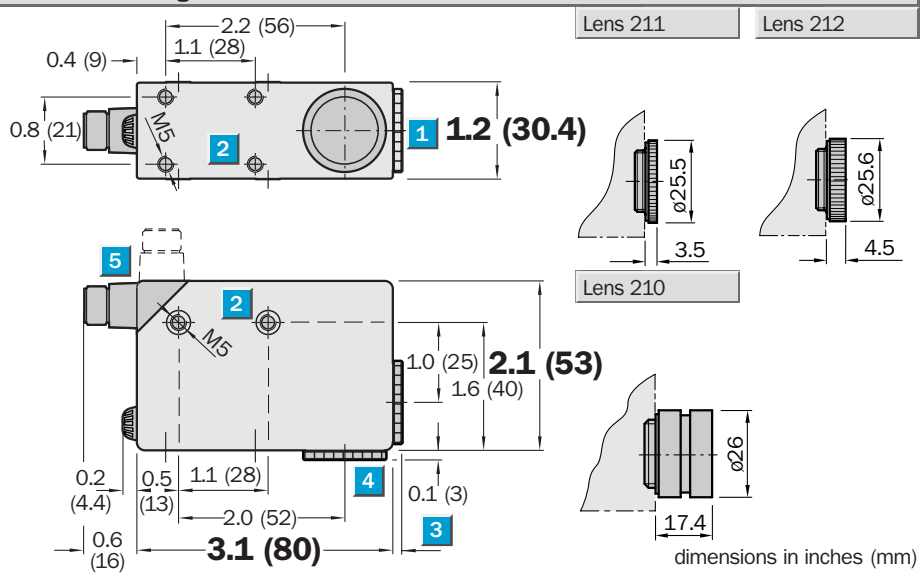
Highlights

- Rugged die cast metal housing
- Red-green LED light source
- Changeable lens position
- Switching frequency to to 10 kHz
- Insensitive to ambient light
- Indicator LEDs for easy setup
- Rotatable quick disconnect

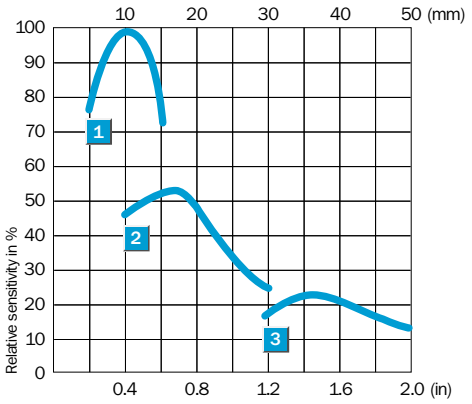
KT 5G-2



Dimensional Drawing



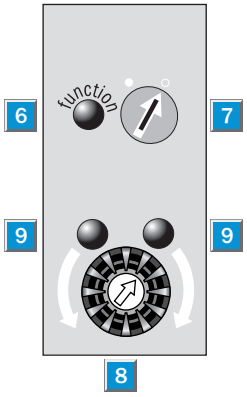
Relative Sensitivity



1	Sensing distance 10 mm
2	Sensing distance 20 mm
3	Sensing distance 40 mm

Adjustments

All types



1	Lens (light transmission), can be replaced by item 4
2	M5 mounting holes, 5.5 mm deep
3	See dimensional drawing of lens
4	Blind screw, can be replaced by item 1
5	M12 plug (rotatable 90°)
6	Output indicator (yellow)
7	Operating mode switch
X	Light switching
⁞	Dark switching
8	Switching threshold adjustment
9	Setting aid (green)

Order Information

Type	Part no.
KT 5G-2P1111	1 015 993
KT 5G-2P1121	1 015 997
KT 5G-2N1121	1 015 983
KT 5G-2P1311	1 016 003
KT 5G-2N1111	1 015 981
KT 5G-2N1311	1 015 988

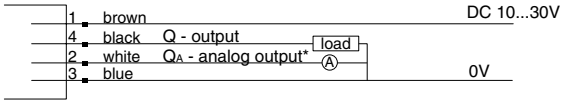
Accessories	page
Cables and connectors	909
Lens	946
Mounting brackets	935

Technical Data	KT 5G-2-	P1111	P1121	N1121	P1311	N1111	N1311			
Sensing range from front edge of lens/										
Light spot dimensions	0.4 in ±0.1 in (10 ±3 mm)/0.05 x 0.2 in (1.2 x 4.2 mm)	■	■	■		■				
	0.8 in ±0.1 in (20 ±3 mm)/0.06 x 0.2 in (1.5 x 5.5 mm)									
	1.6 in ±0.1 in (40 ±3 mm)/0.04 x 0.2 in (1.1 x 4.2 mm)				■		■			
Light spot orientation	Parallel or perpendicular to long side of sensor	■	■	■	■	■	■			
Light source[1], **light type, wavelength**	LED, green light, 520 nm	■	■	■	■	■	■			
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■			
Ripple[3]	< 5 V_{SS}	■	■	■	■	■	■			
Current consumption[4]	< 80 mA	■	■	■	■	■	■			
Switching outputs	Light/dark switching, selectable via switch	■	■	■	■	■	■			
	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■	■		■					
	NPN: HIGH = V_S / LOW = < 2 V			■		■	■			
Output current I_A max.	100 mA	■	■	■	■	■	■			
Response time[5]	50 µs	■	■	■	■	■	■			
Max. switching frequency[6]	to 10 kHz	■	■	■	■	■	■			
Optional timing functions	No timing element	■			■	■	■			
	Deactivation delay, ...20 ms		■	■						
Analog output Q_A, (optional)	0.3…10 mA (consult factory for models)									
Switching threshold	Adjustable (standard type)	■	■	■	■	■	■			
Connection type	Plug, M12 4-pin	■	■	■	■	■	■			
VDE protection class[7]	□	■	■	■	■	■	■			
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■			
Circuit protection[8]	A, B, C	■	■	■	■	■	■			
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■	■	■	■			
	Storage -13...167°F (-25…75°C)	■	■	■	■	■	■			
Shock/vibration	To IEC 68	■	■	■	■	■	■			
Approximate weight	14 oz (400 g)	■	■	■	■	■	■			
Housing material	Die cast zinc	■	■	■	■	■	■			

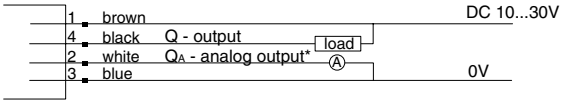
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q and Q_A short-circuit protected
C = Interference pulse suppression

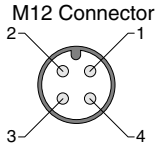
Connection Diagram

PNP Models



NPN Models





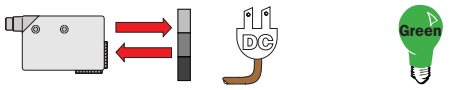
wire colors refer to standard cable, not included

*analog output available on certain models only

SICK

KT 5G-2 Teach

Contrast Sensors



0.4 in (10 mm)/0.8 in (20 mm)
sensing distance

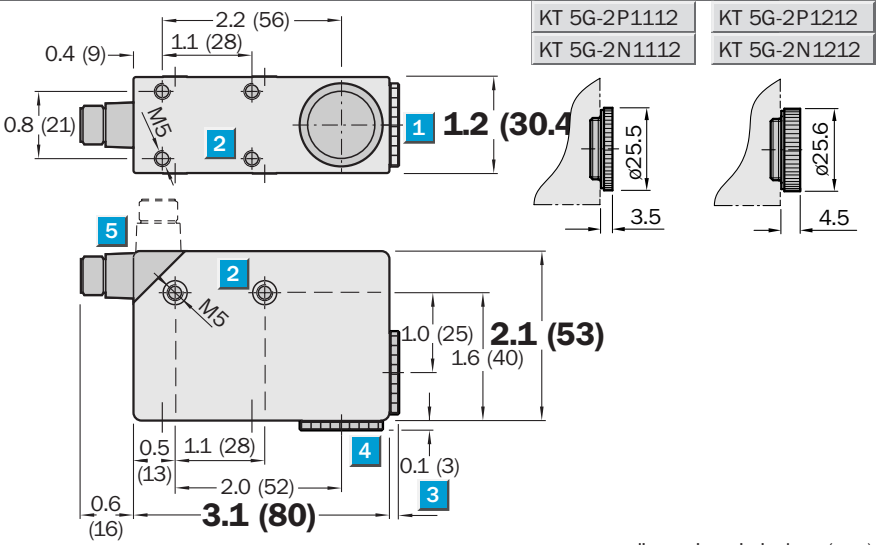
Highlights

- Rugged die cast metal housing
- Teach-in sensitivity setting
- Fine/coarse sensitivity adjustment or teach-in can be done by wire
- Insensitive to ambient light
- Switching rate up to 10 kHz
- Changeable lens position
- Rotatable quick disconnect

KT 5G-2 Teach

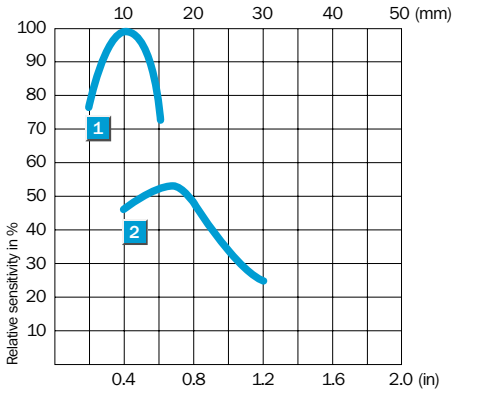
Dimensional Drawing

KT 5G-2P1112	KT 5G-2P1212
KT 5G-2N1112	KT 5G-2N1212



dimensions in inches (mm)

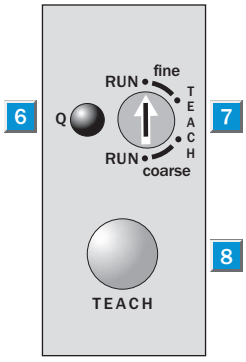
Relative Sensitivity



1	Sensing distance with lens 211	10 mm
2	Sensing distance with lens 212	20 mm

Adjustments

All types



1 Lens (light transmission), can be replaced by Item 4
2 M5 mounting holes, 5.5 mm deep
3 See dimensional drawing of lens
4 Blind screw, can be replaced by Item 1
5 M12 plug (rotatable 90°)
6 Output indicator (yellow)
7 Pre-selection switch for minimum contrast
8 Teach-in button

Teach-in

Teach-in and fine/coarse (contrast resolution)
The two settings can be triggered simultaneously either via control panel or control cables.

Control panel: The teach-in button can be locked against accidental actuation with "run".
In an undefined switching position, no teach-in procedure can be triggered.

Setting via control panel:
1. Select "fine" or "coarse" using rotating switch
2. Position light spot on mark
3. Trigger teach-in via teach-in switch
Light-/dark-switching is not required/acknowledge/signal or Q active = teach-in procedure completed

Setting via control cable:
1. Select "fine" or "coarse" using rotating switch
2. Position light spot on mark
3. Trigger teach-in via ET control cable

Order Information

Type	Part no.
KT 5G-2P1112	1 016 628
KT 5G-2N1112	1 016 717
KT 5G-2P1212	1 016 718
KT 5G-2N1212	1 016 719
KT 5G-2P1122	1 017 296
KT 5G-2N1122	1 017 977
KT 5G-2P2112	1 017 956
KT 5G-2N2112	1 018 164

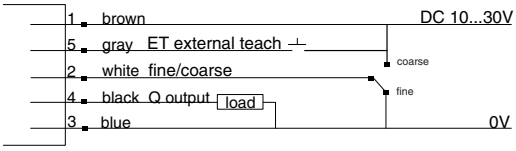
Accessories	page
Cables and connectors	909
Mounting brackets	935
Lens	946

Technical Data	KT 5G-2-	P1112	N1112	P1212	N1212	P1122	N1122	P2112	N2112
Sensing distance	0.4 in (10 mm) ± 0.1 in (3 mm)	■	■			■	■	■	■
	0.8 in (20 mm) ± 0.1 in (3 mm)			■	■				
Light spot dimensions, vertical	0.05 x 0.2 in (1.2 x 4.2 mm)	■	■	■	■	■	■		
horizontal	0.05 x 0.2 in (1.2 x 4.2 mm)							■	■
Light source[1], **light type**	LED, green	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	< 5 V_{SS}	■	■	■	■	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■		■		■		■	
	NPN: HIGH = V_S / LOW = < 2 V		■		■		■		■
Output current I_A max.	100 mA, short circuit protected	■	■	■	■	■	■	■	■
Response time[5]	50 µs	■	■	■	■	■	■	■	■
Max. switching frequency[6]	to 10 kHz	■	■	■	■	■	■	■	■
Time delay	Optional 20 ms OFF delay					■	■		
Teach-in input ET	PNP - Teach > 10 V…< V_S	■		■		■		■	
	Run 0 V or no connection	■		■		■		■	
	NPN - Teach 0 V		■		■		■		■
	Run V_S or no connection		■		■		■		■
Pulse duration	ET > 10 ms	■	■	■	■	■	■	■	■
Retention time	25 ms non-volatile memory	■	■	■	■	■	■	■	■
Fine/coarse input F/C	PNP: Fine: 0 V or no connection	■		■		■		■	
	Coarse: > 10 V…< V_S	■		■		■		■	
	NPN: Fine: V_S or no connection		■		■		■		■
	Coarse: 0 V		■		■		■		■
Connection type	Plug, M12 5-pin	■	■	■	■	■	■	■	■
VDE protection class[7]	⧈	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■	■	■	■	■	■
	Storage -13...167°F(-25…75°C)	■	■	■	■	■	■	■	■
Shock/vibration	To IEC 68	■	■	■	■	■	■	■	■
Approximate weight	14 oz (400 g)	■	■	■	■	■	■	■	■
Housing material	Die cast zinc	■	■	■	■	■	■	■	■

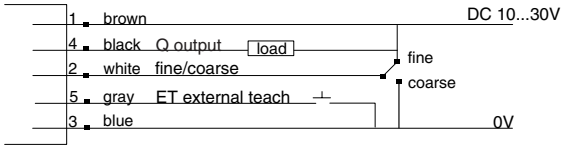
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

Connection Diagram

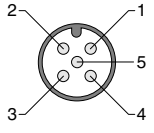
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

KT 5W-2 Dynamic Teach

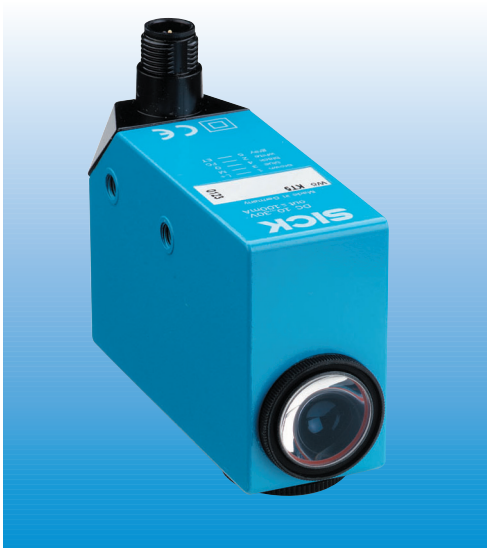
Contrast Sensors

0.4 in (10 mm)/ 0.8 in (20 mm) sensing distance

Highlights

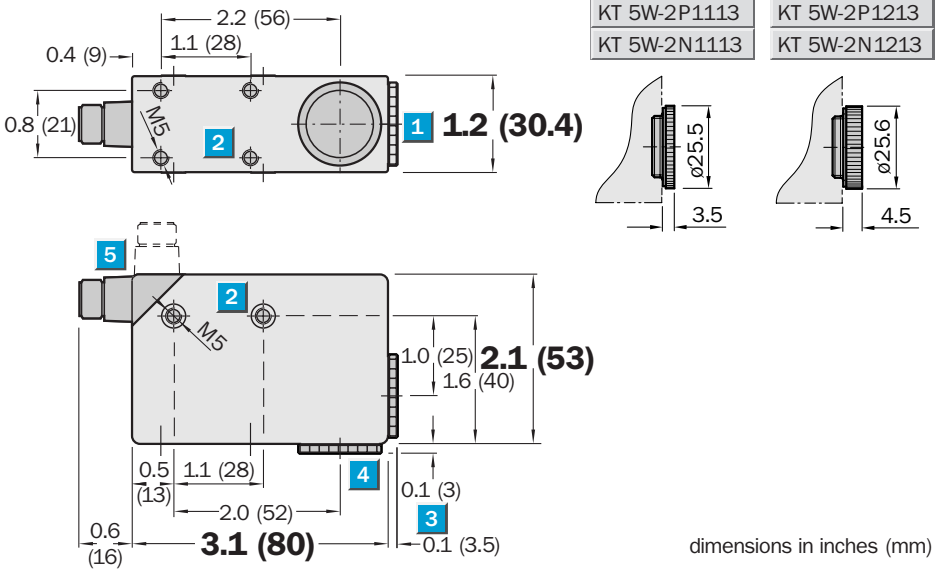
- Rugged die cast metal housing
- Red, blue and green light source automatically selected
- Insensitive to ambient light
- Teach-in sensitivity adjustment “on the fly”
- Switching frequency up to 10 kHz
- Light/dark selection or teach-in can be done via wire
- Changeable lens position

KT 5W-2 Dynamic Teach



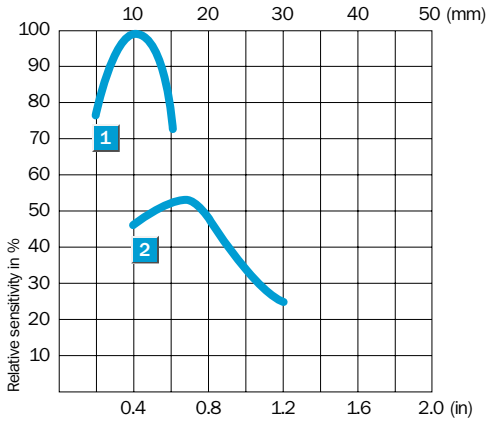
Dimensional Drawing

KT 5W-2P1113	KT 5W-2P1213
KT 5W-2N1113	KT 5W-2N1213



dimensions in inches (mm)

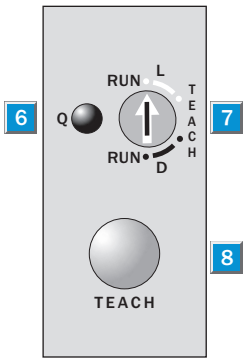
Relative Sensitivity



1	Sensing distance with lens 211	10 mm
2	Sensing distance with lens 212	20 mm

Adjustments

All types



1. Lens (light transmission), can be replaced by Item 4
2. M5 mounting holes, 5.5 mm deep
3. See dimensional drawing of lens
4. Blind screw, can be replaced by Item 1
5. M12 plug (rotatable 90°)
6. Output indicator (yellow)
7. L/D switch
8. Teach button

Teach-in

Teach-in and light/dark
The two settings can be triggered simultaneously either via control panel or control cable.

Control panel: The teach-in button can be locked against accidental actuation with “run”. In an undefined switching position, no teach-in procedure can be triggered.

Setting through control panel:
1. Select “light (L)” or “dark (D)” using rotating switch
2. Trigger teach-in via teach-in button
3. Run the object to be detected at least one register length through the light spot

Acknowledged via Q or LED control flashes=insufficient contrast.

Setting via control cable (overrides setting on control panel)
1. Select “light” or “dark” using control cable
2. Trigger teach-in via ET control cable
3. Run the object to be detected at least one register length through the light spot
4. End teach-in

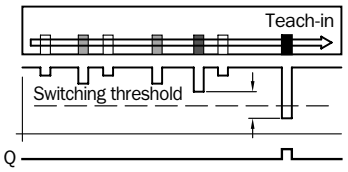
Material speed during teach-in:
min. 25 mm/s, max. 300 mm/s.

Order Information

Type	Part no.
KT 5W-2P1113	1 016 629
KT 5W-2N1113	1 016 630
KT 5W-2P1213	1 016 715
KT 5W-2N1213	1 016 716

Accessories

	page
Cables and connectors	909
Mounting brackets	935
Lens	946

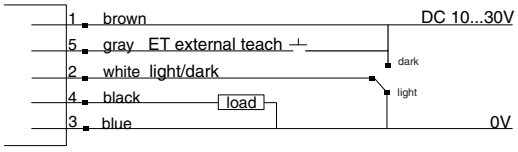


Technical Data	KT 5W-2-	P1113	N1113	P1213	N1213					
Sensing distance	0.4 in (10 mm) ± 0.1 in (3 mm)	■	■							
	0.8 in (20 mm) ± 0.1 in (3 mm)			■	■					
Light spot dimensions	0.05 x 0.2 in (1.2 x 4.2 mm)	■	■							
Light source[1], **light type**	LED, red, blue, green	■	■	■	■					
Supply voltage V_S	10…30 V DC[2]	■	■	■	■					
Ripple[3]	< 5 V_{SS}	■	■	■	■					
Current consumption[4]	< 80 mA	■	■	■	■					
Switching outputs Q	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■		■						
	NPN: HIGH = V_S / LOW = < 2 V		■		■					
Output current I_A max.	100 mA, short-circuit protected	■	■	■	■					
Response time[5]	50 µs	■	■	■	■					
Max. switching frequency[6]	to 10 kHz	■	■	■	■					
Teach-in input ET	PNP - Teach: > 10 V…< V_S	■		■						
	Run: 0 V or no connection	■		■						
	NPN - Teach: 0 V		■		■					
	Run: V_S or no connection		■		■					
Retention time	25 ms non-volatile memory	■	■	■	■					
L/D input, light/dark switching	PNP: dark = > 10 V…< V_S	■		■						
	light = 0 V or no connection	■		■						
	NPN: dark = 0 V		■		■					
	light = V_S or no connection		■		■					
Connection type	Plug, M12 5-pin	■	■	■	■					
VDE protection class[7]	□	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Circuit protection[8]	A, B, C	■	■	■	■					
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■	■					
	Storage -13...167°F (-25…75°C)	■	■	■	■					
Shock/vibration	To IEC 68	■	■	■	■					
Approximate weight	14 oz (400 g)	■	■	■	■					
Housing material	Die cast zinc	■	■	■	■					

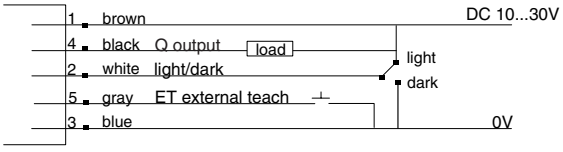
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

Connection Diagram

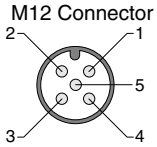
PNP Models



NPN Models



M12 Connector

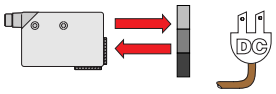


wire colors refer to standard cable, not included

SICK

KT 5G-2 Automatic

Contrast Sensors



0.4 in (10 mm)
sensing distance

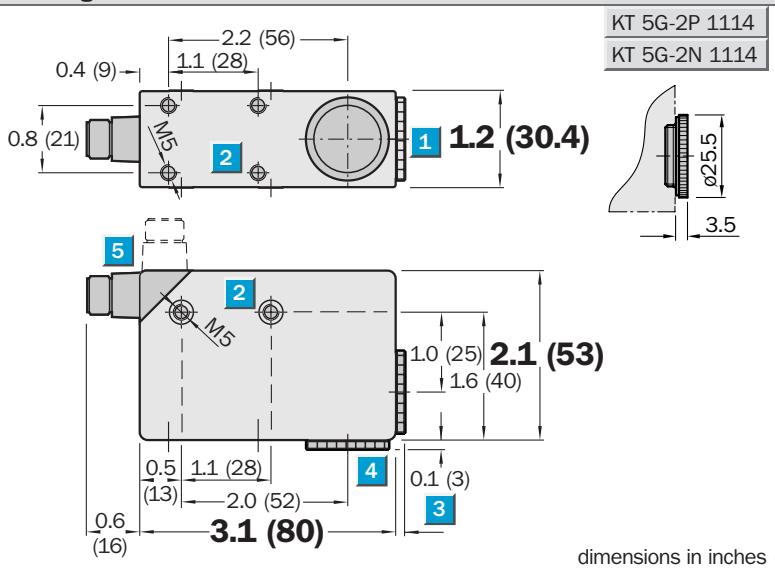
Highlights

- Rugged die cast metal housing
- Continuous, automatic sensitivity adjustment
- Fine/course and light/dark adjustments can be made via the control wire
- Switching frequency up to 10 kHz
- Insensitive to ambient light
- Changeable lens position
- Rotatable quick disconnect

KT 5G-2 Automatic

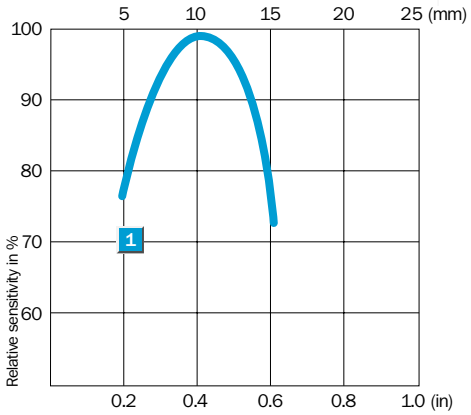
Dimensional Drawing

KT 5G-2P 1114
KT 5G-2N 1114



dimensions in inches (mm)

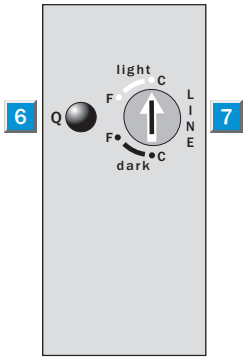
Relative Sensitivity



1	Sensing distance	10 mm

Adjustments

All types



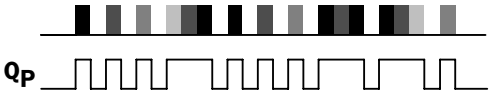
1	Lens (light transmission), can be replaced by Item 4
2	M5 mounting holes, 5.5 mm deep
3	See dimensional drawing of lens
4	Blind screw, can be replaced by Item 1
5	M12 plug (rotatable 90°)
6	Output indicator (yellow)
7	Fine/coarse selection

Function

The switching threshold for the KT 5G-2 P/N 1114 contrast scanner is tracked dynamically to the existing contrast. No teach-in procedure is required. The “fine” or “coarse” contrast and the “light” or “dark” selection can be triggered via the switch on the control panel or the control cable.

In the LINE switching position, the control panel is blocked, only F/C and L/D settings triggered via the control cable are accepted.

The following example shows function in the “coarse” position and the “dark switching” operating mode:



Order Information

Type	Part no.
KT 5G-2P1114	1 016 999
KT 5G-2N1114	1 017 000

Accessories

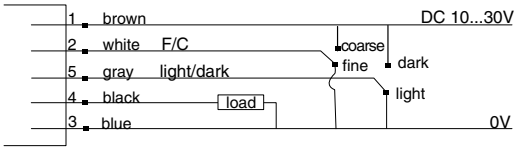
	page
Cables and connectors	909
Mounting brackets	935
Lens	946

Technical Data	KT5G-2-	P1114	N1114
Sensing distance	0.4 in ±0.1 in (10 mm ±3 mm)		
Light spot dimensions	0.05 x 0.2 in (1.2 x 4.2 mm)		
Light source[1], **light type**	LED, green		
Supply voltage V_S	10…30 V DC[2]		
Ripple[3]	< 5 V_{SS}		
Current consumption[4]	< 80 mA		
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V		
	NPN: HIGH = V_S / LOW = < 2 V		
Output current I_A max.	100 mA, short-circuit protected		
Response time[5]	50 µs		
Max. switching frequency[6]	to 10 kHz		
Fine/coarse input, F/C	PNP - Fine 0 V or no connection		
	Coarse > 10 V…< V_S		
	NPN - Fine V_S or no connection		
	Coarse 0 V		
L/D input, light/dark switching	PNP: dark = > 10 V…< V_S		
	light = 0 V or no connection		
	NPN: dark = 0 V		
	light = V_S or no connection		
Connection type	Plug, M12 5-pin		
VDE protection class[7]	□		
Enclosure rating	IP 67/NEMA 6		
Circuit protection[8]	A, B, C		
Ambient temperature T_A	Operation 14...131°F (-10…55°C)		
	Storage -13...167°F (-25…75°C)		
Shock/vibration	To IEC 68		
Approximate weight	14 oz (400 g)		
Housing material	Coated metal		

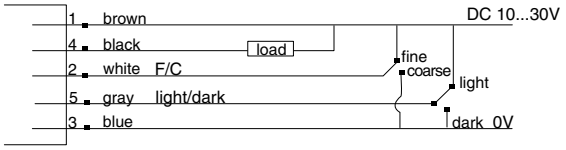
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

Connection Diagram

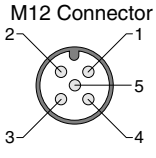
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

KT 5W-2 Mark Teach with Bar Graph Display

Contrast Sensors

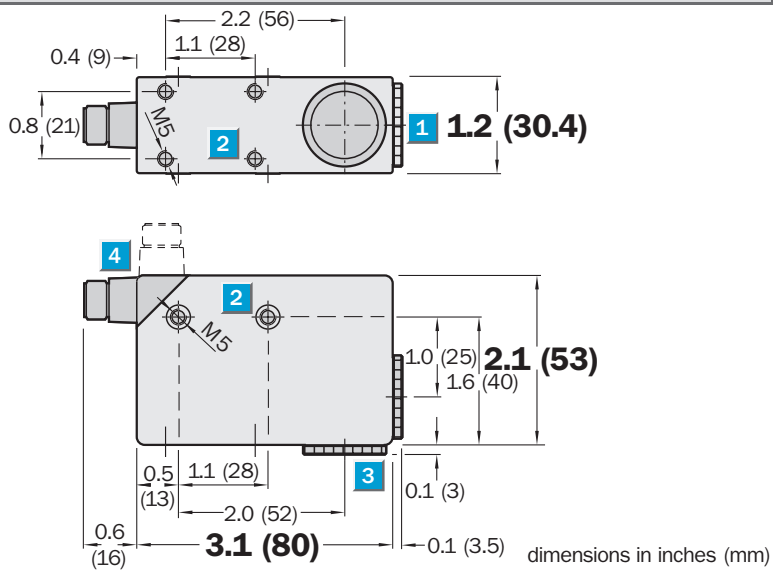
0.4 in (10 mm)
sensing distance

Highlights

- Integrated 10-segment bar graph display
- Teach-in sensitivity adjustment mark-background
- Switching rate up to 10 kHz
- Adjustable threshold after teach-in
- Insensitive to ambient light
- Red, green or blue light source automatically selected
- Rotatable quick disconnect
- Rugged die cast metal housing

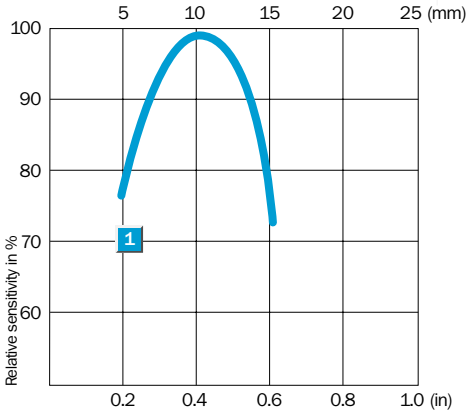
KT 5W-2 Mark Teach

Dimensional Drawing



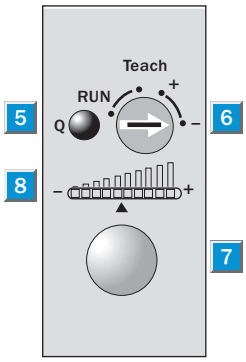
dimensions in inches (mm)

Relative Sensitivity



Adjustments

All types



1. Lens (light transmission), can be replaced by Item 3
2. M5 mounting holes, 5.5 mm deep
3. Blind screw, can be replaced by Item 1
4. 5 pin, M12 x 1 plug (rotatable through 90°)
5. Function signal indicator (yellow)
6. Pre-selection switch
7. Teach-in button
8. Bar display

1	Sensing distance with lens 211	10 mm

Static Teach-in

Control panel: The teach-in button can be locked against accidental actuation with "run". In an undefined switching position, no teach-in procedure can be triggered.
Setting via push button:
1. Select teach-in using rotating switch
2. Position mark or background under the light spot
   – trigger first teach-in procedure via teach-in button
3. Position background or mark under the light spot
   – trigger second teach-in procedure via teach-in button.

Setting via control cable:
1. Position mark or background under the light spot
   – trigger first teach-in procedure via ET control cable
2. Position background or mark under the light spot
   – trigger second teach-in procedure via ET control cable.

Acknowledgement: After the first teach-in procedure, the red transmission light flashes and the function signal slowly indicates that a second teach-in procedure must be triggered.
-- LED and Q flash quickly = insufficient contrast
-- LED and Q do not flash = teach-in completed
Light/dark-switching not required, unit switches on the object to be detected, that was under the light spot during the first teach-in procedure (mark or background).

Order Information

Type	Part no.
KT 5W-2P1116D	1 026 538
KT 5W-2N1116D	1 026 540

Accessories

	page
Cables and connectors	909
Mounting brackets	935
Lens	946

Bar graph status

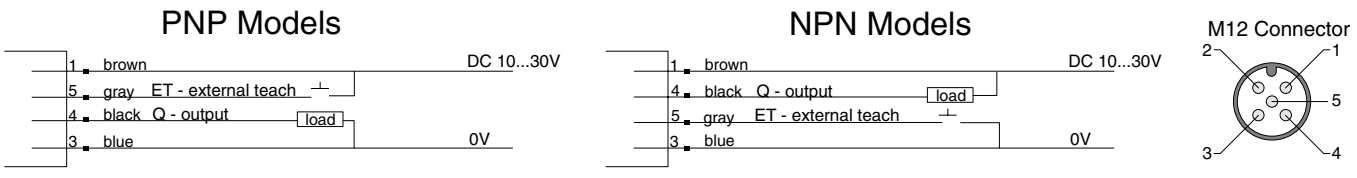
Detection reliability: After teach-in, the bar graph displays the quality of the taught-in contrast. The more lighted LEDs, the more reliable the detection of the mark.
1 LED: minimum contrast difference, not reliable
≤ 4 LEDs: sufficient contrast difference, reliable operation
> 4 LEDs: high contrast difference, very reliable operation
Operation and adjustment: In RUN, bar displays the current level of the material being sensed. Threshold is in the middle, output changes state as threshold is passed. Adjusting +/- changes switching threshold 1/2 LED per press of button.

Technical Data	KT 5W-2-	P1116D	N1116D
Sensing distance*	0.4 in ±0.1 in (10 mm ±3 mm)	■	■
Light spot dimensions	0.05...0.2 in (1.2 x 4.2 mm)	■	■
Light source[1], light type	LED, red, blue, green	■	■
Supply voltage V_S	10…30 V DC[2]	■	■
Ripple[3]	< 5 V_{SS}	■	■
Current consumption[4]	< 130 mA	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■	
	NPN: HIGH = V_S / LOW = < 2 V		■
Output current I_A max.	100 mA, short-circuit protected	■	■
Response time[5]	50 µs	■	■
Max. switching frequency[6]	to 10 kHz	■	■
Teach-in input (ET)	PNP - Teach: > 10 V…< V_S	■	
	Run: 0 V or no connection	■	
	NPN - Teach: 0 V		■
	Run: V_S or no connection		■
Retention time	25 ms non-volatile memory	■	■
Connection type	Plug, M12 5-pin	■	■
VDE protection class[7]	□	■	■
Enclosure rating	IP 67/NEMA 6	■	■
Circuit protection[8]	A, B, C	■	■
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■
	Storage -13...167°F (-25…75°C)	■	■
Shock/vibration	To IEC 68	■	■
Approximate weight	14 oz (400 g)	■	■
Housing material	Coated metal	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

* 20mm and 40mm versions available on demand

Connection Diagram

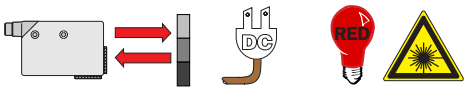


wire colors refer to standard cable, not included

SICK

KT 5L

Contrast Sensors



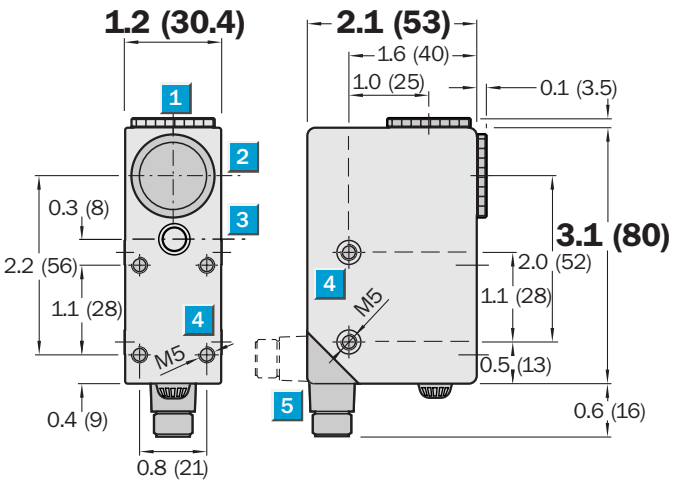
5.9 in (150 mm)
sensing distance

Highlights

- Rugged die cast metal housing
- Laser class II
- Adjustment switch
- Long sensing distance
- Analog output
- High resolution for long sensing distances
- Accurate recording of very small marks
- Switching frequency 10 kHz
- Rotatable m12 quick disconnect

KT 5L

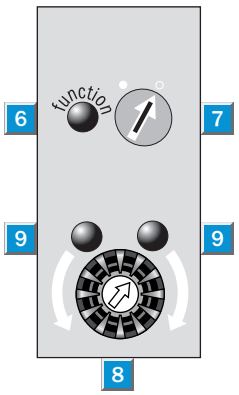
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1	Blind screw
2	Receiver
3	Sender
4	M5 mounting holes, 5.5 mm deep
5	M12 plug
6	Status display (red)
7	Operating mode switch
X	Light switching
I	Dark switching
8	Switching threshold adjustment
9	Adjustment indicators (green)

Order Information

Type	Part no.
KT 5L-P3611S01	1 015 155

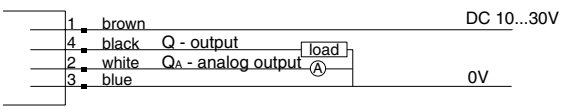
Accessories	page
Cables and connectors	909
Mounting brackets	935

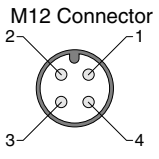
Technical Data	KT 5L-	P3611 S01								
Sensing distance	5.9 in (150 mm) ± 0.4 in (10 mm)									
Light spot	< 0.01 in at 5.9 in (0.3 mm at 150 mm)									
Light source[1], light type	Laser diode, red light									
Supply voltage V_S	10 ... 30 V DC[2]									
Ripple[3]	< 5 V_{SS}									
Current consumption[4]	< 80 mA									
Switching outputs	Light/dark switching, selectable via switch									
	PNP: HIGH = V_S – < 2 V/LOW = 0 V									
	NPN: HIGH = V_S /LOW = < 2 V									
Output current I_A max.	100 mA, short-circuit protected									
Response time[5]	50 µs									
Max. switching frequency[6]	To 10 kHz									
Analog output Q_A	0.3…10 mA									
Connection type	Plug, M12 4-pin									
VDE protection class[7]	□									
Laser class	2 (IEC 825/VDE 0837)									
Enclosure rating	IP 67/NEMA 6									
Circuit protection[8]	A, B, C									
Ambient temperature T_A	Operation 14...104°F (-10…40°C)									
	Storage -13...167°F (-25…75°C)									
Shock/vibration	To IEC 68									
Approximate weight	14 oz (400 g)									
Housing material	Die cast zinc									

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and Q_A short-circuit protected
C = Interference pulse suppression

Connection Diagram

PNP Models



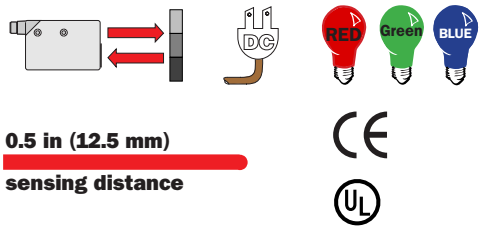


wire colors refer to standard cable, not included

SICK

KT 10W

Contrast Sensors

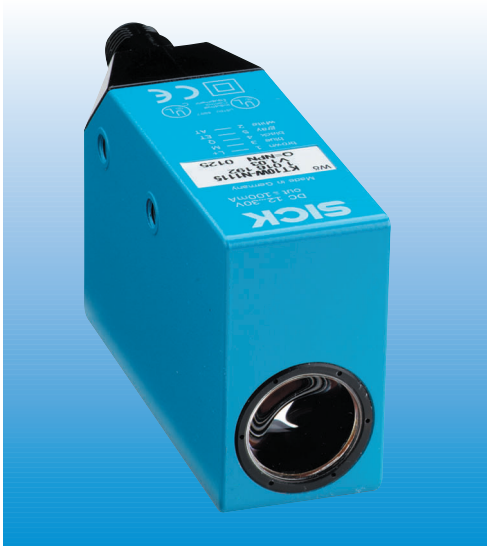


0.5 in (12.5 mm)
sensing distance

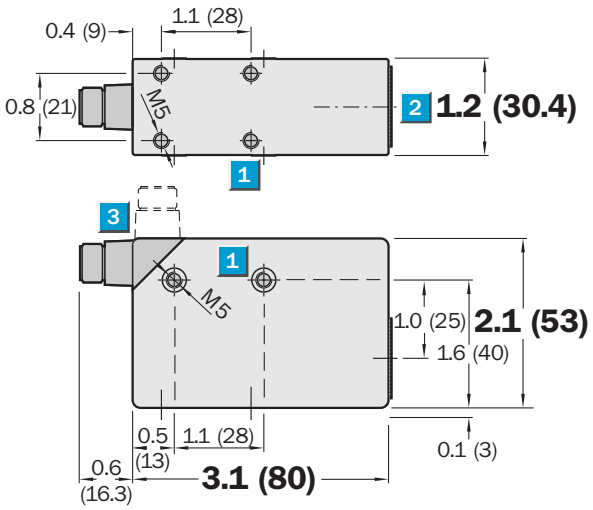
Highlights

- Rugged metal housing
- Advanced “on the fly” teach-in of settings that automatically selects the proper light source
- Insensitive to ambient light
- Red, green and blue LEDs provide the ability to read an color mark
- Switching rate up to 25 kHz
- Rotatable M12 quick disconnect

KT 10W



Dimensional Drawing



dimensions in inches (mm)

Teach-in

The switching threshold is set using the teach-in procedure, with either the ET teach-in cable or the teach-in button on the unit.

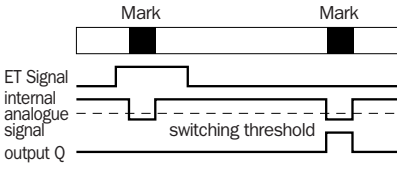
Procedure:

- Move program selector switch to position Q.
- Shine light spot in front of the mark on template.
- Activate and retain teach signal through teach button or ET cable.
- Move the template with the mark through the light spot.
- Deactivate teach signal.
- The switching threshold has settled in the center between the receiver signals from background and mark and is saved in the non-volatile memory.
- The optimum light source is selected automatically.

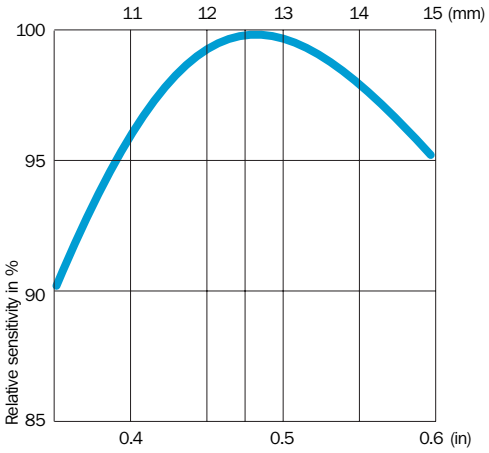
Note:

- For small marks the material speed during the teach-in procedure must not exceed 10 m / minute.
- Teach-in one mark only.
- If the teach-in procedure is unsuccessful, the output switches at approx. 5 kHz and the LED signal flashes.

The receive signal was too low, too high (possibly through brightness) or the contrast differential was too low.

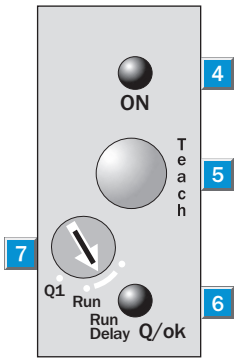


Relative Sensitivity



Adjustments

All types



1 M5 threaded mounting hole, 5.5 mm deep
2 Lens (light transmission)
3 Plug, M12 5-pin, (rotatable)
4 Power indicator (green)
5 Teach-in button
6 Output indicator and teach-in (yellow)
7 Set/run switch

Order Information

Type	Part no.
KT 10W-P1115	1 016 169
KT 10W-N1115	1 016 192
KT 10W-P2115	1 016 562
KT 10W-N2115	1 016 649

Accessories

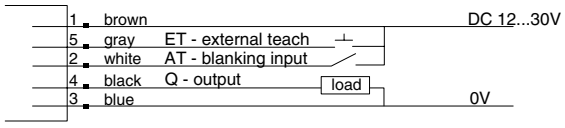
Accessories	page
Cables and connectors	909
Mounting brackets	935

Technical Data	KT 10W-	P1115	N1115	P2115	N2115					
Sensing distance	0.5 in ±0.1 in (12.5 mm ±2 mm)	■	■	■	■					
Light spot dimensions	00. x 0.2 in (0.8 x 4 mm)	■	■	■	■					
Light source[1], light type	LED, red, green, blue	■	■	■	■					
Light spot orientation	Parallel to long side of device	■	■							
	Perpendicular to long side of device			■	■					
Supply voltage V_S	12…30 V DC[2]	■	■	■	■					
Ripple[3]	< 5 V	■	■	■	■					
Current consumption[4]	< 150 mA	■	■	■	■					
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V	■		■						
	NPN: HIGH = V_S/LOW = < 2 V		■		■					
Output current I_A max.	100 mA	■	■	■	■					
Response time[5]	< 20 µs	■	■	■	■					
Max. switching frequency[6]	25 kHz	■	■	■	■					
Jitter	< 10 µs	■	■	■	■					
Timing options	20 ms, adjustable OFF delay	■	■	■	■					
Teach-in input ET	PNP - Teach: > 10 V	■		■						
	Run: < 2 V or no connection									
	NPN - Teach: < 2 V		■		■					
	Run: > 10 V or no connection									
Blanking input AT										
Blanked	PNP: AT > 10 V	■		■						
Free running	AT < 2 V or no connection	■		■						
	NPN: AT < 2 V		■		■					
	AT > 10 V or no connection		■		■					
Connection type	Plug M 12, 5-pin	■	■	■	■					
VDE protection class[7]	⧈	■	■	■	■					
Circuit protection[8]	A, B, C	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A	Operation 14...140°F (-10…60°C)	■	■	■	■					
	Storage -13...167°F (-25…75°C)	■	■	■	■					
Shock/vibration	To IEC 68	■	■	■	■					
Approximate weight	14 oz (400 g)	■	■	■	■					
Housing material	Die cast zinc	■	■	■	■					

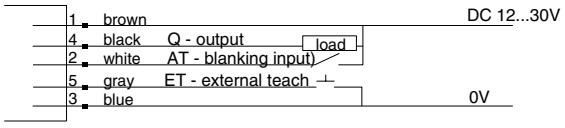
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

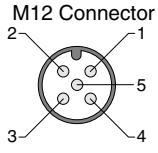
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

NT 6

Contrast Sensors

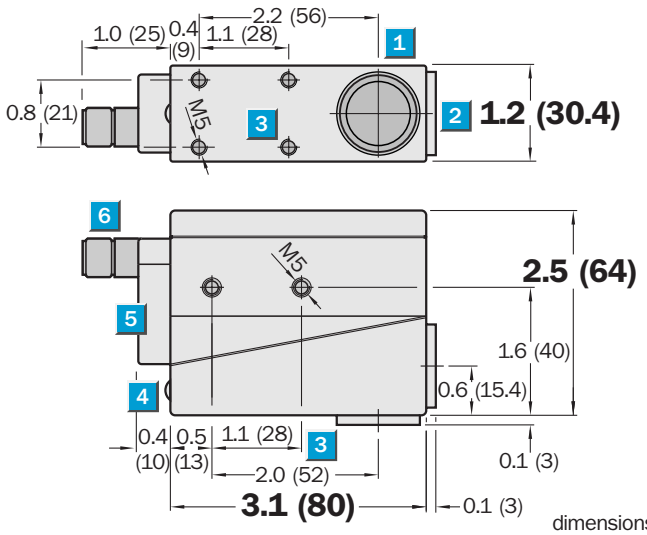
0.4 in (9 mm)
sensing distance

Highlights

- LED light source with two switchable ranges (red/green)
- Changeable lens position
- Selectable light or dark switching
- Status indicator
- Switching frequency up to 10 kHz
- Analog output
- Semi-automatic switching threshold adjustment

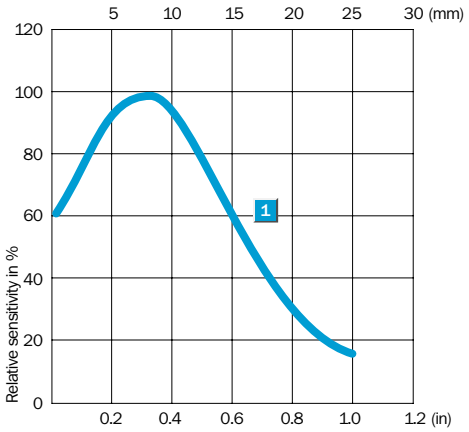
NT 6

Dimensional Drawing



dimensions in inches (mm)

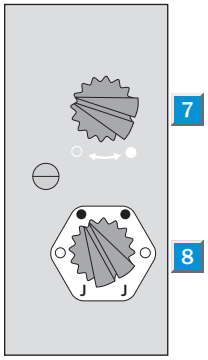
Relative Sensitivity



1	Sensing distance	9 mm

Adjustments

All types



1 Blind screw can be replaced by Item 2
2 Lens can be replaced by Item 1
3 M5 threaded mounting hole, 5.5 mm deep
4 Output indicator
5 Cover for adjuster
6 M12 plug,
or 2 m cable with T3104/1 plug,
or 2 m cable
7 Control for switching threshold
8 Mode selector
○ Light switching
| Dark switching

Order Information

Type	Part no.
NT 6-03012	1 005 821
NT 6-03022	1 005 822
NT 6-03018	1 006 367
NT 6-13012	1 005 823
NT 6-13022	1 005 824
NT 6-04012	1 006 474
NT 6-04022	1 006 475
NT 6-04018	1 007 478

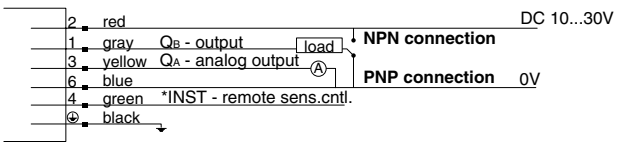
Accessories	page
Cables and connectors	912
Lens	946

Technical Data	NT 6-	03012	03022	03018	13012	13022	04012	04022	04018
Sensing range from front edge of lens	0.4 in ±0.08 in (9 mm ±2 mm)	■	■	■	■	■	■	■	■
Light type/light spot dimension	Green/0.06 x 0.2 in (1.5 x 5 mm)	■	■	■	■	■	■	■	■
	Red/0.06 x 0.2 in (1.5 x 4 mm)	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, red, green selectable	■	■	■	■	■	■	■	■
Light spot orientation	Longitudinal	■	■	■			■	■	■
	Transverse				■	■			
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	< 5 V	■	■	■	■	■	■	■	■
Current consumption[4]	< 80 mA	■	■	■	■	■	■	■	■
Switching outputs	Light/dark switching, selectable via switch	■	■	■	■	■	■	■	■
	B: HIGH = V_S – < 2 V/LOW = < 2 V	■	■	■	■	■	■		
	PNP: HIGH = V_S – < 2 V/LOW = 0 V							■	■
Output current I_A max.	200 mA	■	■	■	■	■	■	■	■
Response time[5]	50 µs	■	■	■	■	■	■	■	■
Max. switching frequency[6]	To 10 kHz	■	■	■	■	■	■	■	■
Analog output Q_A	0.15…6 V (no reflection to total reflection)	■	■	■	■	■	■	■	■
Connection types	Cable[7] with T 3104/1 plug	■			■		■		
	Cable[7] without plug		■			■		■	
	Plug, M12 4-pin			■					■
VDE protection class[8]	□	■	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation 32...122°F (0…50°C)	■	■	■	■	■	■	■	■
	Storage -13...167°F (-25…75°C)	■	■	■	■	■	■	■	■
Shock/vibration	To IEC 68	■	■	■	■	■	■	■	■
Approximate weight	19 oz (540 g)	■	■	■	■	■	■	■	■
Housing material	Cast metal	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
9) Part no. 1 004 936
10) Part no. 2 009 266

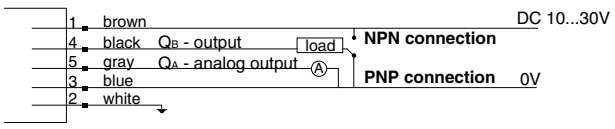
Connection Diagram

Cable and Amphenol Plug Models

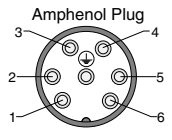


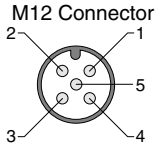
*remote sensitivity control available on special models only

M12 Connector Models



wire colors refer to standard cable, not included





SICK

NT 8

Contrast Sensors

0.4 in (9 mm)
sensing distance

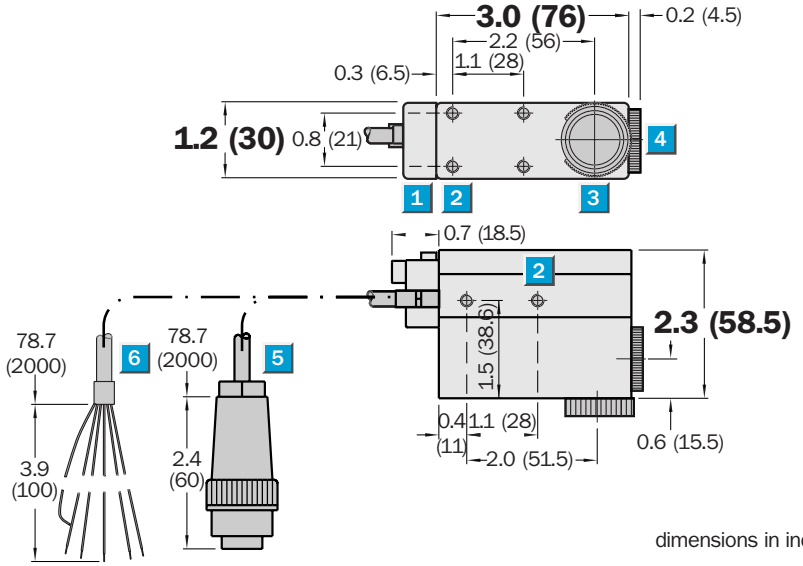
CE

Highlights

- Rugged die cast metal housing
- White light source, filterable
- Switching frequency up to 10 kHz
- Analog output
- Selectable light and dark switching
- Status indicator
- Changeable lens position
- Adjustable switching threshold

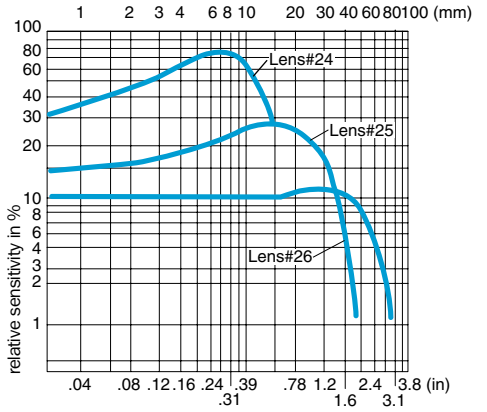
NT 8

Dimensional Drawing



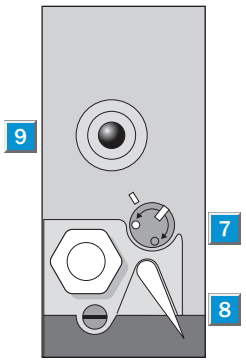
dimensions in inches (mm)

Relative Sensitivity



Adjustments

All types



1 Cover for adjuster
2 M5 threaded mounting hole, 5.5 mm deep
3 Dry cartridge with sight glass, can be replaced by Item 4
4 Lens, can be replaced by Item 3
5 2 m cable with 6-pin plug + PE
6 2 m cable
7 Control for switching threshold
8 Light/dark switch
9 Output indicator

Order Information

Type	Part no.
NT 8-01412	1 005 981
NT 8-02412	1 005 985

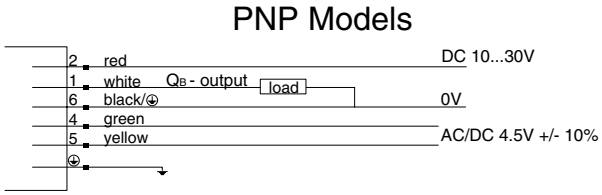
Other models available. Consult www.sickusa.com or call 800-325-SICK.

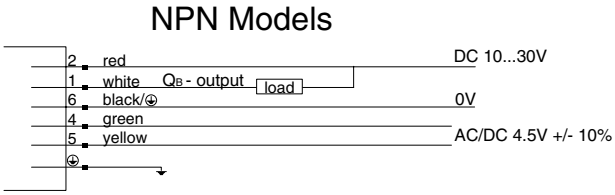
Accessories	page
Cables and connectors	912
Cable	912
Lens	953, 954

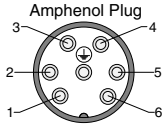
Technical Data	NT 8-	01412	02412
Sensing range from front edge of lens	0.4 in ±0.08 in (9 mm ±2 mm)		
Light	0.06 x 0.14 in (1.5 x 3.5 mm)		
Light source[1], **light type**	Incandescent lamp, white		
Light spot orientation	Longitudinal		
	Transverse		
Supply voltage V_S	10…30 V DC[2]		
Ripple[3]	< 2 V		
Current consumption[4]	< 50 mA		
Supply voltage for lamp	4.5 V ± 10%		
Current consumption for lamp	840 mA		
Switching outputs	Light/dark switching, selectable via switch		
	PNP: HIGH = V_S – < 2 V/LOW = 0 V		
	NPN: HIGH = V_S / LOW = < 2 V		
Output current I_A max.	200 mA		
Response time[5]	50 µs		
Max. switching frequency[6]	10 kHz		
Connection types	Cable[7] with 6-pin plug + PE		
	Cable[7] without plug		
VDE protection class[8]	⧈		
Enclosure rating	IP 67/NEMA 6		
Circuit protection[9]	A, B, C		
Ambient temperature T_A	Operation 32...122°F (0…50°C)		
	Storage -13...185°F (-25…85°C)		
Shock/vibration	To IEC 68		
Approximate weight	10.5 oz (300 g)		
Housing material	Cast metal		

1) Average service life 10,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 0°C
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression
10) Part no. 1 001 324
11) Part no. 1 001 325
12) Part no. 1 001 326
13) Part no. 1 001 327

Connection Diagram







SICK

NTL 6

Contrast Sensors

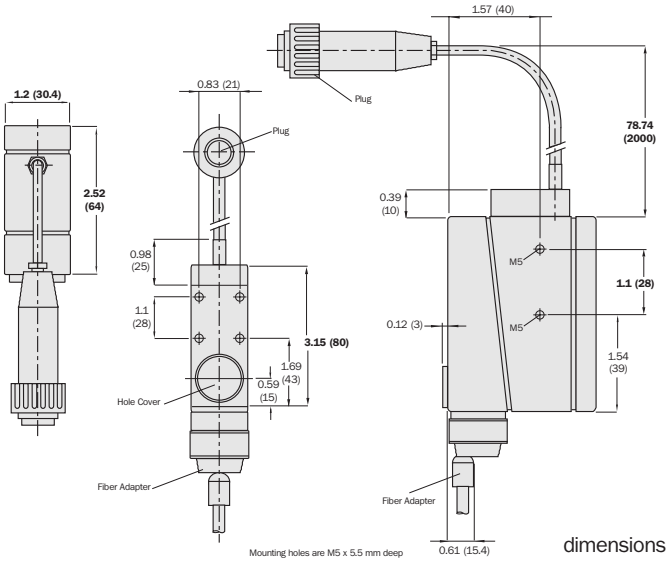
0...0.6 in (0...15 mm)
0...2.4 in (0...60 mm)
sensing distance

Highlights

- Rugged die cast metal housing
- Selectable LED light source (red/IR, red/green)
- Semi-automatic switching threshold adjustment
- Insensitive to ambient light
- Switching frequency up to 10 kHz
- Reverse polarity protected
- PNP or NPN in the same switch
- Status indicator

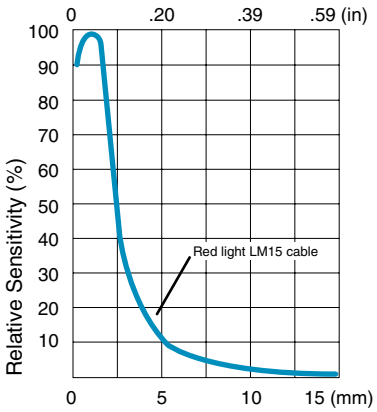
NTL 6

Dimensional Drawing



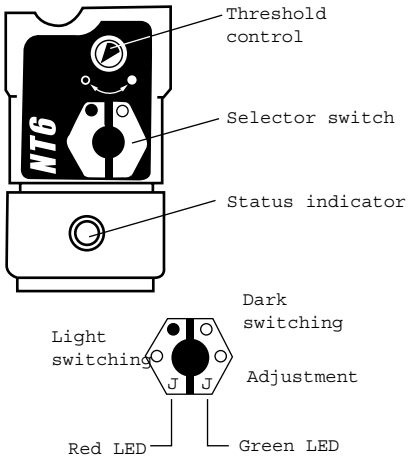
dimensions in inches (mm)

Relative Sensitivity



Adjustments

All types



Order Information

Type	Part no.
NTL 6-B11	1 008 615
NTL 6-B12	1 008 616
NTL 6-E11	1 009 593
NTL 6-E12	1 009 594
NTL 6-B18	1 009 754
NTL 6-B18E01	1 009 853
NTL 6-B10S01	1 011 361

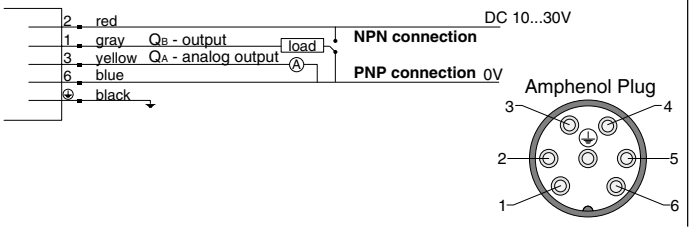
Accessories	page
Cables and connectors	909
Fiber optic cables	1000

Technical Data	NTL 6-	B11	B12	E11	E12	B18	B18E01	B10S01		
Sensing distance, diffuse	0.2...0.2 in (0.5...5 mm) red and green	■	■	■	■	■		■		
	0...0.6 in (0...15 mm) infrared	■	■	■	■	■		■		
Sensing distance, through beam	0...0.8 in (0...20 mm) red and green	■	■	■	■	■	■	■		
	0...2.4 in (0...60 mm) infrared	■	■	■	■	■		■		
Light source[1]**, light type**	LED, red/infrared	■	■	■	■	■		■		
	LED, red/green						■			
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■		
Ripple[3]	≤ 5 V peak to peak	■	■	■	■	■	■	■		
Current consumption[4]	≤ 80 mA	■	■	■	■	■	■	■		
Switching outputs	Light or dark switching via switch	■	■	■	■	■	■	■		
	PNP: HIGH = V_S – < 2 V / LOW = 0 V	■	■	■	■	■	■	■		
	NPN: HIGH = V_S / LOW = < 2 V	■	■			■	■	■		
Output current I_A max.	200 mA	■	■	■	■	■	■	■		
Response time[5]	≤ 50 µs	■	■	■	■	■	■	■		
Max. switching frequency[6]	to 10 kHz	■	■	■	■	■	■	■		
Time delay	15 ms OFF delay			■	■					
Analog output Q_A	.15...6 V	■	■	■	■	■	■	■		
Connection type	Cable		■		■					
	Cable with amphenol plug	■		■						
	Plug, M12 5-pin							■		
	Plug, M12 4-pin					■	■			
VDE protection class[7]	□	■	■	■	■	■	■	■		
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■		
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■		
Ambient temperature T_A	Operation 32...122°F (0…50°C)	■	■	■	■	■	■	■		
	Storage -13...167°F(-25…75°C)	■	■	■	■	■	■	■		
Shock/vibration	To IEC 68	■	■	■	■	■	■	■		
Approximate weight	19 oz (540 g)	■	■	■	■	■	■	■		
Housing material	Die cast metal	■	■	■	■	■	■	■		

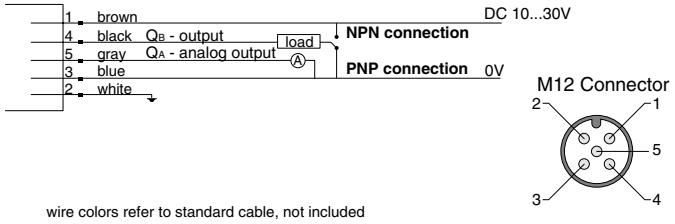
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

Connection Diagram

Cable and Amphenol Plug Models



M12 Connector Models

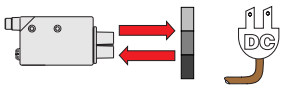


wire colors refer to standard cable, not included

SICK

KTL 5G-2

Contrast Sensors



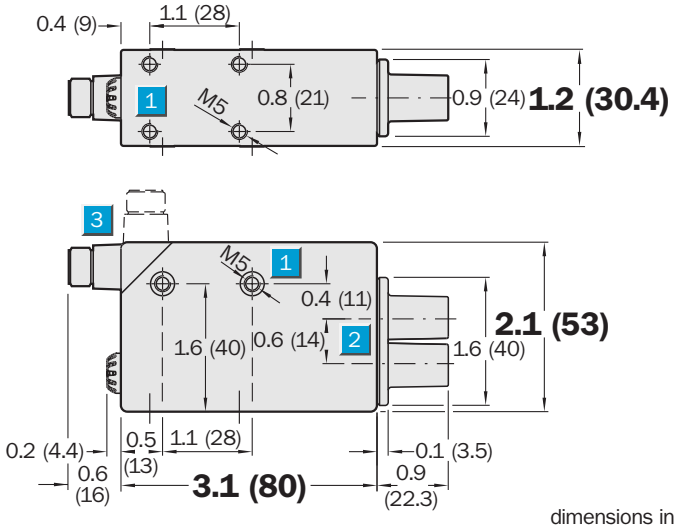
dependent on fiber sensing distance

Highlights

- Rugged metal housing
- Selectable light or dark switching
- Indicator LEDs for easy setup
- Insensitive to ambient light
- Switching frequency 10 kHz
- Uses industry standard fibers
- Rotatable M12 quick disconnect

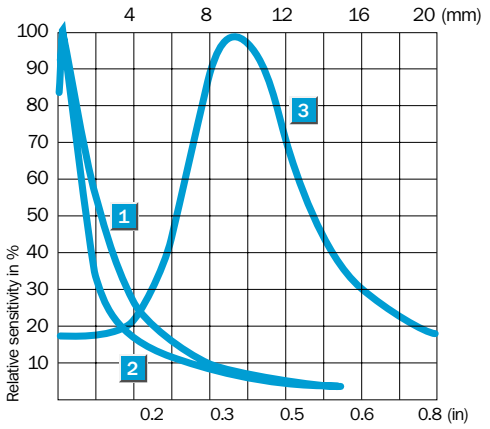
KTL 5G-2

Dimensional Drawing



dimensions in inches (mm)

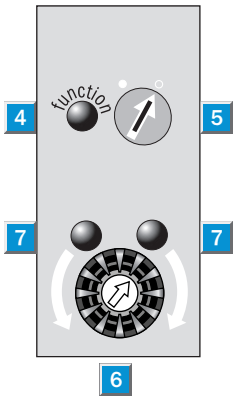
Relative Sensitivity



1	Fiber optic cable LBST 32900
2	Fiber optic cable LBSR 32900
3	Fiber-optic cable OCSL

Adjustments

All types



1	M5 mounting holes, 5.5 mm deep
2	Fiber-optic adapter (M12 x 1 internal thread)
3	M12 plug (rotatable 90°)
4	Output indicator (yellow)
5	Operating mode switch
X	Light switching
I	Dark switching
6	Switching threshold adjustment
7	Adjustment indicators (green)

Order Information

Type	Part no.
KTL 5G-2 P 11	1 016 294
KTL 5G-2 N 11	1 016 295

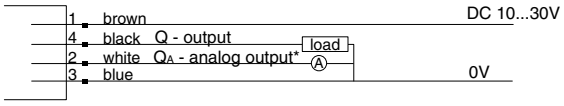
Accessories	page
Cables and connectors	909
Fiber optic cables	1000
Mounting brackets	935

Technical Data	KTL 5G-2-	P11	N11
Sensing distance	Dependent on fiber used		
Light source[1], **light type**	LED, green		
Supply voltage V_S	10…30 V DC[2]		
Ripple[3]	< 5 V_{SS}		
Current consumption[4]	< 30 mA at 24 V DC		
Switching outputs	Light/dark switching, selectable via switch		
	PNP: HIGH = V_S – < 2 V/LOW = 0 V		
	NPN: HIGH = V_S /LOW = < 2 V		
Output current I_A max.	100 mA, short-circuit protected		
Response time[5]	50 µs		
Max. switching frequency[6]	To 10 kHz		
Analog output Q_A	0.3…10 mA (consult factory for models)		
Connection type	Plug, M12 4-pin		
VDE protection class[7]	□		
Enclosure rating	IP 67/NEMA 6		
Circuit protection[8]	A, B, C		
Ambient temperature T_A	Operation 14...131°F (-10…55°C)		
	Storage -13...167°F (-25…75°C)		
Shock/vibration	To IEC 68		
Approximate weight	14 oz (400 g)		
Housing material	Die cast zinc		

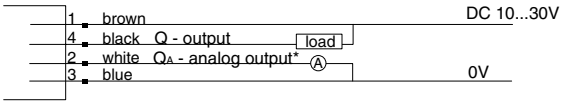
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and Q_A short-circuit protected
C = Interference pulse suppression

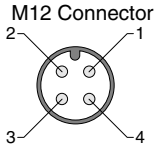
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included

*analog output available on certain models only

SICK

KTL 5W-2 Dynamic Teach

Contrast Sensors

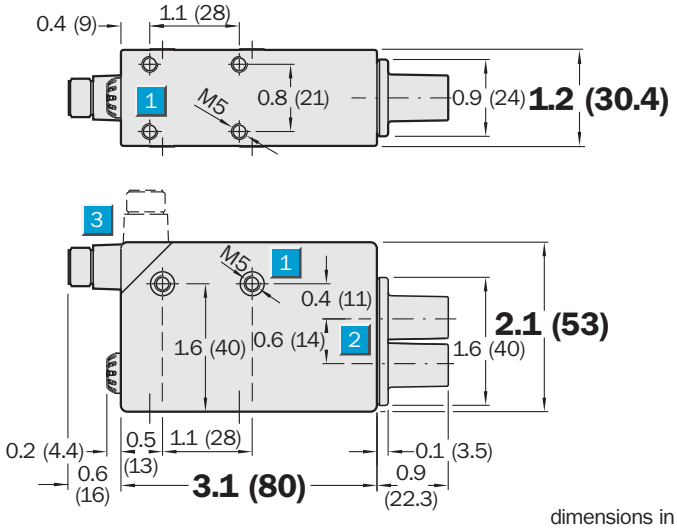
dependent on fiber sensing distance

Highlights

- Rugged die cast metal housing
- Red, blue and green light source automatically selected
- Insensitive to ambient light
- Teach-in sensitivity adjustment “on the fly”
- Switching frequency up to 10 kHz
- Light/dark selection or teach-in can be done via wire
- Uses industry standard fibers

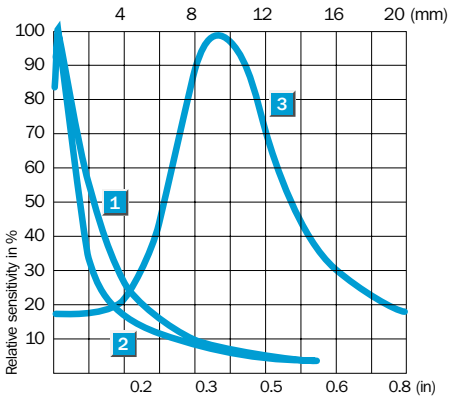
KTL 5W-2 Dynamic Teach

Dimensional Drawing



dimensions in inches (mm)

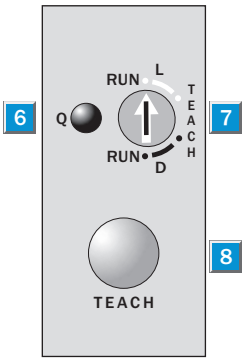
Relative Sensitivity



1	Fiber optic cable LBST 32900
2	Fiber optic cable LBSR 32900
3	Fiber-optic cable OCSL

Adjustments

All types



1	Lens (light transmission), can be replaced by Item 4
2	M5 mounting holes, 5.5 mm deep
3	See dimensional drawing of lens
4	Blind screw, can be replaced by Item 1
5	M12 plug (rotatable 90°)
6	Output indicator (yellow)
7	L/D switch
8	Teach button

Teach-in

Teach-in and light/dark
The two settings can be triggered simultaneously either via control panel or control cable.

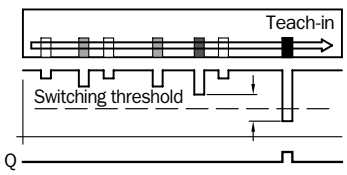
Control panel: The teach-in button can be locked against accidental actuation with “run”. In an undefined switching position, no teach-in procedure can be triggered.

Setting through control panel:
1. Select “light (L)” or “dark (D)” using rotating switch
2. Trigger teach-in via teach-in button
3. Run the object to be detected at least one register length through the light spot

Acknowledged via Q or LED control flashes=insufficient contrast.

Setting via control cable (overrides setting on control panel)
1. Select “light” or “dark” using control cable
2. Trigger teach-in via ET control cable
3. Run the object to be detected at least one register length through the light spot
4. End teach-in

Material speed during teach-in:
min. 25 mm/s, max. 300 mm/s.



Order Information

Type	Part no.
KTL 5W-2 N13	1 019 661
KTL 5W-2 P23	1 019 551

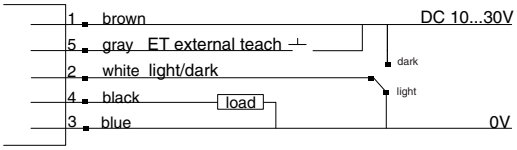
Accessories	page
Cables and connectors	909
Mounting brackets	935
Fiber optic cables	1000

Technical Data	KTL 5W-2-	P23	N13
Sensing distance	Dependent on fiber used		
Light source[1], **light type**	LED, red, blue, green		
Supply voltage V_S	10…30 V DC[2]		
Ripple[3]	< 5 V_{SS}		
Current consumption[4]	< 80 mA		
Switching outputs Q	PNP: HIGH = V_S – < 2 V / LOW = 0 V		
	NPN: HIGH = V_S / LOW = < 2 V		
Output current I_A max.	100 mA, short-circuit protected		
Response time[5]	50 µs		
Max. switching frequency[6]	to 10 kHz		
Teach-in input ET	PNP - Teach: > 10 V…< V_S		
	Run: 0 V or no connection		
	NPN - Teach: 0 V		
	Run: V_S or no connection		
Retention time	25 ms non-volatile memory		
L/D input, light/dark switching	PNP: dark = > 10 V…< V_S		
	light = 0 V or no connection		
	NPN: dark = 0 V		
	light = V_S or no connection		
Connection type	Plug, M12 5-pin		
VDE protection class[7]			
Enclosure rating	IP 67/NEMA 6		
Circuit protection[8]	A, B, C		
	□		
Ambient temperature T_A	Operation 14...131°F (-10…55°C)		
	Storage -13...167°F (-25…75°C)		
Shock/vibration	To IEC 68		
Approximate weight	14 oz (400 g)		
Housing material	Die cast zinc		

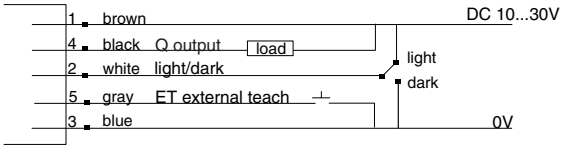
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

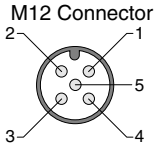
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included

SICK

KTL 10W

Contrast Sensors

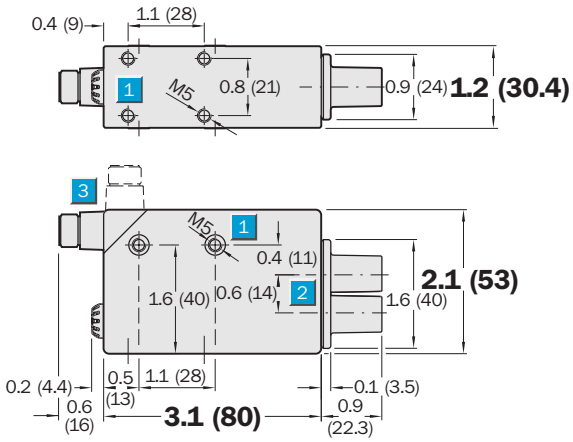
dependent on fiber sensing distance

Highlights

- Rugged metal housing
- Advanced “on the fly” teach-in of settings that automatically selects the proper light source
- Insensitive to ambient light
- Red, green and blue LEDs provide the ability to read an color mark
- Switching rate up to 25 kHz
- Rotatable M12 quick disconnect
- Uses industry standard fibers

KTL 10W

Dimensional Drawing



dimensions in inches (mm)

Teach-in

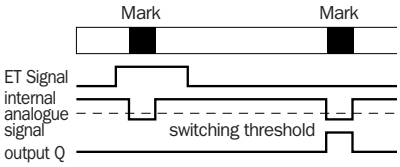
The switching threshold is set using the teach-in procedure, with either the ET teach-in cable or the teach-in button on the unit.

Procedure:

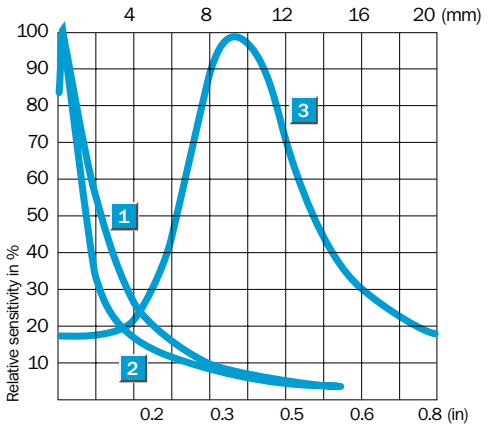
- Move program selector switch to position Q.
- Shine light spot in front of the mark on template.
- Activate and retain teach signal through teach button or ET cable.
- Move the template with the mark through the light spot.
- Deactivate teach signal.
- The switching threshold has settled in the center between the receiver signals from background and mark and is saved in the non-volatile memory.
- The optimum light source is selected automatically.

Note:

- For small marks the material speed during the teach-in procedure must not exceed 10 m / minute.
- Teach-in one mark only.
- If the teach-in procedure is unsuccessful, the output switches at approx. 5 kHz and the LED signal flashes. The received signal was too low, too high (possibly through brightness) or the contrast differential was too low.



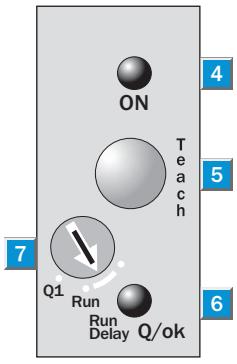
Relative Sensitivity



1	Fiber optic cable LBST 32900
2	Fiber optic cable LBSR 32900
3	Fiber-optic cable OCSL

Adjustments

All types



1	M5 threaded mounting hole, 5.5 mm deep
2	Lens (light transmission)
3	Plug, M12 5-pin, (rotatable)
4	Power indicator (green)
5	Teach-in button
6	Output indicator and teach-in (yellow)
7	Set/run switch

Order Information

Type	Part no.
KTL 10W-P15	1 023 419
KTL 10W-N15	1 023 498

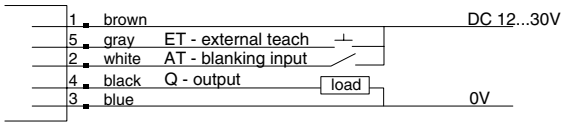
Accessories	page
Cables and connectors	909
Fiber-optic cable	1000
Mounting brackets	935

Technical Data	KTL 10W-	P15	N15
Sensing distance	Dependent on fiber used		
Light source[1], **light type**	LED, red, green, blue		
Supply voltage V_S	12…30 V DC[2]		
Ripple[3]	< 5 V		
Current consumption[4]	< 150 mA		
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V		
	NPN: HIGH = V_S/LOW = < 2 V		
Output current I_A max.	100 mA		
Response time[5]	< 20 µs		
Max. switching frequency[6]	25 kHz		
Jitter	< 10 µs		
Timing options	20 ms, adjustable OFF delay		
Teach-in input ET	PNP - Teach: > 10 V		
	Run: < 2 V or no connection		
	NPN - Teach: < 2 V		
	Run: > 10 V or no connection		
Blanking input AT			
Blanked	PNP: AT > 10 V		
Free running	AT < 2 V or no connection		
	NPN: AT < 2 V		
	AT > 10 V or no connection		
Connection type	Plug M 12, 5-pin		
VDE protection class[7]	□		
Circuit protection[8]	A, B, C		
Enclosure rating	IP 67/NEMA 6		
Ambient temperature T_A	Operation 14...140°F (-10…60°C)		
	Storage -13...167°F (-25…75°C)		
Shock/vibration	To IEC 68		
Approximate weight	14 oz (400 g)		
Housing material	Die cast zinc		

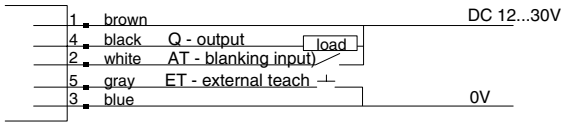
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q and $\bar{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

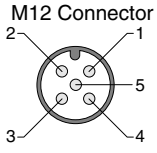
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

Theory of Operation...Color Sensors

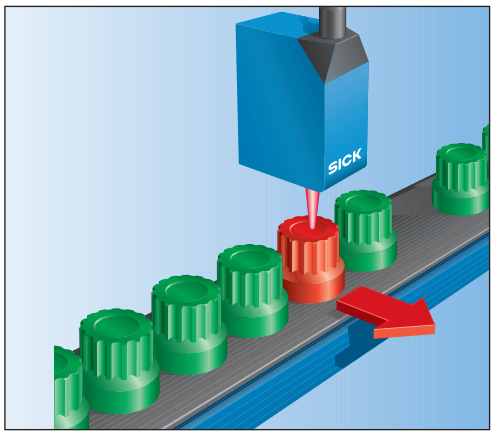


Fig. 1 Color sensor sorting colored products

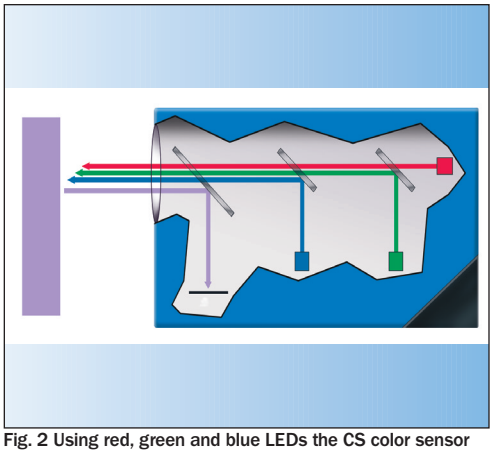


Fig. 2 Using red, green and blue LEDs the CS color sensor can detect even very subtle changes in color


Fig. 3 A CS sensor checking the color of thread before it is packaged

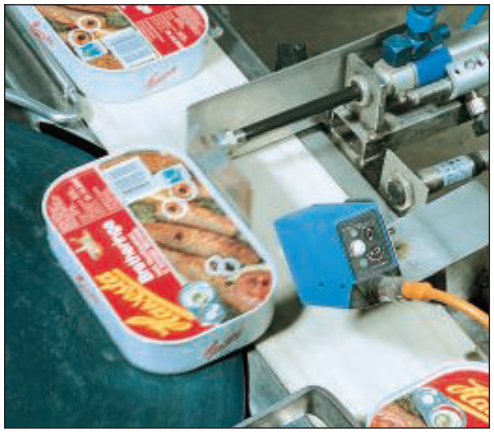


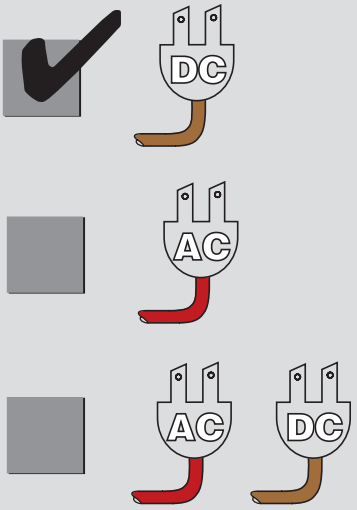
Fig. 4 The CS ensures all cans are packed facing the same way

About Color Sensors

The CSM 1, CS 1 and CS 3 color sensors are small, compact and powerful for color detection of either opaque or transparent targets. Consequently, these can be used for the automation of all industrial processes where color is a factor.

These sensors use three colored LEDs simultaneously as their light source and evaluate both the wavelength and amount of reflected light. The measured values are compared with stored reference color values that the operator enters using a simple teach-in process. If the values are within the defined tolerance, the sensor produces an output. Depending on the application, one or three reference colors can be taught and stored by the sensor. Color sensors are also extremely insensitive to ambient light sources.

Color Sensors



Sensors	Page
CSM 1	594
CS 1	596
CS 3	598
CSL 1	600

CSM 1

Color Sensors

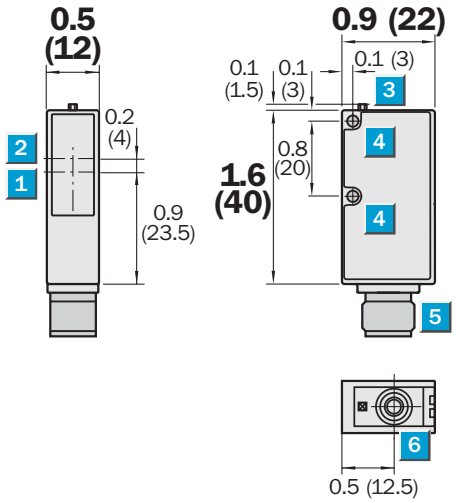

0.5 in (12.5 mm)
sensing distance

Highlights

- Teach-in programming by push button or control wire
- Selectable color tolerance
- Small compact housing
- High switching frequency
- M12 quick disconnect

CSM 1

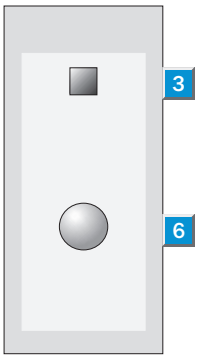
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 LED signal strength indicator
4 Mounting hole Ø 0.1 in (3 mm)
5 Plug, M12 4-pin
6 Teach-in button

Order Information

Type	Part no.
CSM 1-P1114	1 022 569
CSM 1-N1114	1 018 514

Accessories	page
Cables and connectors	909
Mounting systems	921

Technical Data	CSM 1-	P1114	N1114
Sensing distance	0.5 in ±0.08 in (12.5 mm ±2 mm)	■	■
Light spot dimensions	0.06 x 0.26 in (1.5 x 6.5 mm)	■	■
Light source[1], light type	Red, green, blue	■	■
Supply voltage V_S	24 V DC ± 20%	■	■
Ripple[2]	< 5 V_{PP}	■	■
Current consumption[3]	< 35 mA	■	■
Switching outputs	NPN: HIGH = V_S / LOW = < 2 V		■
	PNP: HIGH = V_S < 2 V/ LOW = approx. 0 V	■	
Output current I_A max.	100 mA	■	■
Response time[4]	500 µs	■	■
Switching frequency[5]	1500 Hz	■	■
Teach-in input ET	PNP: Teach > 10 V...< V_S	■	
	NPN: Teach 0 V		■
Connection type	Plug, M12 4-pin	■	■
VDE protection class[6]	□	■	■
Enclosure rating	IP 67	■	■
Circuit protection[7]	A, B, C	■	■
Ambient temperature	Operation 14…131°F (-10…55°C)	■	■
	Storage -4…167°F (-25… 75°C)	■	■
Shock/vibration	To IEC 68	■	■
Approximate weight	0.7 oz (20 g)	■	■
Housing material	Glass fiber reinforced ABS	■	■
Mounting bracket	BEF-WN-W9-2 (#2022855)	■	■

1) Average service life 100,000 h at T_A = 25°C
2) May not exceeded or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Static Teach-in

Static Teach-in and color tolerance selection CSM 1

1. Place object in light spot.
2. Press the Teach-in button on the sensor for >1 s, until the light spot goes out. Green transmitter light goes on for approx. 2 s.
3. Press the Teach-in button during this time:
   "Medium" color tolerance selected (default state) and teach procedure is triggered.
   Do not press Teach-in button, green transmitter light goes out and blue transmitter light goes on for approx. 1 s.
4. Press the Teach-in button during this time:
   "Precise" color tolerance selected and teach procedure is triggered.
   Do not press the Teach-in button, blue transmitter light goes out and red transmitter light goes on for approx. 1 s.
5. Press the Teach-in button during this time:
   "Coarse" color tolerance selected and Teach-in procedure is triggered.
   Do not press Teach-in button, color tolerance selection/teach procedure process repeats (green transmitter light goes on for approx. 2 s.)

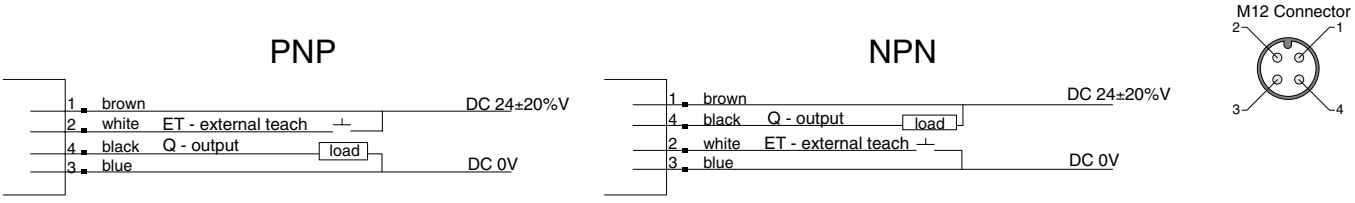
Teach-in via control wire:

1. Place object in light spot.
2. Trigger the Teach-in procedure via the control wire.

When using the control wire for Teach-in, the last color tolerance set via the push button on the sensor or the "medium" default state is selected, i.e., the color tolerance can only be set via the push button on the sensor.

Confirmation:
Red transmitter light and status indicator blink = unsuccessful Teach-in.
Transmitter light and status indicator do not blink = Teach-in completed.

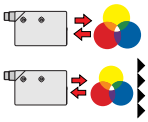
Connection Type



SICK

CS 1

Color Sensors



0.5/2.4 in (12.5/60 mm), 2...39.4 in (50...1000 mm)

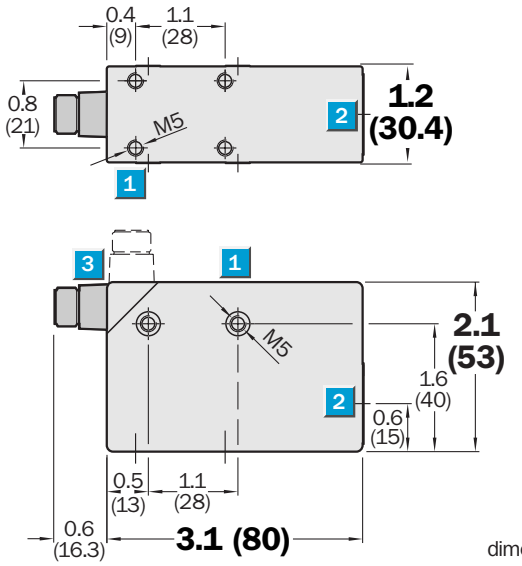
sensing range

Highlights

- Rugged die cast metal housing
- Teach-in programming
- Status indicator
- Color tolerance selector
- Insensitive to ambient light
- Uses reflected or transmitted light
- M12 quick disconnect

CS 1

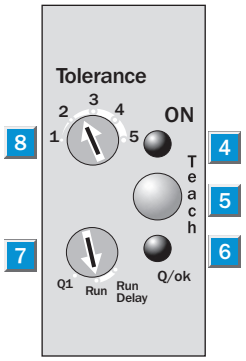
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1	M5 threaded mounting hole, 5.5 mm deep
2	Center of optical axis
3	5-pin, M12 plug (rotatable)
4	Power indicator, green
5	Teach-in button
6	Function indicator output/teach-in (yellow)
7	Set/run switch
8	Tolerance adjustment

Adjustments

To simplify adjustment and operation of the device, the reference color is programmed using the teach-in method. The tolerance can be selected by changing the position on the rotary switch. Reference colors can be stored by simply pressing a button. The programming procedure can also be carried out automatically via the external teach-in (ET) wire. With each pulse, the sensor moves into programming mode, establishes the color of the object being scanned and is then ready to be used again. After external teach-in the device is ready for use after 200 ms.

Order Information

Type	Part no.
CS 1-P1111	1 012 858
CS 1-N1111	1 012 862
CS 1-P3611	1 012 859
CS 1-N3611	1 012 863

Accessories

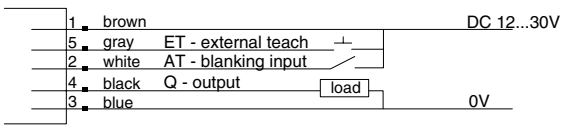
	page
Cables and connectors	909
Reflectors	936
Mounting brackets	935

Technical Data		CS 1-	P 1111	N 1111	P 3611	N 3611					
Sensing distance	0.5 in (12.5 mm)		■	■							
	2.4 in (60 mm)				■	■					
Sensing distance tolerance	± 0.1 in (2 mm)		■	■							
	± 0.4 in (9 mm)				■	■					
Light spot dimensions	0.1 x 0.2 in (2 x 4 mm)		■	■							
	Ø 0.5 in (13 mm)				■	■					
Light spot direction	Vertical		■	■							
Light source[1], light type	LED, green, red, blue		■	■	■	■					
Sensing range											
With PL 80 A reflector	3.9...9.8 in (100…250 mm)		■	■							
	9.8...39.4 in (250…1000 mm)				■	■					
With PL 30 A reflector	2.0...5.9 in (50…150 mm)		■	■							
	7.9...29.5 in (200…750 mm)				■	■					
Supply voltage V_S	12…30 V DC [2]		■	■	■	■					
Ripple[3]	< 5 V		■	■	■	■					
Current consumption[4]	< 80 mA		■	■	■	■					
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V		■		■						
	NPN: HIGH = V_S/LOW = < 2 V			■		■					
Output current I_A max.	100 mA		■	■	■	■					
Response time[5]	< 700 µs		■	■	■	■					
Switching frequency[6]	1000 Hz		■	■	■	■					
Timing options	20 ms OFF delay, fixed		■	■	■	■					
Teach-in input ET	PNP - Teach: > 12 V... < V_S		■		■						
	Run: < 2 V or no connection		■		■						
	NPN - Teach: 0 V…12 V			■		■					
	Run: V_S or no connection			■		■					
Pulse duration	ET: > 0.5 ms		■	■	■	■					
Blanking input AT											
Blanked	PNP: > 12 V...< V_S		■		■						
Free running	< 2 V or no connection		■		■						
Blanked	NPN: 0 V...V_S			■		■					
Free running	V_S or no connection			■		■					
Response time	< 0.2 ms		■	■	■	■					
Connection type	Plug, M12 5-pin		■	■	■	■					
VDE protection class[7]	⧈		■	■	■	■					
Circuit protection[8]	A, B, C		■	■	■	■					
Enclosure rating	IP 67/NEMA 6		■	■	■	■					
Ambient temperature T_A	Operation 14...131°F (-10…55°C)		■	■	■	■					
	Storage -13...158°F (-25…70°C)		■	■	■	■					
Shock/vibration	IEC 68		■	■	■	■					
Approximate weight	14 oz (400 g)		■	■	■	■					
Housing material	Die cast zinc		■	■	■	■					

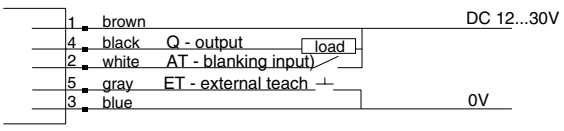
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

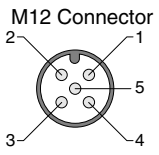
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included

SICK

CS 3

Color Sensors

0.5/2.4 in (12.5/60 mm), 2.0...39.4 in (50...1000 mm)

sensing range

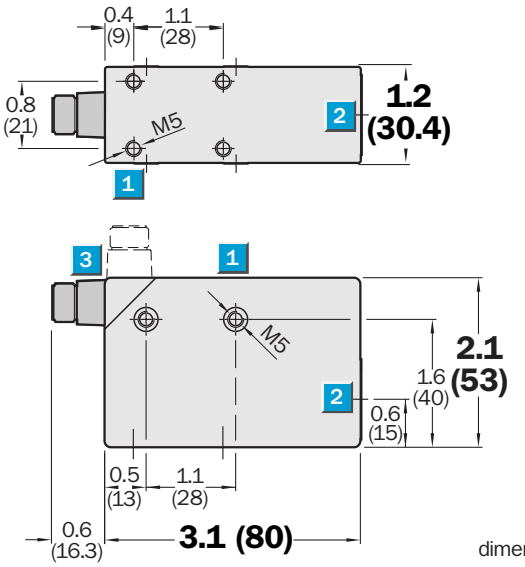
CE

Highlights

- Rugged die cast metal housing
- Teach-in programming
- Color tolerance selector
- 3 reference colors can be stored
- Insensitive to ambient light
- Uses reflected or transmitted light
- M12 quick disconnect

CS 3

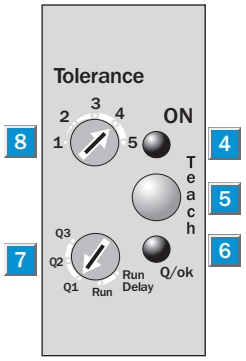
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 M5 threaded mounting hole, 5.5 mm deep
2 Center of optical axis
3 M12 plug (rotatable)
4 Power indicator, green
5 Teach-in button
6 Function indicator: output/teach-in (yellow)
7 Set/run switch
8 Tolerance adjustment

Adjustments

To simplify adjustment and operation of the device, the reference color is programmed using the teach-in method. Color tolerance can be set for each channel individually. Channel and color tolerance is set by changing the position on the rotary switch. The reference colors can then be stored by simply pressing a button. Channel Q 1 can also be programmed automatically via the external teach-in (ET) wire. With each pulse, the sensor moves into programming mode, establishes the color of the object being scanned and is then ready to be used again. After external teach-in the device is ready for use after 200 ms.

Order Information

Type	Part no.
CS 3-P1132	1 012 860
CS 3-N1132	1 012 864
CS 3-P3632	1 012 861
CS 3-N3632	1 012 865

Accessories

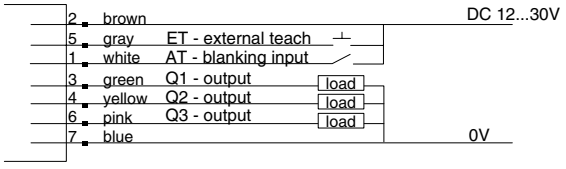
Accessories	page
Cables and connectors	910
Mounting brackets	935
Reflectors	936

Technical Data		CS 3-	P1132	N1132	P3632	N3632
Sensing distance	0.5 in (12.5 mm)		■	■		
	2.4 in (60 mm)				■	■
Sensing distance tolerance	± 0.1 in (2 mm)		■	■		
	± 0.4 in (9 mm)				■	■
Light spot dimensions	0.1 x 0.2 in (2 x 4 mm)		■	■		
	Ø 0.5 in (13 mm)				■	■
Light spot direction	Vertical		■	■		
Light source[1], light type	LED, green, red, blue		■	■	■	■
Sensing range						
With PL 80 A reflector	3.9...9.8 in (100…250 mm)		■	■		
	9.8...39.4 in (250…1000 mm)				■	■
With PL 30 A reflector	2.0...5.9 in (50…150 mm)		■	■		
	7.9...29.5 in (200…750 mm)				■	■
Supply voltage V_S	12…30 V DC[2]		■	■	■	■
Ripple[3]	< 5 V		■	■	■	■
Current consumption[4]	< 80 mA		■	■	■	■
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V		■		■	
	NPN: HIGH = V_S/LOW = < 2 V			■		■
Output current I_A max.	100 mA		■	■	■	■
Response time[5]	< 2.5 ms		■	■	■	■
Switching frequency[6]	300 Hz		■	■	■	■
Timing options	20 ms OFF delay, fixed		■	■	■	■
Teach-in input ET	PNP - Teach: > 12 V... < V_S		■		■	
	Run: < 2 V or no connection		■		■	
	NPN - Teach: 0 V…12 V			■		■
	Run: V_S or no connection			■		■
Pulse duration	ET: > 0.5 ms		■	■	■	■
Blanking input AT						
Blanked	PNP: > 12 V...< V_S		■		■	
Free running	< 2 V or no connection		■		■	
Blanked	NPN: 0 V...V_S			■		■
Free running	V_S or no connection			■		■
Response time[5]	< 0.2 ms		■	■	■	■
Connection type	Plug, M12 8-pin		■	■	■	■
VDE protection class[7]	⧈		■	■	■	■
Circuit protection[8]	A, B, C		■	■	■	■
Enclosure rating	IP 67/NEMA 6		■	■	■	■
Ambient temperature T_A	Operation 14...131°F (-10…55°C)		■	■	■	■
	Storage -13...158°F (-25…70°C)		■	■	■	■
Shock/vibration	IEC 68		■	■	■	■
Approximate weight	14 oz (400 g)		■	■	■	■
Housing material	Die cast zinc		■	■	■	■

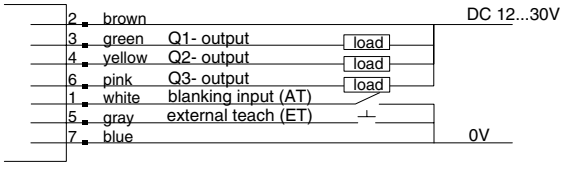
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q_1, Q_2, Q_3 short-circuit protected
C = Interference pulse suppression

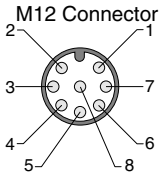
Connection Diagram

PNP Models



NPN Models





wire colors refer to standard cable, not included

SICK

CSL 1

Fiber Optic Color Sensors

dependent on fiber sensing range

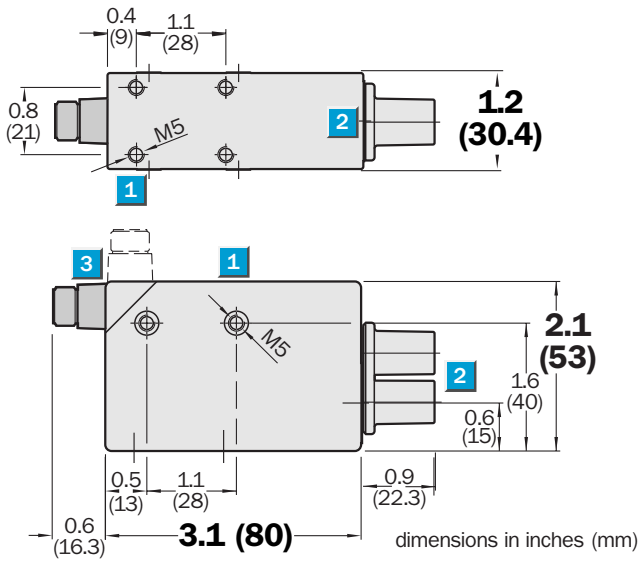
CE

Highlights

- Rugged plastic housing
- Uses reflected or transmitted light
- Fiber optic cable connection
- Fiber optic cable for high temperatures
- Teach-in programming
- Color tolerance selector
- Insensitive to ambient light
- Switching frequency of 700 Hz
- M12 quick disconnect

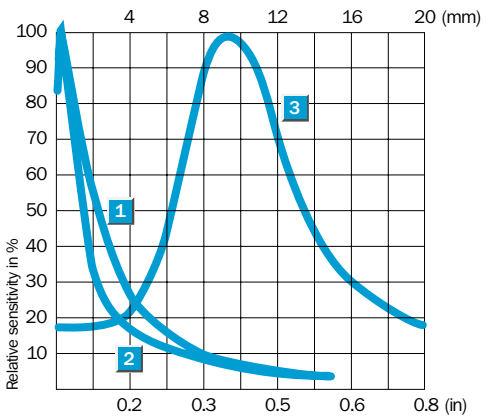
CSL 1

Dimensional Drawing



dimensions in inches (mm)

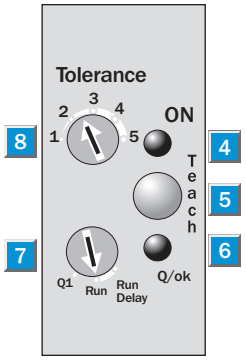
Sensing Distance



1	Fiber optic cable LBST 32900
2	Fiber optic cable LBSR 32900
3	Fiber optic cable OCSL

Adjustments

All types



1	M5 threaded mounting hole, 5.5 mm deep
2	Center of optical axis
3	M12 plug (rotatable)
4	Power indicator, green
5	Teach-in button
6	Function indicator: output/teach-in (yellow)
7	Set/run switch
8	Tolerance adjustment

Adjustment

In order to simplify adjustment and operation of the device, the reference color is programmed using the teach-in method. The tolerance can be selected by changing the position on the rotary switch. Just press the button to store the reference colors. The programming method can also be carried out automatically via the external teach-in (ET) wire. With each pulse, the sensor moves into programming mode, establishes the color of the object being scanned and is then ready to be used again. After external teach-in the device is ready for use after 200 ms.

Order Information

Type	Part no.
CSL 1-P11	1 016 292
CSL 1-N11	1 016 293

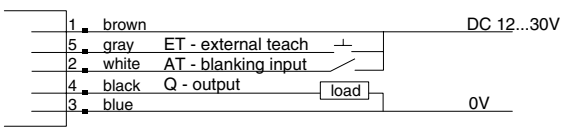
Accessories	page
Cables and connectors	909
Mounting brackets	935
Reflectors	936
Fiber optic cables	1000

Technical Data	CSL 1-	P11	N11
Sensing distance	Dependent on fiber		
Light source[1], light type	LED, green, red, blue		
Supply voltage V_S	12...30 V DC[2]		
Ripple[3]	< 5 V		
Current consumption[4]	< 80 mA		
Switching outputs	PNP: HIGH = V_S – < 2 V/LOW = 0 V		
	NPN: HIGH = V_S/LOW = < 2 V		
Output current I_A max.	100 mA		
Switching frequency	1000 Hz		
Response time[5]	< 700 µs		
Timing options	20 ms OFF delay, fixed		
Teach-in input ET	PNP - Teach: > 12 V...< V_S		
	Run: < 2 V or no connection		
	NPN - Teach: 0 V...12 V		
	Run: V_S or no connection		
Pulse duration	ET: > 0.5 ms		
Blanking input AT			
Blanked	PNP: > 12 V...< V_S		
Free running	< 2 V or no connection		
Blanked	NPN: 0 V...V_S		
Free running	V_S or no connection		
Response time	< 0.2 ms		
Connection type	Plug, M12 5-pin		
VDE protection class[7]	⧈		
Circuit protection[8]	A, B, C		
Enclosure rating	IP 67/NEMA 6		
Ambient temperature T_A	Operation 14...131°F (-10...55°C)		
	Storage -13...158°F (-25...70°C)		
Shock/vibration	To IEC 68		
Approximate weight	14 oz (400 g)		
Housing material	Die cast zinc		

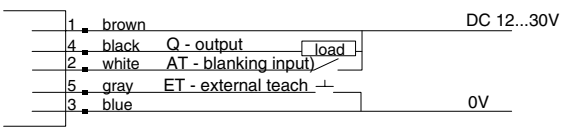
1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
7) Reference voltage DC 50 V
8) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
C = Interference pulse suppression

Connection Diagram

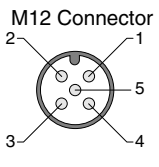
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included

SICK

Theory of Operation...Luminescence Sensors

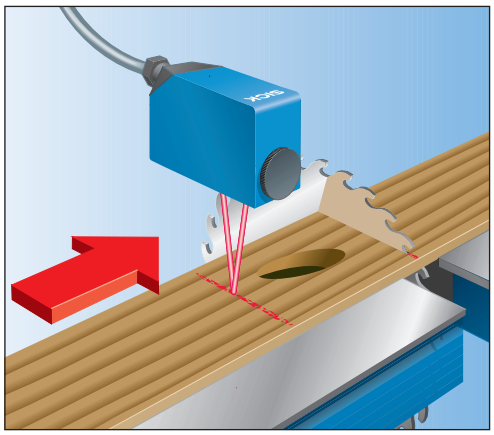


Fig. 1 LUT looking for fluorescent marks on lumber to control the circular saw

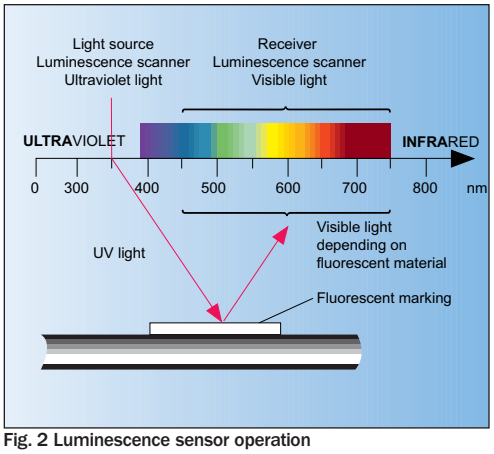


Fig. 2 Luminescence sensor operation

Fig. 3 Label verification by LUT 3-8 in the pharmaceutical industry

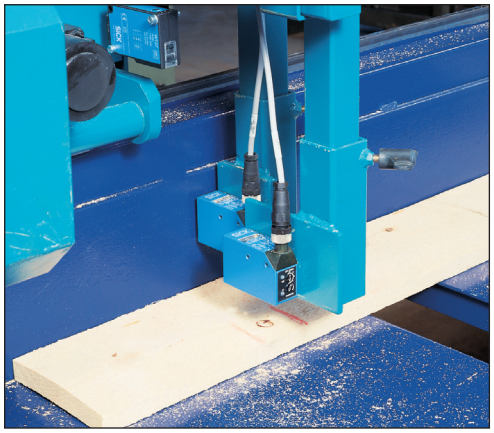


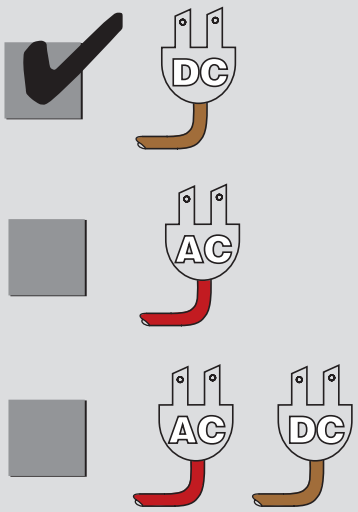
Fig. 4 LUT 3-9 with filter detects markings used to control saw

About Luminescence Sensors

Luminescence sensors offer unparalleled power; luminescence sensors are able to handle more advanced applications than standard photoelectric proximity sensors. In the case of a registration mark on an irregular background, such as grained wood, that can't be read reliably, a luminescence sensor may help. The sensitivity of the device can be set with a potentiometer to allow optimum adjustment to the fluorescent material. The background that the fluorescent material is applied to doesn't affect the level of detection reliability.

The LUT series reacts only to luminescent materials activated by the UV light source in the sensor (Fig. 2). Luminescent pigments can be added to the target or can be applied in the form of colored marks with fluorescent chalk or paint (Fig. 1, 4). Since these markings can also be invisible, they can be used as control marks on goods for proof of authenticity, without spoiling the appearance of the finished product.

Luminescence Sensors



Sensors	Page
LUT 2	604
LUT 3-6	606
LUT 3-8	608
LUT 3-9	610
LUT 1-4	612
LUT 1-5	614

LUT 2

Luminescence Sensors

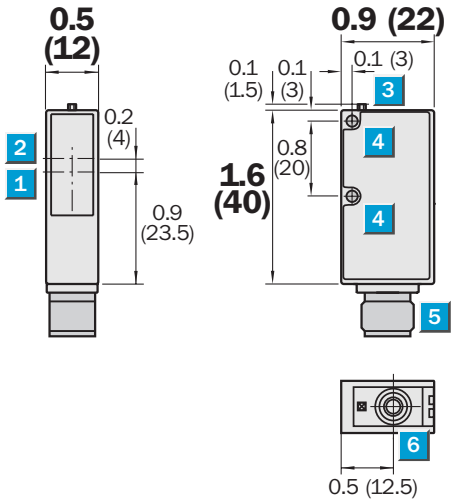
0.5 in (12.5 mm)
sensing distance

Highlights

- Static Teach-in sensitivity adjustment, mark and background, by push button or control wire
- Switching threshold adjustment for low fluorescence
- Small compact housing
- High switching frequency
- M12 quick disconnect

LUT 2

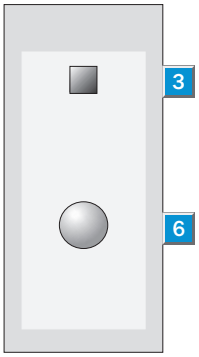
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Center of optical axis, sender
2 Center of optical axis, receiver
3 LED signal strength indicator
4 Mounting hole Ø 0.1 in (3 mm)
5 Plug, M12 4-pin
6 Teach-in button

Order Information

Type	Part no.
LUT 2-P1116	1 023 500
LUT 2-N1116	1 023 501

Accessories	page
Cables and connectors	909
Mounting systems	921

Technical Data	LUT 2-	P1116	N1116							
Sensing distance	0.5 in ±0.08 in (12.5 mm ±2 mm)									
Wave Length	370 nm									
Light spot dimensions	0.08 x 0.10 in (2 x 2.5 mm)									
Light source[1], light type	UV light source									
Supply voltage V_S	24 V DC ± 20%									
Ripple[2]	< 5 V_{PP}									
Current consumption[3]	< 30 mA									
Switching outputs	NPN: HIGH = V_S / LOW = < 2 V									
	PNP: HIGH = V_S < 2 V/ LOW = approx. 0 V									
Output current I_A max.	100 mA									
Response time[4]	1 ms and 250 µs									
Switching frequency[5]	500 Hz and 2000 Hz									
Teach-in input ET	PNP: Teach > 10 V…< V_S									
	NPN: Teach 0 V									
Connection type	Plug, M12 4-pin									
VDE protection class[6]	⧈									
Enclosure rating	IP 67									
Circuit protection[7]	A, B, C									
Ambient temperature	Operation 14…131°F (-10…55°C)									
	Storage -13…167°F (-25…75°C)									
Shock/vibration	To IEC 68									
Approximate weight	0.7 oz (20 g)									
Housing material	Glass fiber reinforced ABS									
Mounting bracket	BEF-WN-W9-2 (#2022855)									

1) Average service life 100,000 h at T_A = 25°C
2) May not exceeded or fall short of V_S tolerances
3) Without load
4) Signal transit time with resistive load
5) With light/dark ratio 1:1
6) Reference voltage 50 V DC
7) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

Static Teach-in

Static Teach-in LUT 2 via push button:
1. Place object in light spot.
2. Press the Teach-in button on the sensor for >1 s. First Teach-in procedure is triggered.
3. Place the light spot on the background, press the Teach-in button. Second Teach-in procedure is triggered.

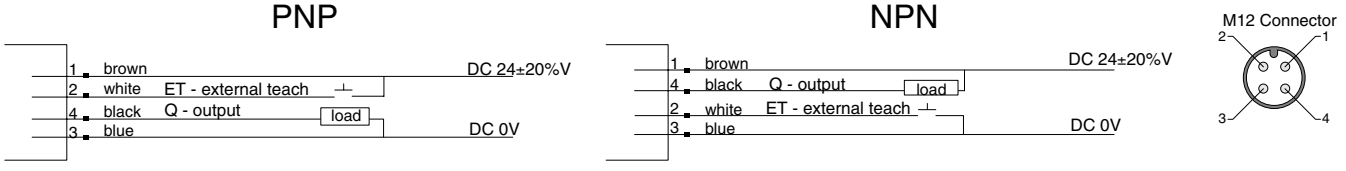
Teach-in via control wire:
1. Place object in light spot.
2. Trigger the first Teach-in procedure via the control wire.
3. Place the light spot on the background, and then trigger the second Teach-in procedure via the control wire.

Confirmation:
LED and status indicator do not blink = Teach-in procedure completed with standard sensitivity (2000 Hz).
LED and status indicator blink 2x quickly = Teach-in procedure completed with high sensitivity (500 Hz).
LED and status indicator blink rapidly = Teach-in procedure not completed.

Preselection of high-sensitivity (500 Hz) via push-button
1. Place object in light spot.
2. Press the Teach-in button on the sensor for >1s. First Teach-in procedure is triggered.
3. Place the light spot on the background, press the Teach-in button. Second Teach-in procedure is triggered.
4. Press the Teach-in button on the sensor again within the next two seconds.

Confirmation
LED and status indicator blink 2x quickly = Teach-in procedure completed with high sensitivity (500 Hz).
LED and status indicator blink rapidly = Teach-in procedure not completed.

Connection Type



LUT 3-6

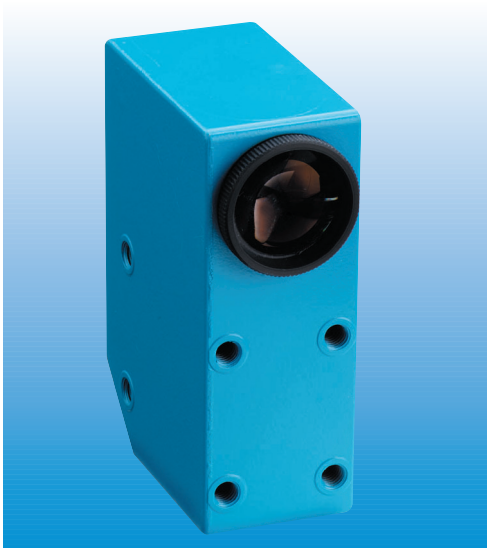
Luminescence Sensors

0.4...2.0 in (10...50 mm)
sensing distance

Highlights

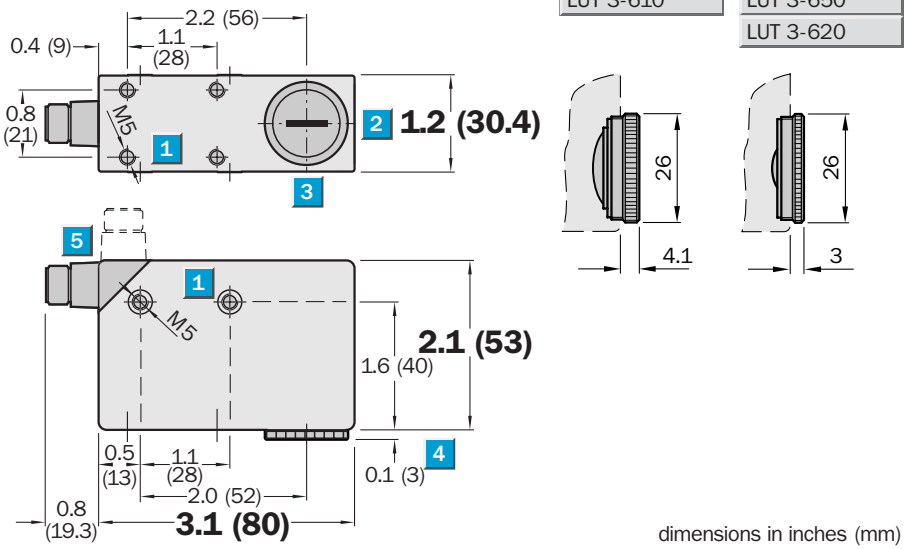
- Compact, rugged die cast metal housing
- Semiconductor UV light source
- No lamp replacement
- Interchangeable lenses for sensing range options
- Adjustable sensitivity
- Status indicator
- No interference from surface reflection
- M12 rotatable quick disconnect

LUT 3-6



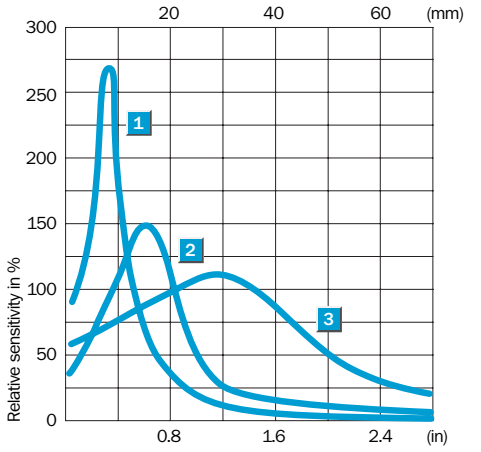
Dimensional Drawing

LUT 3-610
LUT 3-650
LUT 3-620



dimensions in inches (mm)

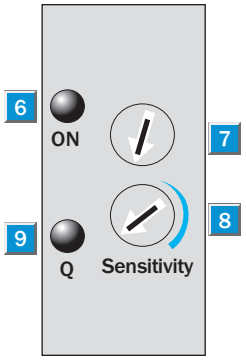
Relative Sensitivity



1	Sensing distance	10 mm
2	Sensing distance	20 mm
3	Sensing distance	50 mm

Adjustments

All types



1	M5 threaded mounting hole, 5.5 mm deep
2	Light spot direction
3	Center of optical axis
4	See dimensional drawing for lens
5	M12 plug (rotatable)
6	Power indicator
7	Not used
8	Sensitivity adjustment
9	Output indicator

Order Information

Type	Part no.
LUT 3-610	1 015 396
LUT 3-620	1 015 397
LUT 3-650	1 015 398

LUT 3-6 Replacement Lens

OBJ-LUT 3-10	2 016 348
OBJ-LUT 3-20	2 016 349
OBJ-LUT 3-50	2 016 350

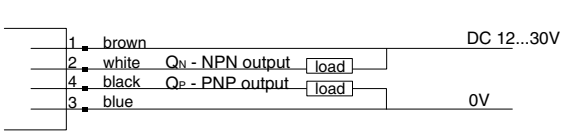
Accessories

	page
Cables and connectors	909
Mounting brackets	935
Lenses	946

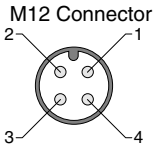
Technical Data	LUT 3-	610	620	650
Sensing distance[1]/	0.4 in/0.08 x 0.2 in (10 mm/2 x 6 mm)	■		
light spot sizes	0.8 in/0.1 x 0.4 in (20 mm/3 x 9 mm)		■	
	2.0 in/0.2 x 0.6 in (50 mm/5 x 15 mm)			■
Light spot direction	Vertical	■	■	■
Light source[2], **light type**	UV light source	■	■	■
Wavelength	380 nm	■	■	■
Supply voltage V_S	12…30 V DC[3]	■	■	■
Ripple[4]	max. 2 V	■	■	■
Current consumption[5]	60 mA	■	■	■
Switching outputs	Light switching	■	■	■
	PNP: HIGH = V_S – <3 V/LOW = 0 V	■	■	■
	NPN: HIGH = V_S/LOW = <2 V	■	■	■
Output current I_A max.	100 mA	■	■	■
Response time[6]	0.3 ms	■	■	■
Switching frequency[7]	1.5 kHz	■	■	■
Connection type	Plug, M12 4-pin	■	■	■
VDE protection class[8]	⧈	■	■	■
Circuit protection[9]	A, B, C	■	■	■
Enclosure rating	IP 67	■	■	■
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■
	Storage -13...167°F (-25…75°C)	■	■	■
Shock/vibration	To IEC 68	■	■	■
Approximate weight	14 oz (400 g)	■	■	■
Housing material	Die cast metal	■	■	■

1) From front edge of lens
2) Average service life 100,000 h at T_A =25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs Q_P and Q_N short-circuit protected
C = Interference pulse suppression

Connection Diagram

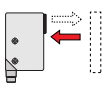


wire colors refer to standard cable, not included



LUT 3-8

Luminescence Sensors




0.4/0.8/2.0/3.5 in (10/20/50/90 mm)

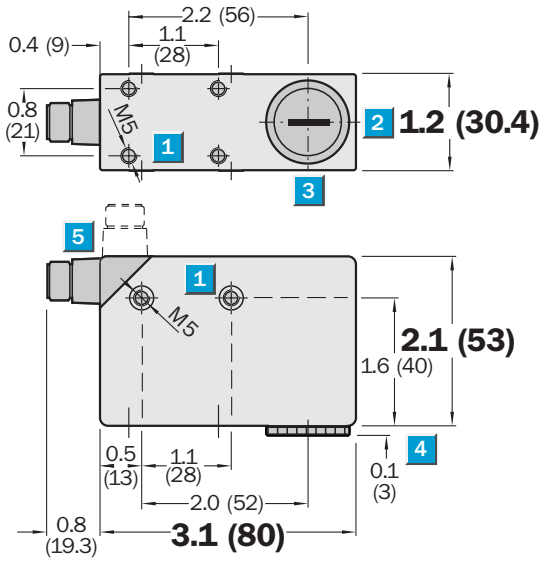
sensing distance

Highlights

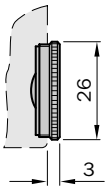
- Compact, rugged die cast metal housing
- Semiconductor UV light source
- Adjustable time delay
- Interchangeable lenses for sensing range options (10, 20, 50, 90 mm)
- Fiber optic cable connection
- Analog output
- Optical filters available for difficult applications
- M12 rotatable quick disconnect

LUT 3-8

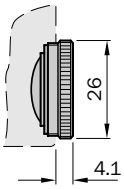
Dimensional Drawing



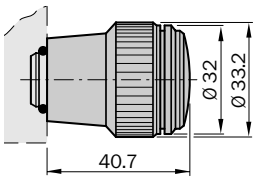
LUT 3-820
LUT 3-821
LUT 3-850
LUT 3-851
LUT 3-852
LUT 3-853



LUT 3-810

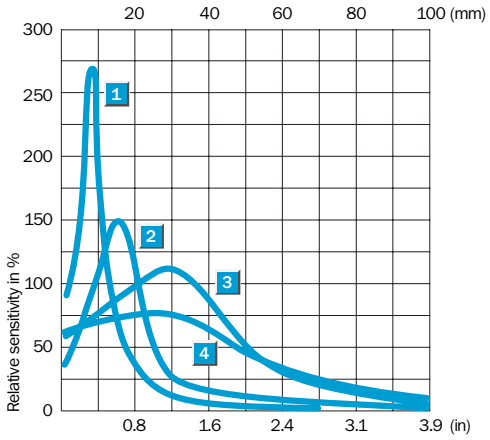


LUT 3-890



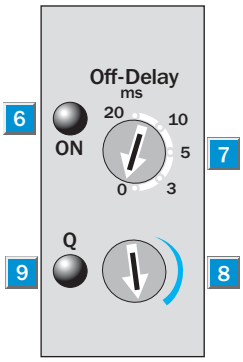
dimensions in inches (mm)

Relative Sensitivity



Adjustments

All types



1 M5 threaded mounting hole, 5.5 mm deep
2 Light spot direction
3 Center of optical axis
4 See dimensional drawing for lens
5 M12 plug (rotatable)
6 Operating indicator
7 Time delay selector switch
8 Sensitivity adjustment
9 Output indicator

1	Sensing distance	10 mm
2	Sensing distance	20 mm
3	Sensing distance	50 mm
4	Sensing distance	90 mm

Order Information

Type	Part no.
LUT 3-810	1 012 867
LUT 3-820	1 012 868
LUT 3-850	1 012 869
LUT 3-890	1 014 058

With additional optical filters

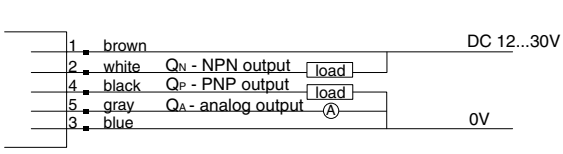
LUT 3-821	1 016 922	OG 570 Filter
LUT 3-851	1 012 870	OG 570 Filter
LUT 3-852	1 012 871	RG 610 Filter
LUT 3-853	1 012 872	RG 665 Filter

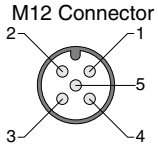
Accessories	page
Cables and connectors	909
Mounting brackets	935
Lenses	946
Liquid light guide	1007

Technical Data	LUT 3-	810	820	850	890*	851	852	853
Sensing distance[1]/	0.4 in/0.08 x 0.2 in (10 mm/2 x 6 mm)	■						
light spot sizes	0.8 in/0.1 x 0.4 in (20 mm/3 x 9 mm)		■					
	2.0 in/0.2 x 0.6 in (50 mm/5 x 15 mm)			■		■	■	■
	3.5 in/0.3 x 0.8 in (90 mm/8 x 20 mm)				■			
Light spot direction	Vertical	■	■	■	■	■	■	■
Light source[2], **light type**	UV light source	■	■	■	■	■	■	■
Wavelength	385 nm	■	■	■	■	■	■	■
Supply voltage V_S	12…30 V DC[3]	■	■	■	■	■	■	■
Ripple[4]	max. 2 V	■	■	■	■	■	■	■
Current consumption[5]	60 mA	■	■	■	■	■	■	■
Switching outputs	Light switching	■	■	■	■	■	■	■
	PNP: HIGH = V_S – <3 V/LOW = 0 V	■	■	■	■	■	■	■
	NPN: HIGH = V_S/ LOW = <2 V	■	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■
Response time[6]	0.3 ms	■	■	■	■	■	■	■
Switching frequency[7]	1.5 kHz	■	■	■	■	■	■	■
Time delay (OFF delay)	3 ms, 5 ms, 10 ms, 20 ms, adjustable	■	■	■	■	■	■	■
Analog output Q_A	0.5…10 mA, 800 Ω	■	■	■	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■	■	■	■
VDE protection class[8]	□	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■	■	■	■	■
	Storage -13...167°F (-25…75°C)	■	■	■	■	■	■	■
Shock/vibration	IEC 68	■	■	■	■	■	■	■
Approximate weight	14 oz (400 g)	■	■	■	■	■	■	■
Housing material	Die cast metal	■	■	■	■	■	■	■

1) From front edge of lens
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs Q_P and Q_N short-circuit protected
C = Interference pulse suppression
* Lens is not interchangeable with other models

Connection Diagram





wire colors refer to standard cable, not included

SICK

LUT 3-9

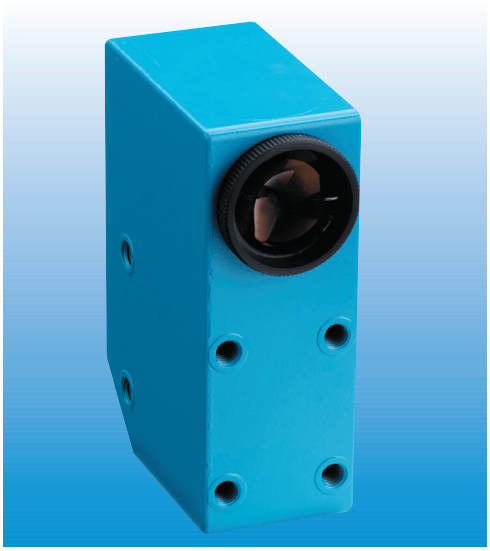
Luminescence Sensors

0.4/0.8/2.0/3.5 in (10/20/50/90 mm)
sensing distance

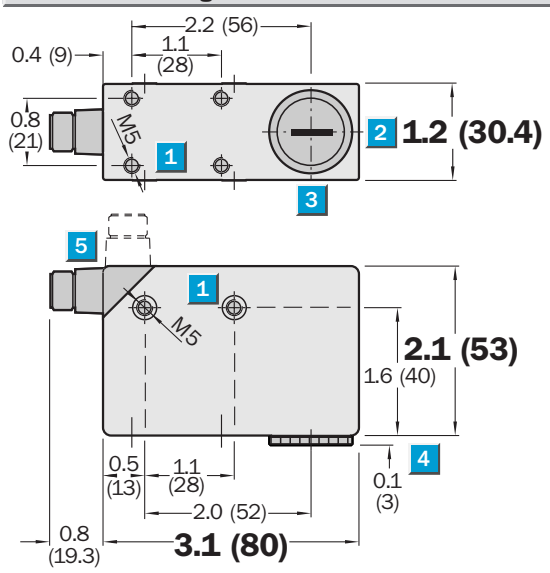
Highlights

- Compact, rugged die cast metal housing
- Semiconductor UV light source
- Adjustable time delay
- Interchangeable lenses for sensing range options (10, 20, 50, 90 mm)
- Fiber optic cable connection
- Analog output
- Optical filters available for difficult applications
- M12 rotatable quick disconnect

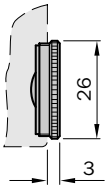
LUT 3-9



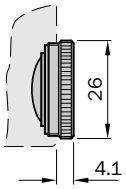
Dimensional Drawing



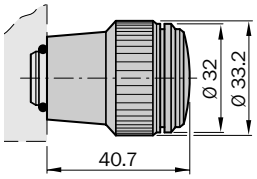
LUT 3-920
LUT 3-950
LUT 3-951
LUT 3-952
LUT 3-953



LUT 3-910

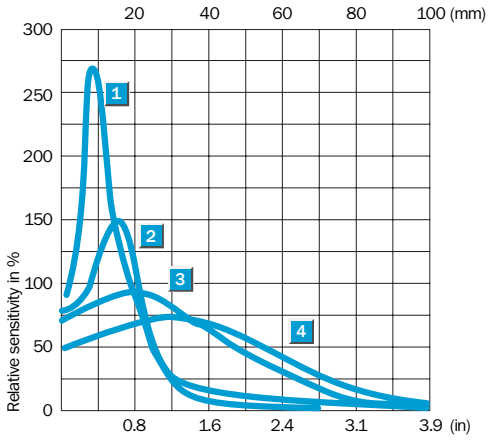


LUT 3-990



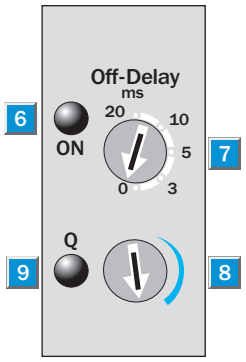
dimensions in inches (mm)

Relative Sensitivity



Adjustments

All types



1	M5 threaded mounting hole, 5.5 mm deep
2	Light spot direction
3	Center of optical axis
4	See dimensional drawing for lens
5	M12 plug (rotatable)
6	Operating indicator
7	Time delay selector switch
8	Sensitivity adjustment
9	Output indicator

1	Sensing distance	10 mm
2	Sensing distance	20 mm
3	Sensing distance	50 mm
4	Sensing distance	90 mm

Order Information

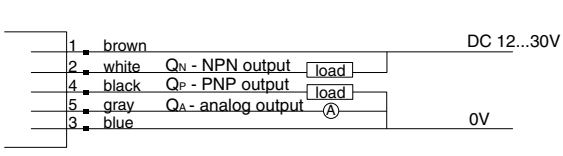
Type	Part no.	
LUT 3-910	1 019 285	
LUT 3-920	1 019 286	
LUT 3-950	1 019 287	
LUT 3-990	1 019 291	
With additional optical filters		
LUT 3-951	1 019 288	OG 570 Filter
LUT 3-952	1 019 289	RG 610 Filter
LUT 3-953	1 019 290	RG 665 Filter

Accessories	page
Cables and connectors	909
Mounting brackets	935
Lenses	946
Liquid light guide	1007

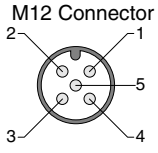
Technical Data	LUT 3-	910	920	950	990*	951	952	953
Sensing distance[1]/	0.4 in/0.08 x 0.2 in (10 mm/2 x 6 mm)	■						
light spot sizes	0.8 in/0.1 x 0.4 in (20 mm/3 x 9 mm)		■					
	2.0 in/0.2 x 0.6 in (50 mm/5 x 15 mm)			■		■	■	■
	3.5 in/0.3 x 0.8 in (90 mm/8 x 20 mm)				■			
Light spot direction	Vertical	■	■	■	■	■	■	■
Light source[2], **light type**	UV light source	■	■	■	■	■	■	■
Wavelength	370 nm	■	■	■	■	■	■	■
Supply voltage V_S	12…30 V DC[3]	■	■	■	■	■	■	■
Ripple[4]	max. 2 V	■	■	■	■	■	■	■
Current consumption[5]	60 mA	■	■	■	■	■	■	■
Switching outputs	Light switching	■	■	■	■	■	■	■
	PNP: HIGH = V_S – <3 V/LOW = 0 V	■	■	■	■	■	■	■
	NPN: HIGH = V_S/ LOW = <2 V	■	■	■	■	■	■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■
Response time[6]	0.3 ms	■	■	■	■	■	■	■
Switching frequency[7]	1.5 kHz	■	■	■	■	■	■	■
Time delay (OFF delay)	3 ms, 5 ms, 10 ms, 20 ms, adjustable	■	■	■	■	■	■	■
Analog output Q_A	0.5…10 mA, 800 Ω	■	■	■	■	■	■	■
Connection type	Plug, M12 5-pin	■	■	■	■	■	■	■
VDE protection class[8]	□	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■
Ambient temperature T_A	Operation 14...131°F (-10…55°C)	■	■	■	■	■	■	■
	Storage -13...167°F (-25…75°C)	■	■	■	■	■	■	■
Shock/vibration	IEC 68	■	■	■	■	■	■	■
Approximate weight	14 oz (400 g)	■	■	■	■	■	■	■
Housing material	Die cast metal	■	■	■	■	■	■	■

1) From front edge of lens
2) Average service life 100,000 h at T_A = 25°C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs Q_P and Q_N short-circuit protected
C = Interference pulse suppression
* Lens is not interchangeable with other models

Connection Diagram



wire colors refer to standard cable, not included



SICK

LUT 1-4

Luminescence Sensors

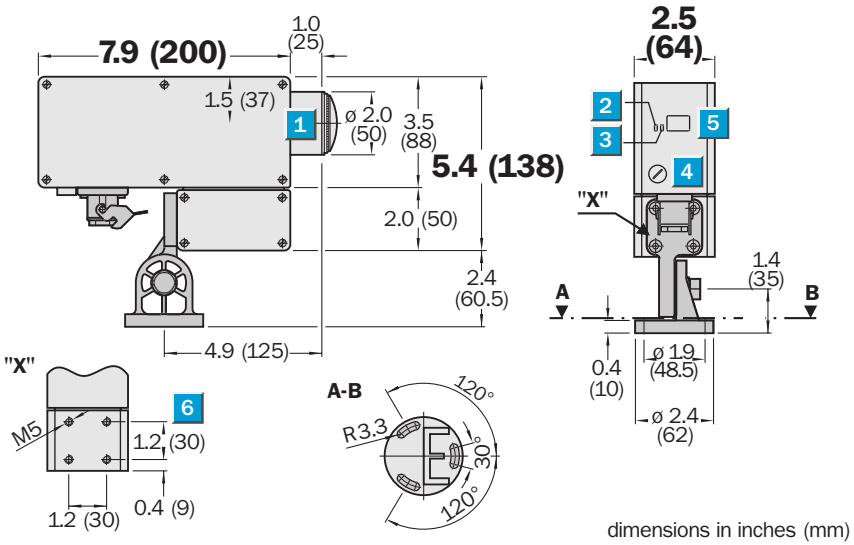
0.2...11.8 in (5...300 mm)
sensing distance

Highlights

- Rugged metal housing
- UV light source with high-pressure mercury vapor lamp
- Interchangeable lenses for sensing range options
- Allows fiber connection
- No interference from surface reflection
- Digital indicator shows received light intensity
- Colored filters available for difficult applications

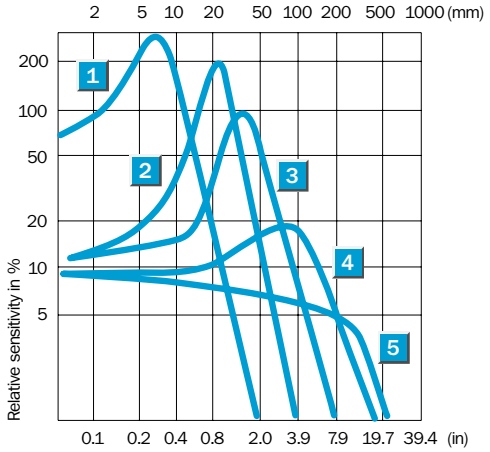
LUT 1-4

Dimensional Drawing



dimensions in inches (mm)

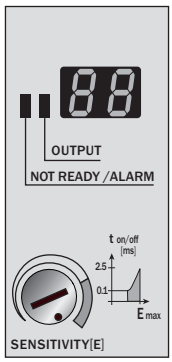
Relative Sensitivity



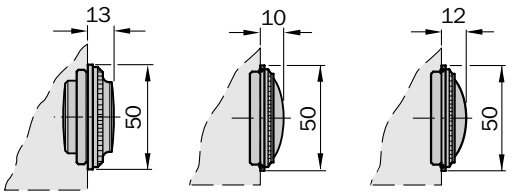
1	Sensing distance	10 mm
2	Sensing distance	20 mm
3	Sensing distance	50 mm
4	Sensing distance	125 mm
5	Sensing distance	300 mm

Adjustments

All types



LUT 1-410	LUT 1-430	LUT 1-450	
LUT 1-420	LUT 1-440		



1 Lens, see dimensional drawing
2 Readiness indicator
3 Output indicator
4 Sensitivity adjustment
5 Digital intensity signal
6 Threaded mounting hole, 12 mm deep

Order Information

Type	Part no.
LUT 1-400	1 007 626
LUT 1-410	1 005 935
LUT 1-420	1 005 936
LUT 1-430	1 005 937
LUT 1-440	1 005 938
LUT 1-450	1 005 939

Accessories	page
Cables and connectors	913
Fiber optic cables	1007
Lenses	953

Special Accessories

Color Filter

Type	Wavelength	Part no.
FLTR-570-LUT 1-4	570…750 nm	4 005 810
FLTR-610-LUT 1-4	610…750 nm	4 012 735
FLTR-630-LUT 1-4	630…750 nm	4 014 153
FLTR-665-LUT 1-4	665…750 nm	4 014 154

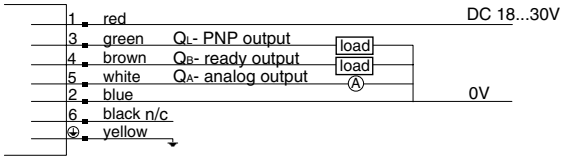
Spare Lamp

SLA-LUT 1-4	1 002 262

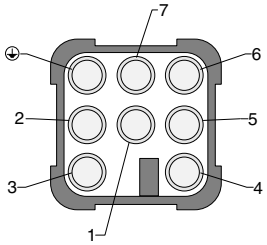
Technical Data		LUT 1-	400	410	420	430	440	450			
Sensing distance[1]/	0.4 in/Ø 0.1 in (10 mm/Ø 3 mm)			■							
light spot diameter	0.8 in/Ø 0.2 in (20 mm/Ø 4 mm)				■						
	2.0 in/Ø 0.3 in (50 mm/Ø 8 mm)					■					
	4.9 in/Ø 0.6 in (125 mm/Ø 15 mm)						■				
	11.8 in/Ø 1.6 in (300 mm/Ø 40 mm)							■			
With fiber optic cable, no lens	0.3 in/Ø 0.4 in (8 mm/Ø 10 mm)		■								
With fiber optic cable, with 144 lens	0.6 in/Ø 0.2 in (15 mm/Ø 6 mm)		■								
With fiber optic cable, with 144 lens and diaphragm	0.6 in/Ø 0.2 in (15 mm/Ø 3 x 6 mm)		■								
Light source	High-pressure mercury vapor lamp		■	■	■	■	■	■			
Light type, wavelength	UV, 365 nm		■	■	■	■	■	■			
Average service life	4000 h		■	■	■	■	■	■			
Supply voltage V_S	18…30 V DC [2]		■	■	■	■	■	■			
Ripple[3]	2 V		■	■	■	■	■	■			
Current consumption[4]	700 mA		■	■	■	■	■	■			
Switching outputs Q_L[5] and Q_B[6]	Light/dark-switching, selectable		■	■	■	■	■	■			
	PNP: HIGH = V_S – <2 V/LOW = 0 V		■	■	■	■	■	■			
Output current I_A max.	200 mA		■	■	■	■	■	■			
Max. switching frequency[7]	5 kHz		■	■	■	■	■	■			
At max. sensitivity	200 Hz		■	■	■	■	■	■			
Response time	0.1 ms		■	■	■	■	■	■			
At max. sensitivity	2.5 ms		■	■	■	■	■	■			
Analog output Q_A	0…1.5 V		■	■	■	■	■	■			
Connection type	Plug		■	■	■	■	■	■			
VDE protection class[8]	□		■	■	■	■	■	■			
Circuit protection[9]	A, B, C		■	■	■	■	■	■			
Enclosure rating	IP 63		■	■	■	■	■	■			
Ambient temperature	Operation 32...113°F (0…45°C)		■	■	■	■	■	■			
	Storage -13...167°F (-25…75°C)		■	■	■	■	■	■			
Approximate weight	5.5 lb (2.5 kg)		■	■	■	■	■				
Housing material	Die cast metal		■	■	■	■	■	■			

1) From front edge of lens
2) Limit values
3) May not exceed or fall short of V_S
4) Without load
5) Q_L = signal output
6) Q_B = operational readiness
7) With light/dark ratio 1:1
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs Q_L, Q_B and Q_{LU} short-circuit protected
C = Interference pulse suppression

Connection Diagram



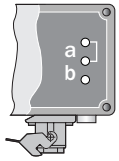
wire colors refer to standard cable, not included



Truth Table LUT 1-4

Internal Jumper	o a o b o			o a o b o		
	Delivered state					
Switching type	Light switching			Dark switching		
Sender lamp	off	started		off	started	
Luminescence	–	yes	no	–	yes	no
Output Q_B (PNP)	LOW	HIGH		LOW	HIGH	
Readiness indicator (red)	on	off/(flashing*)		on	off/(flashing*)	
Output Q_L (PNP)	LOW	HIGH	LOW	LOW	LOW	HIGH
Status indicator (green)	off	on	off	off	on	off

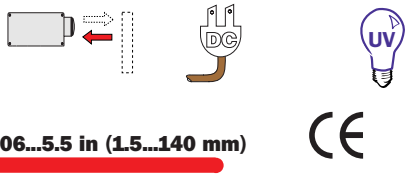
* Flashing: lamp power still sufficient for operation



SICK

LUT 1-5

Luminescence Sensors



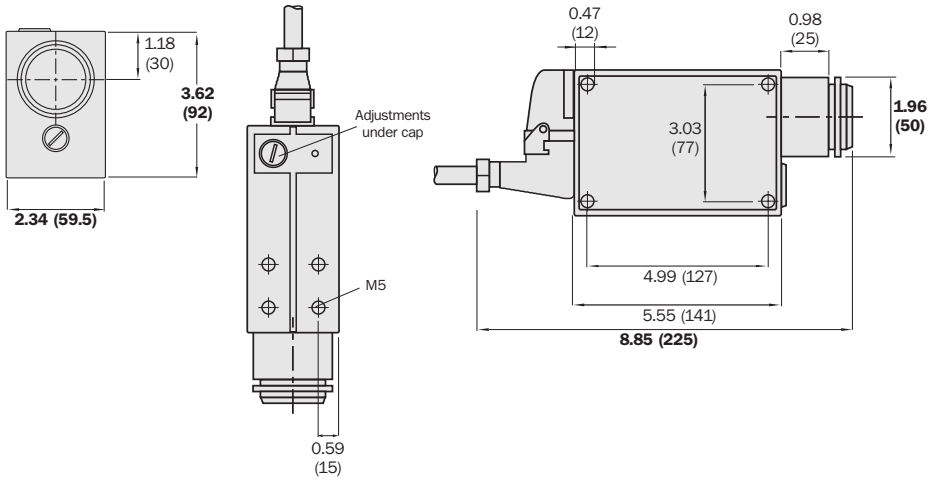
0.06...5.5 in (1.5...140 mm)
sensing distance

Highlights

- Rugged metal housing
- Adjustable sensitivity
- Interchangeable lenses for sensing range options
- Allows fiber cable connection
- Status indicator
- No interference from surface reflection
- Analog output for quality control
- Colored filters available for difficult applications

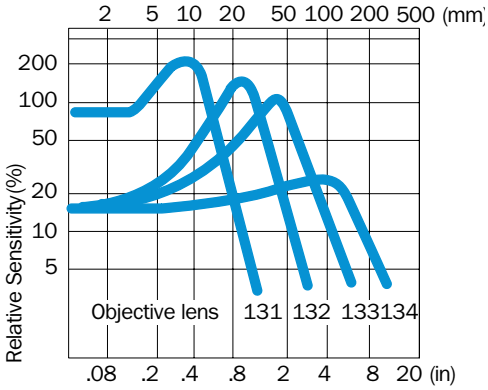
LUT 1-5

Dimensional Drawing



dimensions in inches (mm)

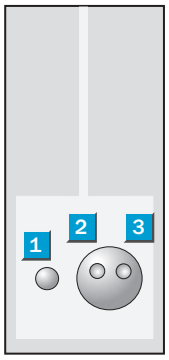
Relative Sensitivity



1	LUT1-510 1.5...10 mm	8 mm focus
2	LUT1-520 14...28 mm	20 mm focus
3	LUT1-530 22...56 mm	50 mm focus
4	LUT1-540 30...140 mm	125 mm focus

Adjustments

All types



1	LED output
2	Delay adjustment
3	Sensitivity adjustment

Order Information

Type	Part no.
LUT 1-500	1 007 597
LUT 1-510	1 005 931
LUT 1-520	1 005 932
LUT 1-530	1 005 933
LUT 1-540	1 005 934

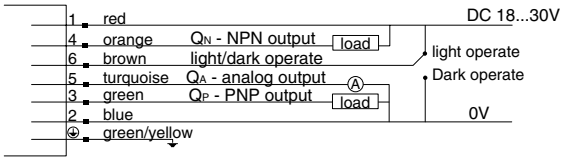
Accessories	page
Cables and connectors	913
Fiber optic cable	1007
Lenses	953

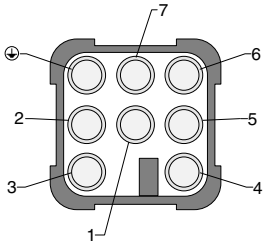
Technical Data	LUT 1-	500*	510	520	530	540
Sensing distance[1]	0.3 in/Ø 0.2 in (8 mm/Ø 5 mm)		■			
light spot diameter	0.8 in/Ø 0.2 in (20 mm/Ø 8 mm)			■		
	2.0 in/Ø 0.6 in (50 mm/Ø 15 mm)				■	
	4.9 in/Ø 1.4 in (125 mm/Ø 35 mm)					■
With fiber optic cable, no lens*	0.3 in/Ø 0.4 in (8 mm/Ø 10 mm)	■				
With fiber optic cable, with 144 lens*	0.6 in/Ø 0.2 in (15 mm/Ø 6 mm)	■				
With fiber optic cable, with 144 lens and diaphragm*	0.6 in/Ø 0.2 in (15 mm/Ø 3 x 6 mm)	■				
Light source	UV-A florescent tube	■	■	■	■	■
Light type, wavelength	UV 365 nm	■	■	■	■	■
Average service life	8000 hours	■	■	■	■	■
Supply voltage V	18-30 V DC[2]	■	■	■	■	■
Ripple[2]	2 V	■	■	■	■	■
Current consumption[4]	800 mA	■	■	■	■	■
Switching outputs Q_N[5] and Q_P[6]	NPN or PNP Light or dark switching	■	■	■	■	■
Output current I_A max.	200 mA	■	■	■	■	■
Max. switching frequency[7]	250 Hz	■	■	■	■	■
Response time	1 ms	■	■	■	■	■
OFF time delay	3...100 ms	■	■	■	■	■
Analog output Q_A	0...10 mA	■	■	■	■	■
Connection type	Rectangular 7-pin DIN 43 652	■	■	■	■	■
VDE protection class[8]	□	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■
Enclosure rating	IP 64	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25…50°C)	■	■	■	■	■
	Storage -13...167°F (-25…75°C)	■	■	■	■	■
Approximate weight	5.5 lb (1.1 kg)	■	■	■	■	■
Housing material	Die cast metal	■	■	■	■	■

* Fiber optic cables and lenses are not included with the LUT 1-500. These accessories must be purchased separately.

1) From front edge of lens
2) Limit values
3) May not exceed or fall short of V_S
4) Without load
5) Q_L = signal output
6) Q_B = operational readiness
7) With light/dark ratio 1:1
8) Reference voltage DC 50 V
9) A = V_S connections reverse-polarity protected
B = Outputs Q_L, Q_B and Q_{LU} short-circuit protected
C = Interference pulse suppression

Connection Diagram





wire colors refer to standard cable, not included

SICK

Theory of Operation..Displacement Sensors

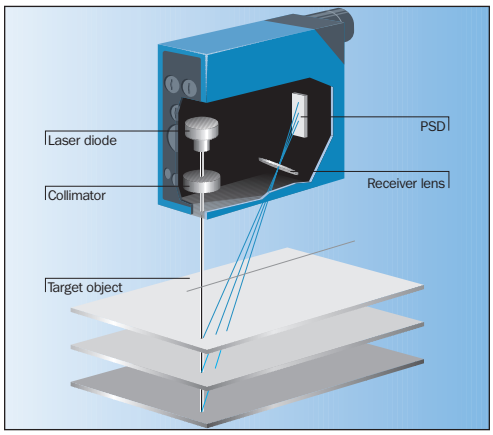


Fig. 1 All-in-one sensor with PSD technology:Triangulation measurement forms the physical basis of the OD sensor

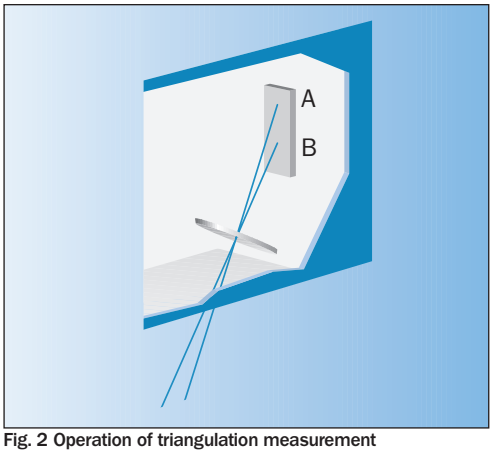


Fig. 2 Operation of triangulation measurement

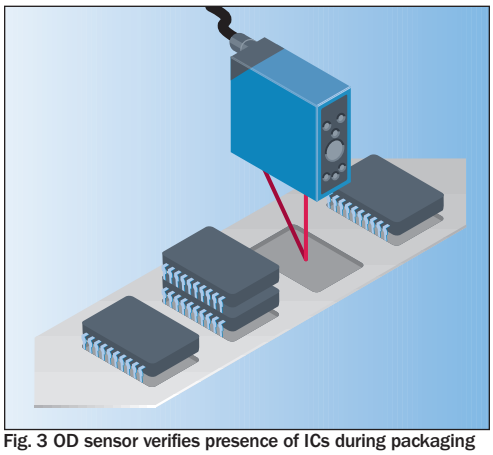


Fig. 3 OD sensor verifies presence of ICs during packaging in semi-conductor industry

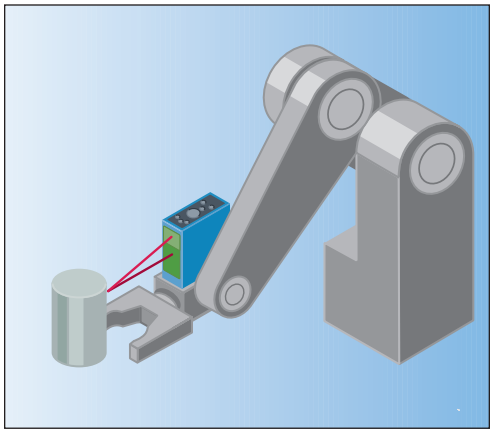


Fig. 4 In the robotics industry OD sensors align and position robot arms

About Displacement Sensors

The OD displacement sensors are a sensing and measuring system in one easy to use, easy to install, compact package. The intelligent micro-controller technology makes it possible to integrate both sensing and measuring functions into a single device. Calibration of the analog output and the adjustment of the sensing range of the switching output are performed with the user-friendly teach-in function.

Displacement sensors detect minute variations, recesses or unevenness in the target object. It can measure with ultra precision and reliably detect the presence of objects such as those found in the automotive, electronics packaging and robotics industries.

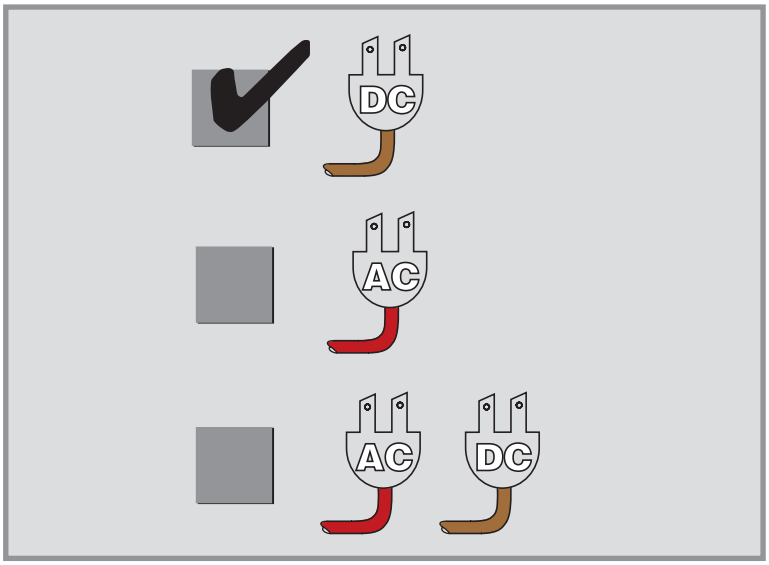
The OD is an all in one sensor with PSD technology: Tried and tested triangulation measurement forms the physical basis of the OD sensor. The optical, circuit and signal processing systems are designed for maximum resolution while maintaining high linearity. (see Fig. 1)

The OD sensor utilizes triangulation measurement. The position of the light spot on the PSD depends on the distance to the object that has been detected. Signals A and B change according to the position of the light spot. The signals are processed in the micro-controller to produce a linear output signal based on the distance to the object. (See Fig. 2)

New to the OD family are the sensors with a CMOS receiver (see page 632). These sensors provide even higher performance when the target objects are either very shiny, very dark or both.

Additionally, the new OD sensors with the CMOS have a digital display and easy to use buttons for simple set up and adjustment.

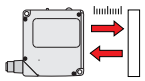
Displacement Sensors



SICK

OD Setting and Calibration

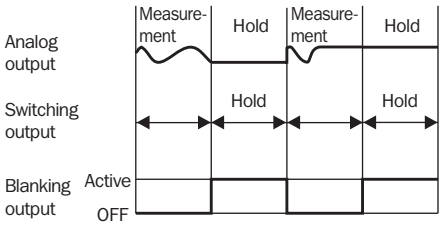
Displacement Sensors

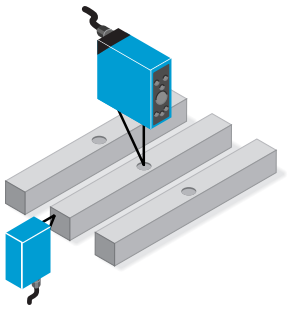


OD

Description of the Blanking Input (SH)

- When the blanking input is active, the control and analog outputs retain their previous status (PNP type); active level is HIGH; NPN type; active level is LOW).

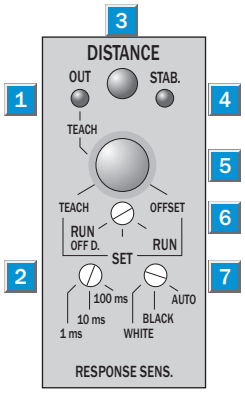




Description of the Operating Panel

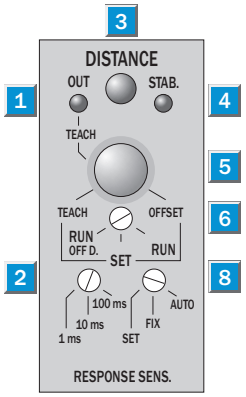
Adjustments

OD 25-05P132	
OD 25-05P830	
OD 25-05N132	
OD 25-05N830	
OD 50-10P840	
OD 50-10N840	



Adjustments

OD 30-04P840	OD 250-150P840
OD 30-04N840	OD 250-150N840
OD 100-35P840	
OD 100-35N840	
OD 130-50P840	
OD 130-50N840	



1 Teach-in indicator/output indicator
In the RUN mode the LED indicator shows "Open collector" status: orange – output ON, off: does not illuminate – output OFF.

2 Switch response time with 3 positions
Positions 100 ms, 10 ms or 1 ms are selected according to required response time and resolution – the longer the response time, the better the resolution.

3 Distance indicator
Display for the distance from the front of the sensor to the object. In scanning range: LED display lights red (closer than half-way), orange (half-way) or green (farther than half-way). The distance indicator blinks red-green, when the object is outside measurement range.

4 Stability indicator (STAB)
The LED indicator lights green when there is light reception with reserve. It does not light when there is insufficient reception and it lights red if reflection is too weak or too strong (mirror-like surface).

5 Teach-in button – Set Mode (during teach-in)
a) Setting the scanning distance: The LED lights green 1 x when the first distance is set and 2 x, when the second distance is set. In the event of an error, it lights red 1 x.
b) Setting offset: The LED lights green 3 x, when offset is set. In the event of an error, it lights red 1 x.
c) Resetting offset: The LED lights green 3 x, when the offset is reset.

6 Mode selector with 3 positions
Positions SET, RUN and RUN with OFF DELAY are required for the teach-in procedure.

7 Sensitivity selector with 3 positions
WHITE (white object), BLACK (black object) and AUTO (grey and/or multicolored object). When the selector is set to AUTO, WHITE or BLACK is selected depending on the reflection.

8 OD 30/OD 50/OD 100/OD 130/OD 250:
AUTO: Automatic amplifier control (gain) depending on reflectance.
SET/FIX: Switch setting SET: Reflectance is taught by Teach-in. Switch setting FIX: Amplification is set after Teach-in with the switching function FIX.

Two steps for calibrating the analog output

1. Position the object at the middle of the sensor's scanning distance. The LED distance indicator lights orange.

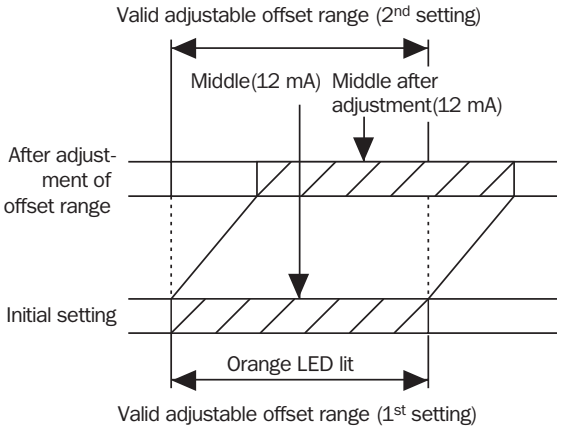
2. Switch the mode selector to SET. Press the teach-in button for 2 to 5 seconds or trigger it via the connection cable. (TI) Teach-in signal lights green three times. Switch the mode selector to RUN or RUN with OFF DELAY; the calibration is complete.

The teach-in input is independent of the position of the mode selector (Run or SET).

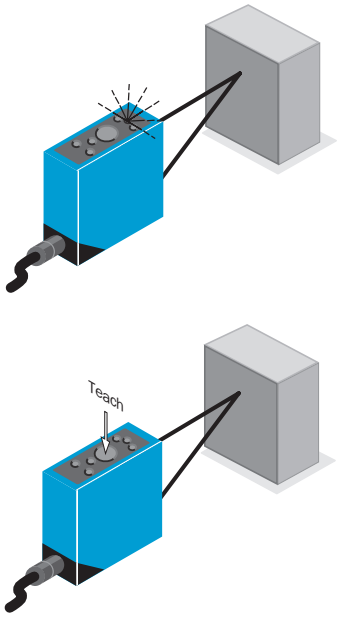
Two steps for resetting offset

1. Switch the mode selector to SET.

2. Press the teach-in button for longer than 5 seconds or trigger it via the connection cable.



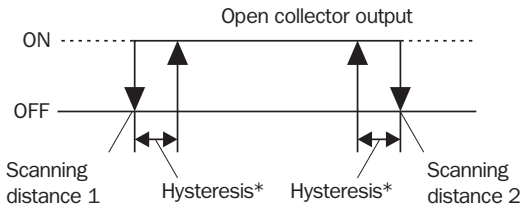
1. Position of the sensor



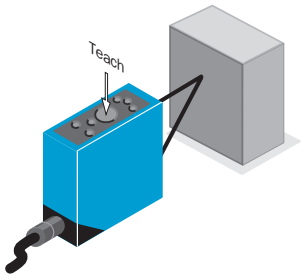
2. Teach-in calibration of the analogue output

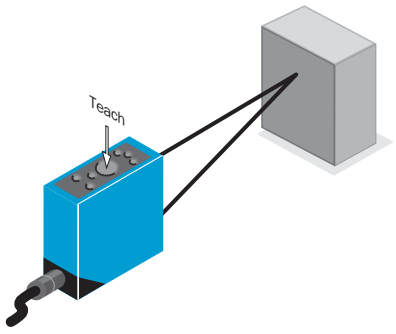
Three steps for setting the switching control output

1. Switch the mode selector to SET. Position the object at scanning distance 1. Press the teach-in button for less than 2 seconds or trigger it via the connection cable.
2. Position the object at scanning distance 2. Press the teach-in button for less than 2 seconds or trigger it via the connection cable.
3. Switch the mode selector to RUN or RUN with OFF DELAY. The teach-in input is independent of the position of the mode selector.
* The hysteresis depends on the response time; the longer the response time the smaller the hysteresis. Therefore, the higher the reflectivity, the smaller the hysteresis.



Object at scanning distance 1

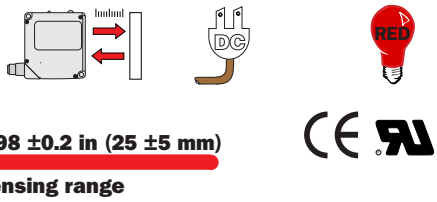




Object at scanning distance 2

OD 25

Displacement Sensors



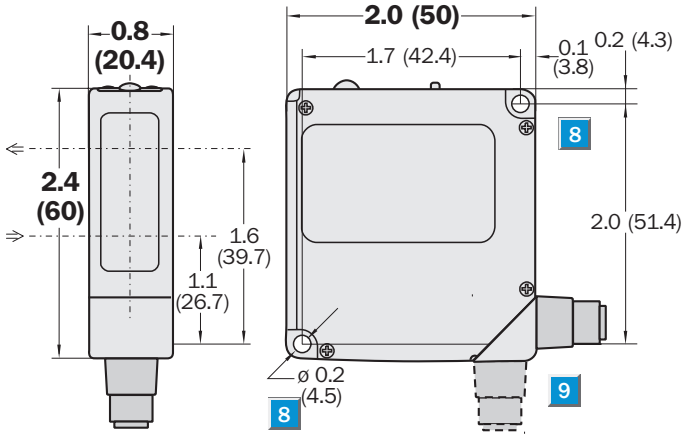
0.98 ±0.2 in (25 ±5 mm)
sensing range

Highlights

- Non-contact measurement with a resolution of 3 microns (0.00012 in)
- All functions integrated into a single, compact housing
- Simple, one step push-button set up for outputs
- 16-bit microprocessor means a smaller sensor with superior accuracy and linearity
- Both analog and switching outputs
- Cable connection swivels for easy installation

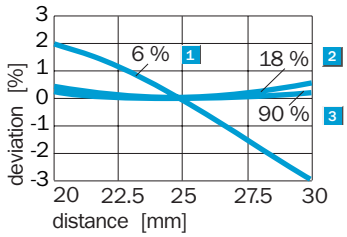
OD 25

Dimensional Drawing



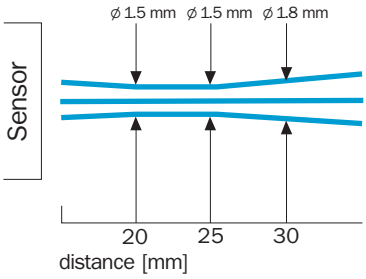
dimensions in inches (mm)

Deviation OD 25-05 (LED)



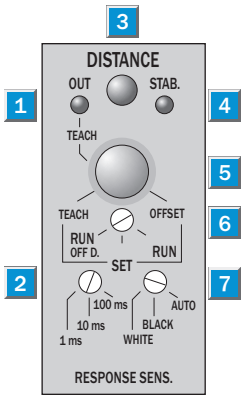
1	Deviation on black
2	Deviation on grey
3	Deviation on white

Light Spot Diameter OD 25-05 (LED)



Adjustments

All types



1	Teach-in indicator/output indicator
2	Response time selector
3	Distance indicator
4	Stability indicator
5	Teach-in button
6	Mode selector
7	Sensitivity selector
8	Mounting hole, Ø 4.5 mm through hole
9	2 m cable or M12 8-pin plug; 90° rotatable

Order Information

Type	Part no.
OD 25-05P132	6 020 643
OD 25-05P830	6 020 647
OD 25-05N132	6 020 642
OD 25-05N830	6 020 646

Accessories	page
ODC processor units	634
Connection cables	910

Technical Data	0D-	25-05 P132	25-05 P830	25-05 N132	25-05 N830					
Sensing range	0.98 ± 0.2 in (25 ± 5 mm)	■	■	■	■					
Light source	LED, red light, 650 nm	■	■	■	■					
Analog output (output lead)	4…20 mA , (0…300 Ω)	■	■	■	■					
Switching outputs	PNP; 24 V/100 mA open collector (max.)	■	■							
	NPN; 24 V/100 mA open collector (max.)			■	■					
Supply voltage V_S	DC 12…24 V, +10%/– 5%	■	■	■	■					
Accuracy	± 1% FS[1] at 18%…90%, ± 4% FS[1] at 6%	■	■	■	■					
Current consumption[2]	120 mA (at 24 V) (including analog output current)	■	■	■	■					
Linearity	± 1% FS[1] at 18%…90%, ± 3% FS[1] at 6%	■	■	■	■					
Drift	± 0.05%/°C FS[1]	■	■	■	■					
Resolution of analog output	3/10/30 µm at 100/10/1 ms	■	■	■	■					
Hysteresis of control output	10/30/100 µm (90% remission)@ 100/10/1 ms	■	■	■	■					
	30/120/500 µm (6% remission)@ 100/10/1 ms	■	■	■	■					
Analog output freq. response – 3 dB	100 ms…6.7/s, 10 ms…54/s, 1 ms…770/s	■	■	■	■					
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active	■	■	■	■					
Hold input (SH), blanking input	NPN LOW = active, PNP HIGH = active	■	■	■	■					
Timing options	Fixed 40 ms off delay	■	■	■	■					
VDE protection class	⧫	■	■	■	■					
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)	■	■	■	■					
Warm-up time[3]	10 min. max.	■	■	■	■					
EMC	EN 50081-1, EN 50082-2	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Circuit protection[4]	A, B, D	■	■	■	■					
Ambient temperature[5]	Operating 14...104°F (-10…40°C)	■	■	■	■					
	Storage -4...140°F (-20…60°C)	■	■	■	■					
Connection types	2 m cable	■		■						
	Plug, M12 8-pin		■		■					
Housing material	PBT	■	■	■	■					
Approximate weight	2.5 oz (70 g)	■	■	■	■					
Shock/vibration	50 G, 3 axis, each 3 times/	■	■	■	■					
	10...55 Hz, 1.5 mm amp., 3 axis, each 2 hours									

1) FS = Full Scale = 10 mm/0D25,

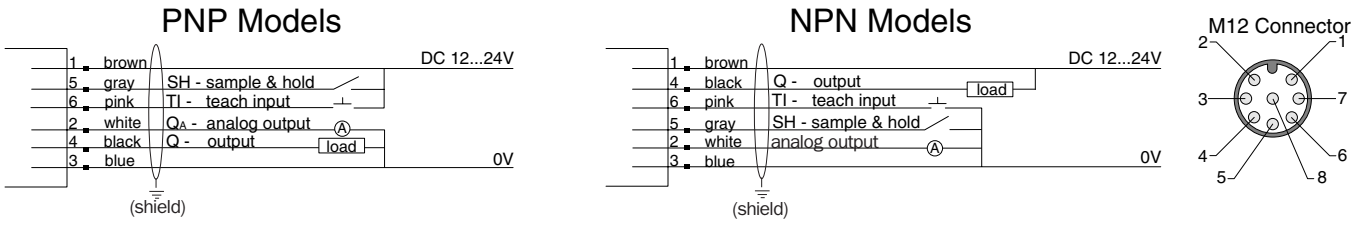
2) Without load

3) For applications with max. resolution and accuracy

4) A = Input and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression

5) Do not bend below 0°C

Connection Diagram

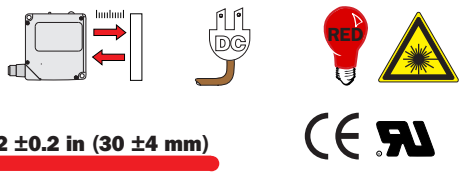


wire colors refer to cable 6 020 663, not included with quick disconnect models

SICK

OD 30

Displacement Sensors



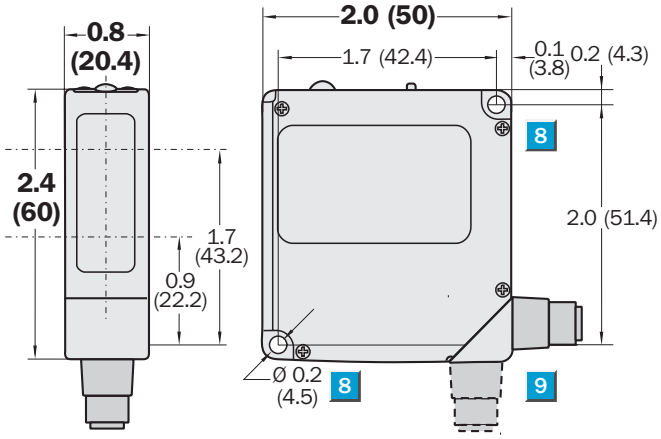
1.2 ±0.2 in (30 ±4 mm)
sensing range

Highlights

- Non-contact measurement with a resolution of 1 micron (0.00004 in)
- All functions integrated into a single, compact housing
- Simple, one step push-button set up for outputs
- 16-bit microprocessor means a smaller sensor with superior accuracy and linearity
- Both analog and switching outputs
- Cable connections swivel for easy installation

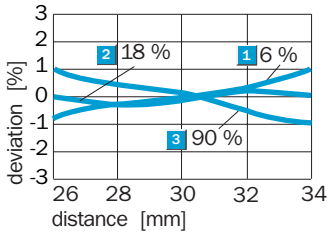
OD 30

Dimensional Drawing



dimensions in inches (mm)

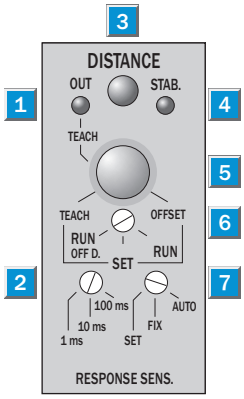
Deviation OD 30-04 (LED)



1	Deviation on black
2	Deviation on grey
3	Deviation on white

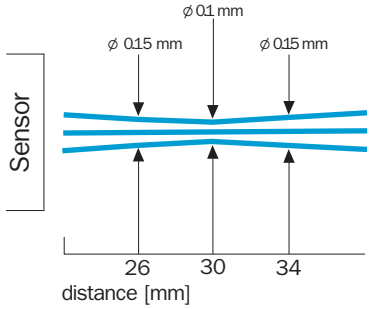
Adjustments

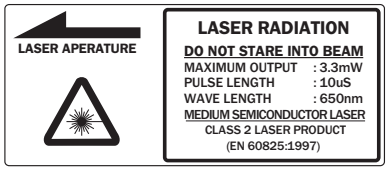
All types



1	Teach-in indicator/output indicator
2	Response time selector
3	Distance indicator
4	Stability indicator
5	Teach-in button
6	Mode selector
7	Sensitivity selector
8	Mounting hole, Ø 4.5 mm through hole
9	M12 8-pin plug; 90° rotatable

Light Spot Diameter OD 30-04 (LED)





Order Information

Type	Part no.
OD 30-04P840	6 020 841
OD 30-04N840	6 020 842

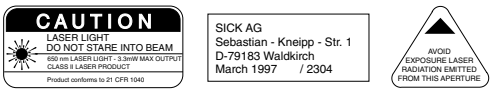
Accessories	page
ODC processor units	634
Connection cables	910

Technical Data	OD-	30-04 P840	30-04 N840							
Sensing range	1.2 ± 0.2 in (30 ± 4 mm)	■	■							
Light source	Laser class II, IEC 60825: 1998	■	■							
	21 CFR 1040.10									
Analog output (output lead)	4…20 mA , (0…300 Ω)	■	■							
Switching outputs	PNP; 24 V/100 mA open collector	■								
	NPN; 24 V/100 mA open collector		■							
Supply voltage V_S	DC 12…24 V, – 5%/+10%	■	■							
Accuracy	± 2% FS[1] at 6%…90%	■	■							
Current consumption[2]	75 mA (at 24 V)	■	■							
Linearity	± 0.5% FS[1] at 6%	■	■							
Drift	± 0.02%/°C FS1[1]	■	■							
Resolution of analog output	1/3/10 µm at 100/10/1 ms	■	■							
Hysteresis of control output	10/30/100 µm (90% remission) @ 100/10/1 ms	■	■							
	30/120/500 µm (6% remission)@ 100/10/1 ms	■	■							
Analog output freq. response – 3 dB	100 ms…5/s, 10 ms…42/s, 1 ms…720/s	■	■							
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active	■	■							
Hold input (SH)Blanking in	NPN LOW = active, PNP HIGH = active	■	■							
Timing options	Fixed 40 ms off delay	■	■							
VDE protection class	⧫	■	■							
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)	■	■							
Warm-up time[3]	10 min. max.	■	■							
EMC	EN 50081-1, EN 50082-2	■	■							
Enclosure rating	IP 67/NEMA 6	■	■							
Circuit protection[4]	A, B, D	■	■							
Ambient temperature[5]	Operating 14...104°F (-10…40°C)	■	■							
	Storage -4...140°F (-20…60°C)	■	■							
Connection types	Plug, M12 8-pin	■	■							
Housing material	Die cast zinc	■	■							
Approximate weight	2.5 oz (70 g)	■	■							
Shock/vibration	50 G, 3 axis, each 3 times/	■	■							
	10...55 Hz, 1.5 mm amp., 3 axis, each 2 hours									

1) FS = Full Scale = 8 mm/OD30
2) Without load
3) For applications with max. resolution and accuracy
4) A = Input and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression
5) Do not bend below 0°C

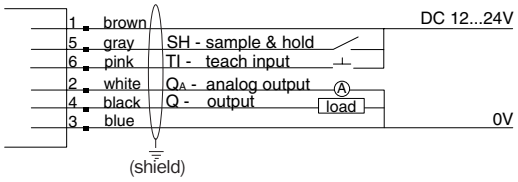
Beam Attenuator

The OD 30 sensors are equipped with an M12 style quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.

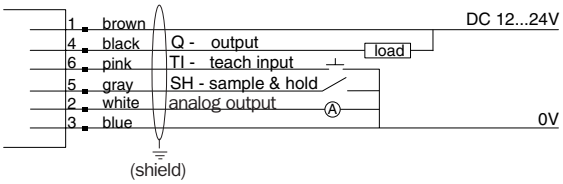


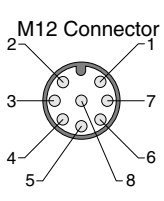
Connection Diagram

PNP Models



NPN Models





wire colors refer to cable 6 020 663, not included with quick disconnect models

SICK

OD 50

Displacement Sensors

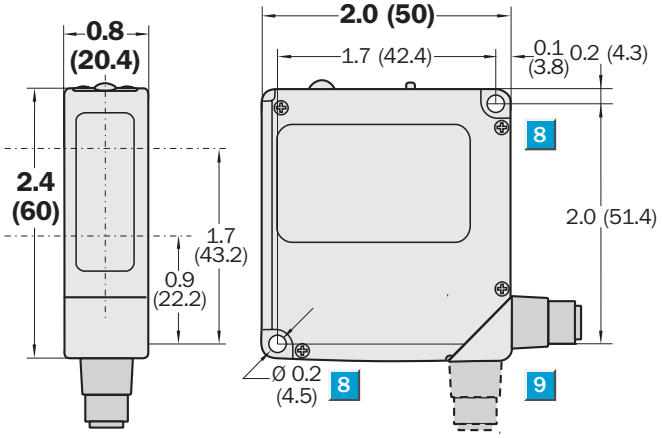
2.0 ±0.4 in (50 ±10 mm)
sensing range

Highlights

- Non-contact measurement with a resolution of 3 microns (0.00012 in)
- All functions integrated into a single, compact housing
- Simple, one step push-button set up for outputs
- 16-bit microprocessor means a smaller sensor with superior accuracy and linearity
- Both analog and switching outputs
- Cable connections swivel for easy installation

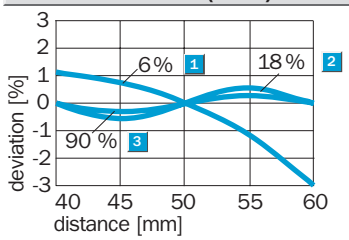
OD 50

Dimensional Drawing



dimensions in inches (mm)

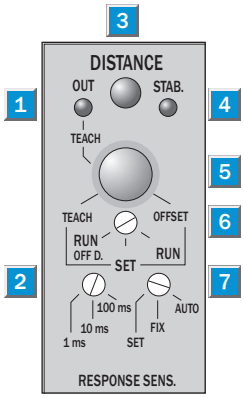
Deviation OD 50-10 (Laser)



1	Deviation on black
2	Deviation on grey
3	Deviation on white

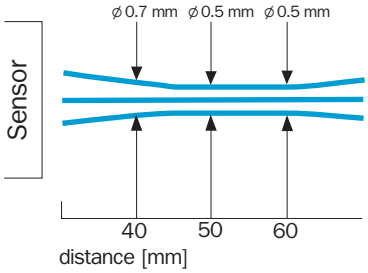
Adjustments

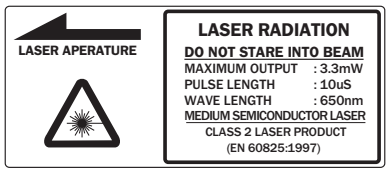
All types



1	Teach-in indicator/output indicator
2	Response time selector
3	Distance indicator
4	Stability indicator
5	Teach-in button
6	Mode selector
7	Sensitivity selector
8	Mounting hole, Ø 4.5 mm through hole
9	M12 8-pin plug; 90° rotatable

Light Spot Diameter OD 50-10 (Laser)





Accessories	page
ODC processor units	634
Connection cables	910

Order Information

Type	Part no.
OD 50-10P840	6 020 641
OD 50-10N840	6 020 640

Technical Data	OD-	50-10 P840	50-10 N840							
Sensing range	2.0 ± 0.4 in (50 ± 10 mm)	■	■							
Light source	Laser class II, IEC 60825: 1998	■	■							
	21 CFR 1040.10									
Analog output (output lead)	4…20 mA , (0…300 Ω)	■	■							
Switching outputs	PNP; 24 V/100 mA open collector	■								
	NPN; 24 V/100 mA open collector		■							
Accuracy	±2% FS[1] at 6%…90%	■	■							
Linearity	±1.5% FS[1] at 6%…90%	■	■							
Drift	±0.02%/°C FS1[1]	■	■							
Resolution of analog output	3/10/30 µm at 100/10/1 ms	■	■							
Hysteresis of control output	10/30/100 µm (90% remission) @ 100/10/1 ms	■	■							
	30/120/500 µm (6% remission)@ 100/10/1 ms	■	■							
Analog output freq. response – 3 dB	100 ms…6.7/s, 10 ms…54/s, 1 ms…770/s	■	■							
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active	■	■							
Hold input (SH)	NPN LOW = active, PNP HIGH = active	■	■							
Timing options	Fixed 40 ms off delay	■	■							
VDE protection class	⧫	■	■							
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)	■	■							
Supply voltage V_S	DC 12…24 V, – 5%/+10%	■	■							
Current consumption[2]	75 mA (at 24 V)	■	■							
Warm-up time[3]	10 min. max.	■	■							
EMC	EN 50081-1, EN 50082-2	■	■							
Enclosure rating	IP 67	■	■							
Circuit protection[4]	A, B, D	■	■							
Ambient temperature[5]	Operating 14...104°F (-10…40°C)	■	■							
	Storage -4...140°F (-20…60°C)	■	■							
Connection types	Plug, M12 8-pin	■	■							
Housing material	Die cast zinc	■	■							
Approximate weight	2.5 oz (70 g)	■	■							
Shock/vibration	50 G, 3 axis, each 3 times/	■	■							
	10...55 Hz, 1.5 mm amp., 3 axis, each 2 hours									

1) FS = Full Scale = 20 mm/OD50

2) Without load

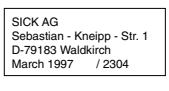
3) For applications with max. resolution and accuracy

4) A = Input and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression

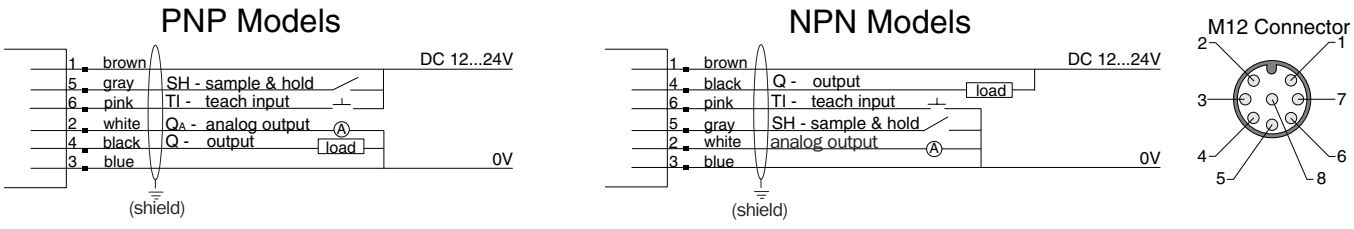
5) Do not bend below 0°C

Beam Attenuator

The OD 50 sensors are equipped with an M12 style quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.



Connection Diagram



wire colors refer to cable 6 020 663, not included with quick disconnect models

SICK

OD 100

Displacement Sensors

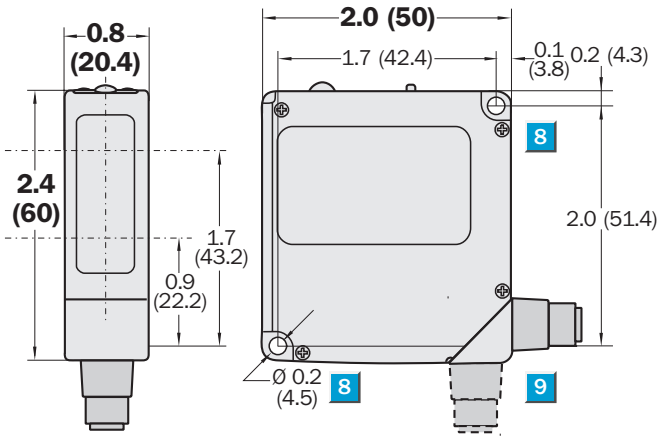
3.9 in ±1.4 in (100 mm ±35 mm)
sensing range

Highlights

- Non-contact measurement with a resolution of 15 microns (0.0006 in)
- All functions integrated into a single, compact housing
- Simple, one step push-button set up for outputs
- 16-bit microprocessor means a smaller sensor with superior accuracy and linearity
- Both analog and switching outputs
- Cable connections swivel for easy installation

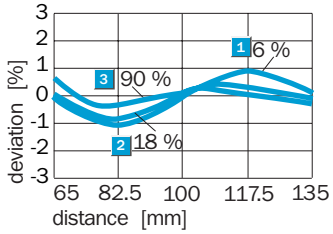
OD 100

Dimensional Drawing



dimensions in inches (mm)

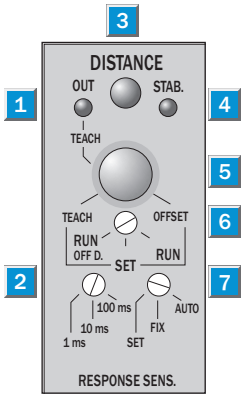
Deviation OD 100-35 (Laser)



1	Deviation on black
2	Deviation on grey
3	Deviation on white

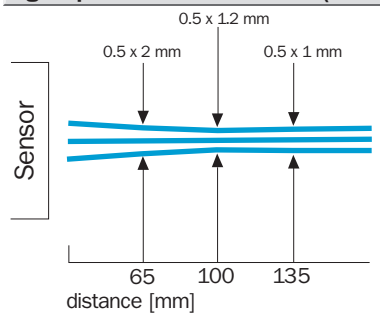
Adjustments

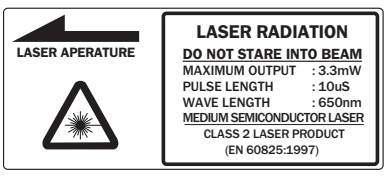
All types



1	Teach-in indicator/output indicator
2	Response time selector
3	Distance indicator
4	Stability indicator
5	Teach-in button
6	Mode selector
7	Sensitivity selector
8	Mounting hole, Ø 4.5 mm through hole
9	M12 8-pin plug; 90° rotatable

Light Spot Diameter OD 100-35 (Laser)





Order Information

Type	Part no.
OD 100-35P840	6 022 478
OD 100-35N840	6 022 479

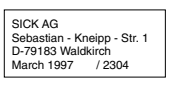
Accessories	page
ODC processor units	634
Connection cables	910

Technical Data	OD-	100-35 P840[2]	100-35 N840[2]							
Sensing range	3.9 in ±1.4 in (100 mm ±35 mm)									
Light source	Laser class II, IEC 60825: 1998									
	21 CFR 1040.10									
Analog output (output lead)	4…20 mA , (0…300 Ω)									
Switching outputs[3]	PNP; 24 V/100 mA open collector									
	NPN; 24 V/100 mA open collector									
Accuracy	±2% FS[4]/90% - 6%									
Linearity	±1.5% FS[4]/90% - 6%									
Drift	±0.02%/°C FS[4]									
Resolution of analog output[5]	15/50/150 µm at 100/10/1 ms									
Analog output freq. response – 3 dB	100 ms…5/s, 10 ms…42/s, 1 ms…720/s									
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active									
Hold input (SH)	NPN LOW = active, PNP HIGH = active									
Timing options	Fixed 40 ms off delay									
VDE protection class	⧫									
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)									
Supply voltage V_S	DC 12…24 V, – 5%/+10%									
Current consumption[6]	75 mA (at 24 V)									
Warm-up time[7]	10 min. max.									
EMC	EN 50081-2, EN 50082-2									
Enclosure rating	IP 67									
Circuit protection[8]	A, B, D									
Ambient temperature T_A[9]	Operating 14...104°F (-10…40°C)									
	Storage -4...140°F (-20…60°C)									
Connection types	Plug, M12 8-pin									
Housing material	Die cast zinc									
Approximate weight	2.5 oz (70 g)									
Shock/vibration	50 G, 3 axis, each 3 times/									
	10...55 Hz, 1.5 mm amp., 3 axis, each 2 hours									

2) Connection: M12 plug 2 m prefabricated cable, Order no. 6 020 663
3) Minimum teachable distance window is 4...10 times resolution of analog output
4) FS = Full Scale = 80 mm/OD100, 100 mm
5) 90% remission, white target
6) Without load
7) For applications with max. resolution and accuracy
8) A = Inputs and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression
9) Do not bend cable below 0°C

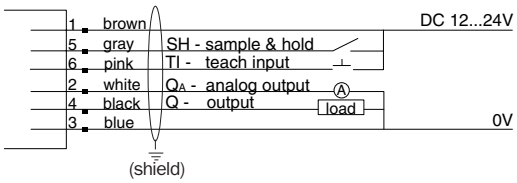
Beam Attenuator

The OD 100 sensors are equipped with an M12 style quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.

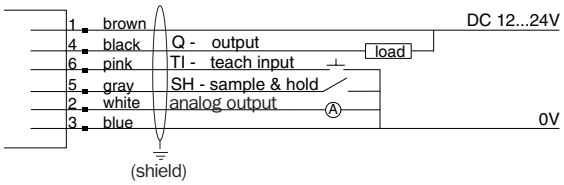


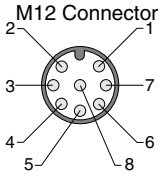
Connection Diagram

PNP Models



NPN Models





wire colors refer to cable 6 020 663, not included with quick disconnect models

SICK

OD 130

Displacement Sensors

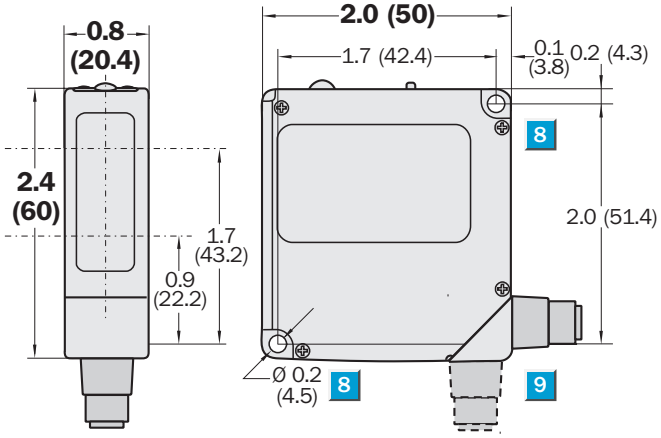
5.1 in ±2.0 in (130 mm ±50 mm)
sensing range

Highlights

- Non-contact measurement with a resolution of 20 microns (0.0008 in)
- All functions integrated into a single, compact housing
- Simple, one step push-button set up for outputs
- 16-bit microprocessor means a smaller sensor with superior accuracy and linearity
- Both analog and switching outputs
- Cable connections swivel for easy installation

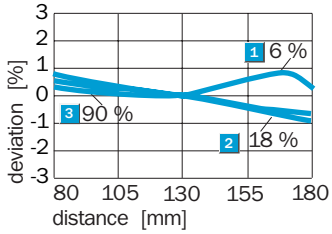
OD 130

Dimensional Drawing



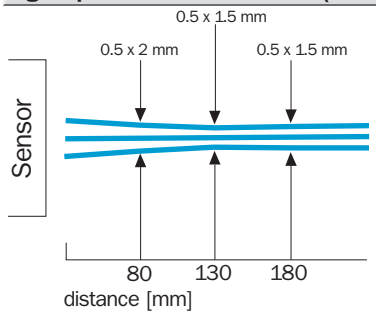
dimensions in inches (mm)

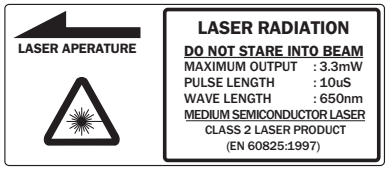
Deviation OD 130-50 (Laser)



1	Deviation on black
2	Deviation on grey
3	Deviation on white

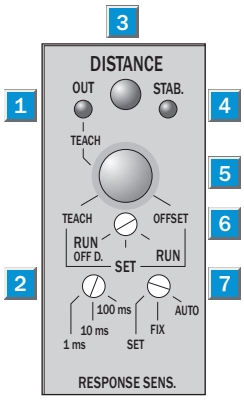
Light Spot Diameter OD 130-50 (Laser)





Adjustments

All types



1	Teach-in indicator/output indicator
2	Response time selector
3	Distance indicator
4	Stability indicator
5	Teach-in button
6	Mode selector
7	Sensitivity selector
8	Mounting hole, Ø 4.5 mm through hole
9	M12 8-pin plug; 90° rotatable

Order Information

Type	Part no.
OD 130-50P840	6 021 849
OD 130-50N840	6 021 850

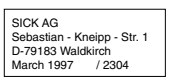
Accessories	page
ODC processor units	634
Connection cables	910

Technical Data	OD-	130-50 P840[2]	130-50 N840[2]
Sensing range	5.1 in ±2.0 in (130 mm ±50 mm)		
Light source	Laser class II, IEC 60825: 1998		
	21 CFR 1040.10		
Analog output (output lead)	4…20 mA , (0…300 Ω)		
Switching outputs[3]	PNP; 24 V/100 mA open collector		
	NPN; 24 V/100 mA open collector		
Accuracy	±2% FS[4]/90% - 6%		
Linearity	±1.5% FS[4]/90% - 6%		
Drift	±0.02%/°C FS[4]		
Resolution of analog output[5]	20/70/200 µm at 100/10/1 ms		
Analog output freq. response – 3 dB	100 ms…5/s, 10 ms…42/s, 1 ms…720/s		
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active		
Hold input (SH)	NPN LOW = active, PNP HIGH = active		
Timing options	Fixed 40 ms off delay		
VDE protection class	⧫		
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)		
Supply voltage V_S	DC 12…24 V, – 5%/+10%		
Current consumption[6]	75 mA (at 24 V)		
Warm-up time[7]	10 min. max.		
EMC	EN 50081-2, EN 50082-2		
Enclosure rating	IP 67		
Circuit protection[8]	A, B, D		
Ambient temperature T_A[9]	Operating 14...104°F (-10…40°C)		
	Storage -4...140°F (-20…60°C)		
Connection types	Plug, M12 8-pin		
Housing material	Die cast zinc		
Approximate weight	2.5 oz (70 g)		
Shock/vibration	50 G, 3 axis, each 3 times/		
	10...55 Hz, 1.5 mm amp., 3 axis, each 2 hours		

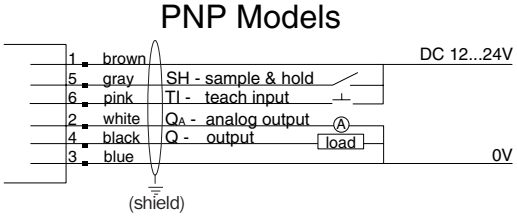
2) Connection: Plug 2 m prefabricated cable, Order no. 6 020 663
3) Minimum teachable distance window is 4...10 times resolution of analog output
4) FS = Full Scale = 100 mm/OD130
5) 90% remission, white target
6) Without load
7) For applications with max. resolution and accuracy
8) A = Inputs and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression
9) Do not bend cable below 0°C

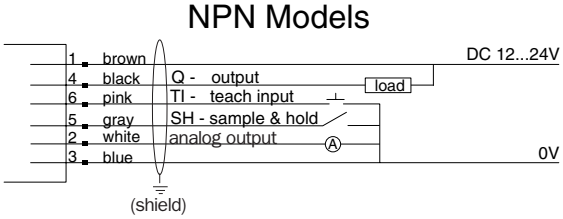
Beam Attenuator

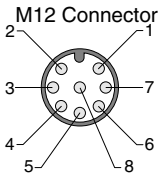
The OD 130 sensors are equipped with an M12 style quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.



Connection Diagram







wire colors refer to cable 6 020 663, not included with quick disconnect models

SICK

OD 250

Displacement Sensors

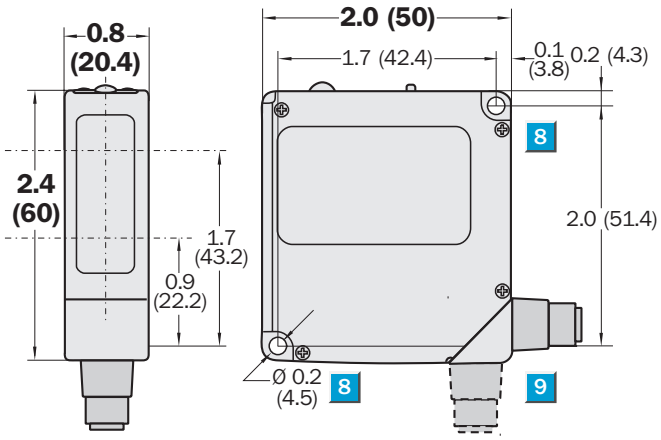
9.8 in ±5.9 in (250 mm ±150 mm)
sensing range

Highlights

- Non-contact measurement with a resolution of 150 microns (0.006 in)
- All functions integrated into a single, compact housing
- Simple, one step push-button set up for outputs
- 16-bit microprocessor means a smaller sensor with superior accuracy and linearity
- Both analog and switching outputs
- Cable connections swivel for easy installation

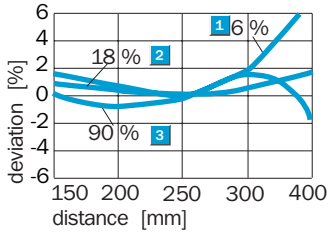
OD 250

Dimensional Drawing



dimensions in inches (mm)

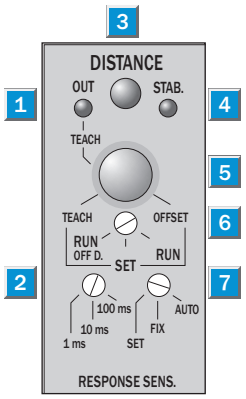
Deviation OD 250-150 (Laser)



1	Deviation on black
2	Deviation on grey
3	Deviation on white

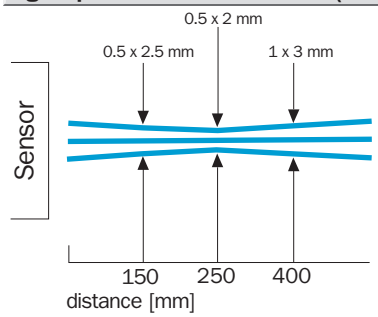
Adjustments

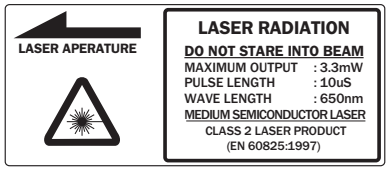
All types



1	Teach-in indicator/output indicator
2	Response time selector
3	Distance indicator
4	Stability indicator
5	Teach-in button
6	Mode selector
7	Sensitivity selector
8	Mounting hole, Ø 4.5 mm through hole
9	M12 8-pin plug; 90° rotatable

Light Spot Diameter OD 250-150 (Laser)





Order Information

Type	Part no.
OD 250-150P840	6 021 853
OD 250-150N840	6 021 854

Accessories

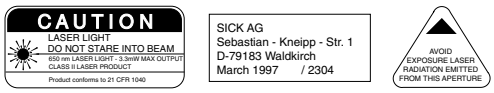
	page
ODC processor units	634
Connection cables	910

Technical Data	OD-	250-150 P840[2]	250-150 N840[2]
Sensing range	9.8 in ±5.9 in (250 mm ±150 mm)		
Light source	Laser class II, IEC 60825: 1998		
	21 CFR 1040.10		
Analog output (output lead)	4…20 mA , (0…300 Ω)		
Switching outputs[3]	PNP; 24 V/100 mA open collector		
	NPN; 24 V/100 mA open collector		
Accuracy	±3% FS[4]/90% - 18%		
Linearity	±3% FS[4]/90% - 18%		
Drift	±0.02%/°C FS[4]		
Resolution of analog output[5]	150/500/1500 µm at 100/10/1 ms		
Analog output freq. response – 3 dB	100 ms…5/s, 10 ms…42/s, 1 ms…720/s		
Teach-in input (TI)	NPN LOW = active, PNP HIGH = active		
Hold input (SH)	NPN LOW = active, PNP HIGH = active		
Timing options	Fixed 40 ms off delay		
VDE protection class	⏀		
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)		
Supply voltage V_S	DC 12…24 V, – 5%/+10%		
Current consumption[6]	75 mA (at 24 V)		
Warm-up time[7]	10 min. max.		
EMC	EN 50081-2, EN 50082-2		
Enclosure rating	IP 67		
Circuit protection[8]	A, B, D		
Ambient temperature T_A[9]	Operating 14...104°F (-10…40°C)		
	Storage -4...140°F (-20…60°C)		
Connection types	Plug, M12 8-pin		
Housing material	Die cast zinc		
Approximate weight	2.5 oz (70 g)		
Shock/vibration	50 G, 3 axis, each 3 times/		
	10...55 Hz, 1.5 mm amp., 3 axis, each 2 hours		

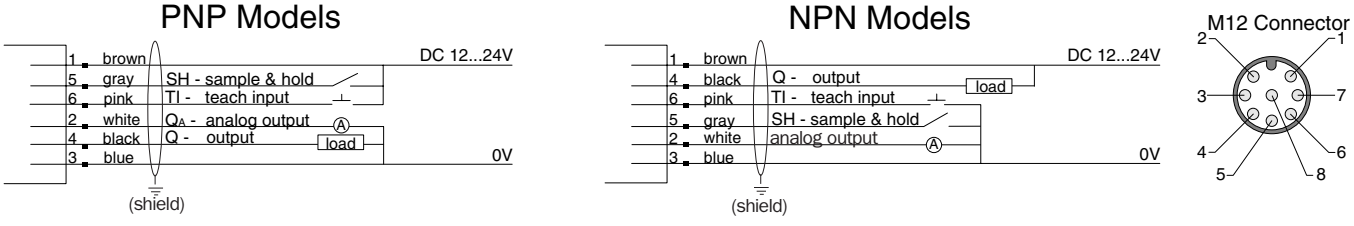
2) Connection: Plug 2 m prefabricated cable, Order no. 6 020 663
3) Minimum teachable distance window is 4...10 times resolution of analog output
4) FS = Full Scale = 300 mm/OD 250
5) 90% remission, white target
6) Without load
7) For applications with max. resolution and accuracy
8) A = Inputs and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression
9) Do not bend cable below 0°C

Beam Attenuator

The OD 250 sensors are equipped with an M12 style quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.



Connection Diagram



wire colors refer to cable 6 020 663, not included with quick disconnect models

SICK

OD CMOS

Displacement Sensors

1.2 ±0.2 (30 ±4)/2 ±0.4 (50 ±10)/3.1 ±0.6 (80 ±15)/ 3.9 ± 1.6 in (100 ±40 mm)

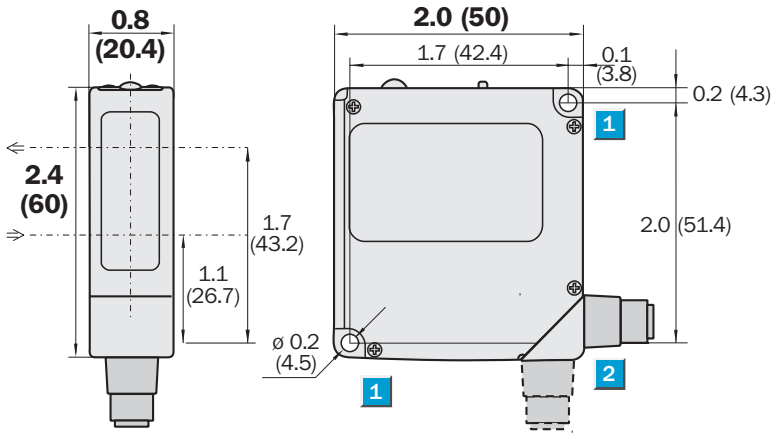
sensing range

Highlights

- CMOS Technology:
  - object independent measuring: shiny, dark
  - highly precise measurement for quality improvement
  - better in handling multiple reflections from the surface.
- Stand-alone device- no external controller necessary
- Setting and display on the device for quick, fast and easy set up

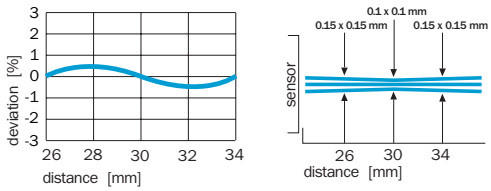
OD CMOS

Dimensional Drawing

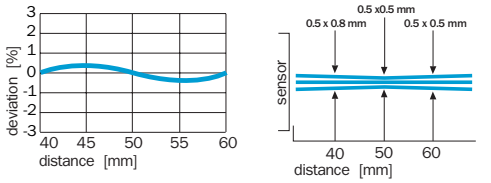


dimensions in inches (mm)

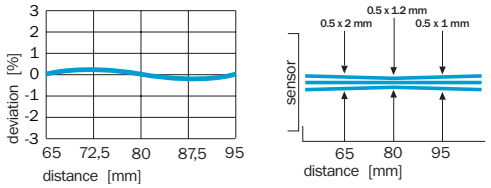
Deviation/Light Spot Diameter OD 30-04



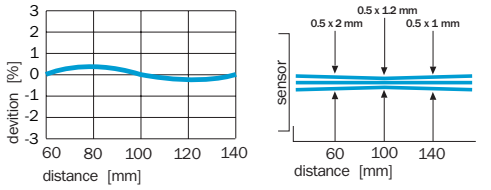
Deviation/Light Spot Diameter OD 50-10



Deviation/Light Spot Diameter OD 80-15

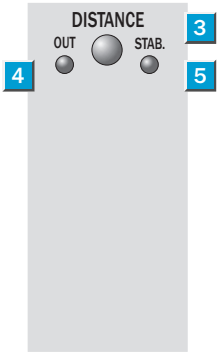


Deviation/Light Spot Diameter OD 100-40

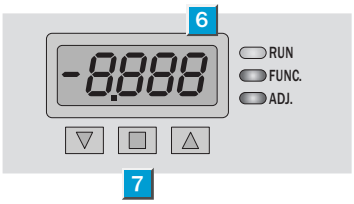


Adjustments

All types



1 Mounting hole, Ø4.5 mm
2 2 m cable (5 m option) or M12 plug; 90° rotatable
3 Distance indicator
4 Output indicator (OUT)
5 Stability indicator
6 Display
7 Mode buttons



Order Information

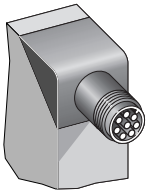
Type	Part no.
OD 30-04N850	6 025 034
OD 30-04P850	6 025 032
OD 50-10N850	6 025 038
OD 50-10P850	6 025 039
OD 80-15N850	6 025 042
OD 80-15P850	6 025 040
OD 100-40N850	6 025 046
OD 100-40P850	6 025 044

Accessories	page
ODC processor units	634
Connection cables	910

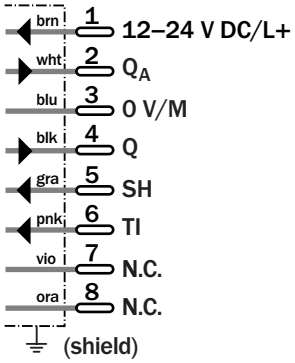
Technical Data	OD-	30-04 P850	30-04 N840	50-10 P850	50-10 N850	80-15 P850	80-15 N850	100-40 P850	100-40 N850
Sensing range	1.2 ±0.2 in (30 ± 4 mm)	■	■						
	2.0 ±0.4 in (50 ± 10 mm)			■	■				
	3.1 ±0.6 in (80 ± 15 mm)					■	■		
	3.9 ±1.6 in (100 ± 40 mm)							■	■
Light source	Laser category II, EN60825: 1998	■	■	■	■	■	■	■	■
Analog output	4–20 mA , 0–300 Ω	■	■	■	■	■	■	■	■
Switching outputs	PNP; 30 V/100 mA open collector	■		■		■		■	
	NPN; 30 V/100 mA open collector		■		■		■		■
Accuracy	± 1%/6% – 90 % remission (FS [1])	■	■	■	■	■	■	■	■
Linearity	± 1%/6% – 90 % remission (FS [1])	■	■	■	■	■	■	■	■
Drift	± 0.08 %/°C (FS [1])	■	■	■	■	■	■	■	■
Resolution of analog output[2]	10/6/5/4/2/2 µm [3]	■	■						
	20/15/10/10/8/8 µm [3]			■	■				
	30/20/15/15/8/8 µm [3]					■	■		
	60/50/35/35/20/10 µm [3]							■	■
Analog output freq. response – 3 dB	1000/s; 344/s; 85,6/s; 21,7/s; 5,47/s; 1,37/s [3]	■	■	■	■	■	■	■	■
Teach-in-Input (TI)	NPN LOW = active, PNP HIGH = active	■	■	■	■	■	■	■	■
Hold input (SH)	NPN LOW = active, PNP HIGH = active	■	■	■	■	■	■	■	■
Timer	0–10 s off/on delay, one shot, none	■	■	■	■	■	■	■	■
VDE protection glass	⍾	■	■	■	■	■	■	■	■
Sensitivity to ambient light	10,000 lx (sun), 3000 lx (artificial light)	■	■	■	■	■	■	■	■
Supply voltage U_V	DC 12–24 V, –5 %/+10 %	■	■	■	■	■	■	■	■
Current consumption[4]	120 mA (by 24 V)	■	■	■	■	■	■	■	■
Warm-up time[5]	5 min. max.	■	■	■	■	■	■	■	■
EMV	EN 50081-2, EN 50082-2	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[6]	A, B, D	■	■	■	■	■	■	■	■
Ambient temperature T_U[7]	Operating 14...104°F (-10…40°C)	■	■	■	■	■	■	■	■
	Storage -4...140°F (-20…60°C)	■	■	■	■	■	■	■	■
Housing	Zinc	■	■	■	■	■	■	■	■

1) FS = Full Scale = 8 mm/OD 30, 20 mm/OD 50, 30 mm/OD 80, 80 mm/OD 100
2) 90% remission
3) 1/4/16/64/256/1024 avg.
4) Without load
5) For applications with max. resolution and accuracy
6) A = Inputs and outputs reverse-polarity protected
B = Outputs short-circuit protected
D = Interference pulse suppression
7) Do not bend below 0°C

Connection Diagram



8-pin, M 12



SICK

ODC

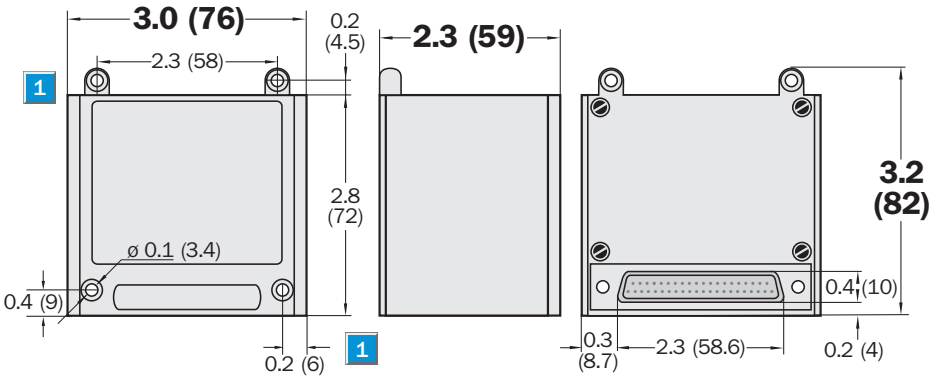
Displacement Sensor Processor Unit

Highlights

- Advanced digital signal processing for up to two analog inputs
- Will work with any 4...20 mA input, but is already set up for OD series
- RS 232 and Profibus available
- 2 OD's for thickness measurement
- All setup parameters can be set remotely via PLC, PC
- 2 kHz input scanning frequency
- Alphanumeric display
- Filtering options to measure eccentricity or run-out

ODC

Dimensional Drawing

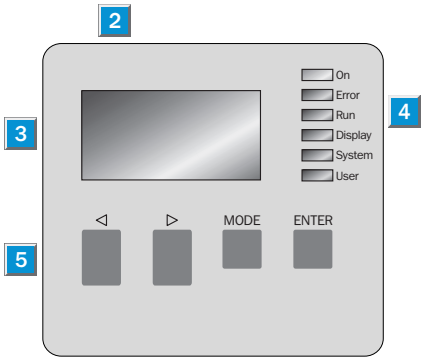


dimensions in inches (mm)

Adjustments

All types

1 Mounting holes, Ø 3.4 mm (through hole)
2 Electronics module
3 LC display
4 Status LEDs
5 Film keypad



Order Information

Type	Part no.
ODC 100-P120	6 022 480

Accessories

	page
Mounting socket ODC-SOC	637

Technical Data	ODC 100-	P120
Analogue inputs	Two inputs, 0…20 mA, 4…20 mA	
	(selectable depending on device type)	
Accuracy	± 0.05% (full scale)	
Scanning frequency	2 kHz max.	
Measured value calculation	Linearization, offset, autozero	
	A, B, A + B, A – B, K – (A + B) [1]	
Measurement functions	Peak/bottom/hold, Peak-to-peak/Hold,	
	sample/hold, Automatic peak hold	
Filter functions	High pass, low pass, mean value creation	
Interfaces	RS 232	
	Profibus DP	
Switching outputs [2]	PNP; 24 V/100 mA open collector	
Outputs [2]	HH, H, Go, L, LL, (PNP)	
	Error	
Inputs	Sync autozero	
Off delay	60 ms fixed for the outputs	
Supply voltage V_S	24 V DC ± 10%	
EMC	EN 50081-1, EN 50082-2	
VDE protection class	III	
Enclosure rating	IP 20	
Ambient temperature T_A	Operation 32...104°F (0…40°C)	
	Storage -22...140°F (-30…60°C)	
Housing material	Zinc	

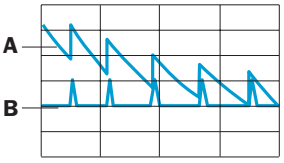
1) A = Sensor 1
B = Sensor 2

2) Total current for all outputs < 500 mA

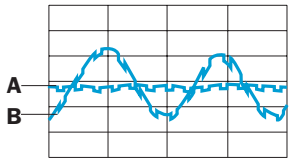
Technical Features/Typical Application

• High pass filter

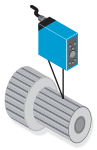
Function: elimination of the low-frequency components from the analog input signal.
Effect: gradual signal changes are ignored, i.e. only fast changes are recorded.



A Unfiltered data: height difference and height are displayed.
B Filtered data: only the height difference is displayed.



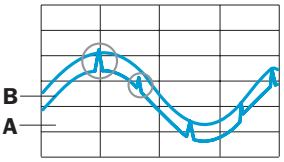
A Unfiltered data: number of grooves and the eccentricity are displayed.
B Filtered data: only the number is displayed.



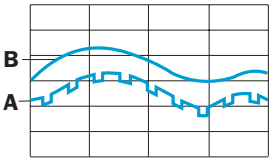
Measuring the groove depth or number of grooves

• Low pass filter

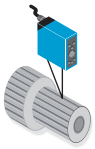
Function: elimination of the high-frequency components from the analog input signal.
Effect: fast signal changes are ignored, i.e. only gradual changes are recorded.



A Unfiltered data: interferences are displayed.
B Filtered data: measurement curve is displayed without interferences.

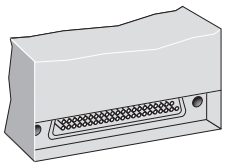


A Unfiltered data: grooves and eccentricity are displayed.
B Filtered data: only the eccentricity is displayed.



Confirming that the collector runs round

Connection Diagram



1	+24 V/L+
2	PE
3	In-Sig. 2 – (GND)
4	In-Sig. 2 – (Q_A)
5	Shield 2
6	Q 2 input
7	Autozero
8	Teach-Sen. 2 (TI)
9	Hold-Sen. 2 (SH)
10	H output
11	L output
12	Error output

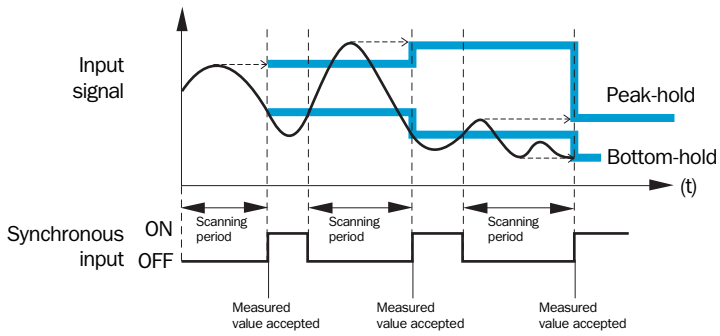
13	RTS
14	T x D
15	+24 V/L+
16	PE
17	PE
18	+ 5 V
19	PB +
20	GND/M
21	PE
22	In-Sig. 1– (GND)
23	In-Sig. 1– (Q_A)
24	Shield 1 (GND)

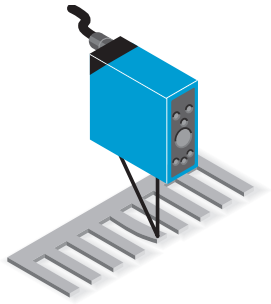
25	Q 1 input
26	Sync input
27	Teach-Sen. 1 (TI)
28	Hold-Sen. 1 (SH)
29	HH output
30	LL output
31	Go output
32	CTS
33	R x D
34	GND/M
35	PE
36	GND/M
37	PB –

SICK

Peak-bottom-hold

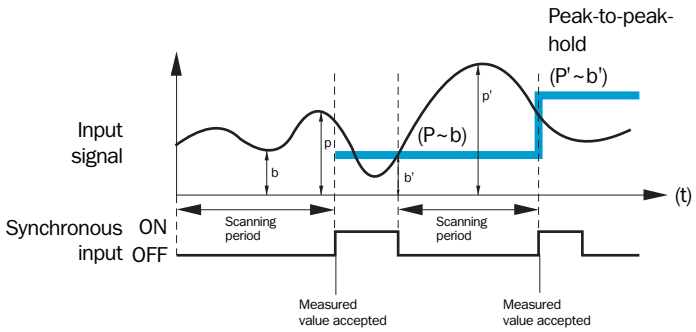
The "Peak (bottom) hold" function is used to measure the highest (lowest) value during a specific time period.

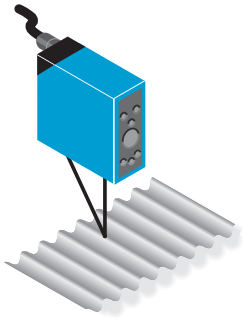




Peak-to-peak-hold

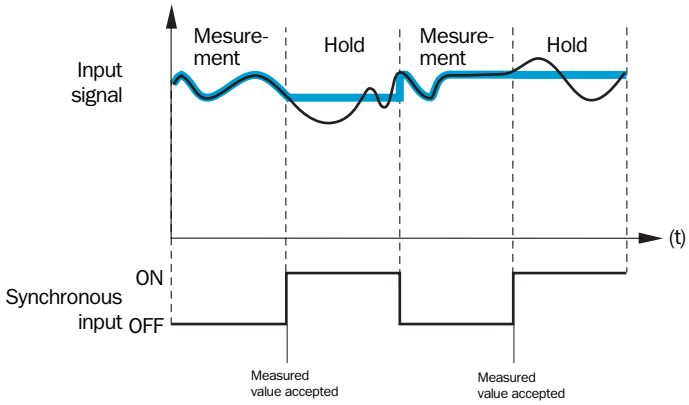
The "Peak-to-peak" function is used to measure the difference between the highest and lowest values during the pre-set time period.

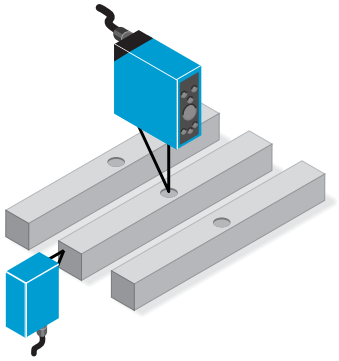




Sample/hold

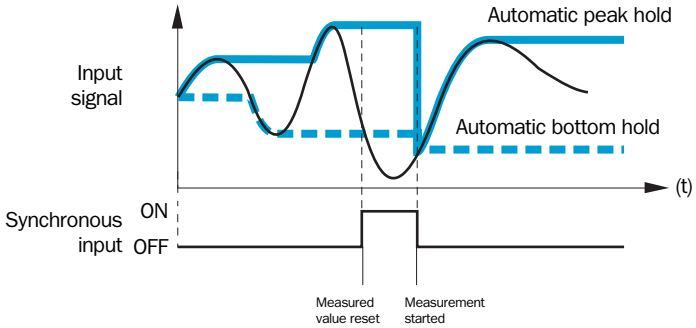
The "Sample-and-hold" function is used to measure the value during a specific time period.

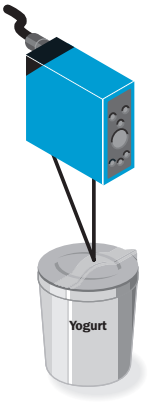




Automatic peak value hold

The "Automatic peak and bottom hold" function is used to measure the highest (lowest) value from the beginning of the measurement.



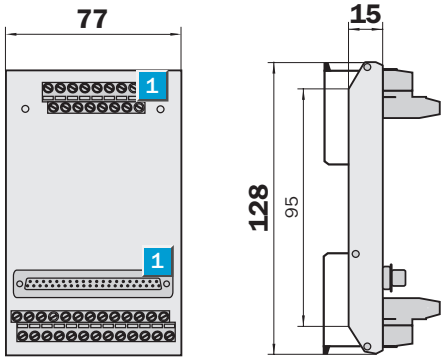


Mounting Socket for ODC-SOC

Highlights

- For use with all OD sensors
- Mounting socket for top hat profile rail mounting

Dimensional Drawing: Mounting Socket ODC-SOC



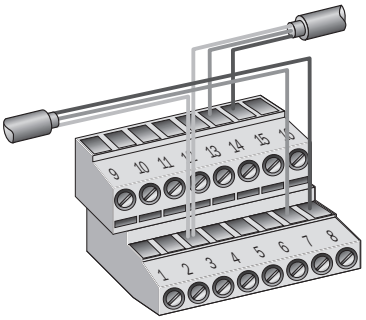
1 M3 threaded mounting hole for fixing the ODC evaluation unit

Order Information

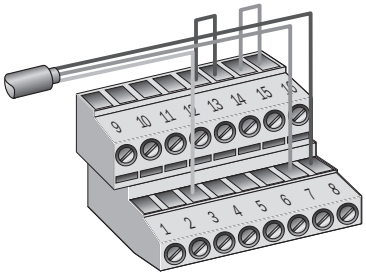
Type	Part no.
ODC-SOC	6 020 985

Terminal Assignment X1

X1, module not connected to the end of the field bus cable

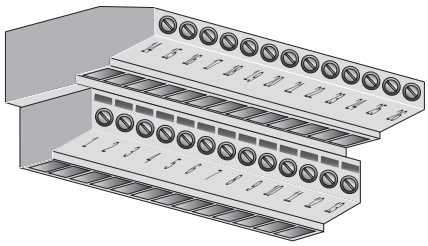


X1, module connected to the end of the field bus cable



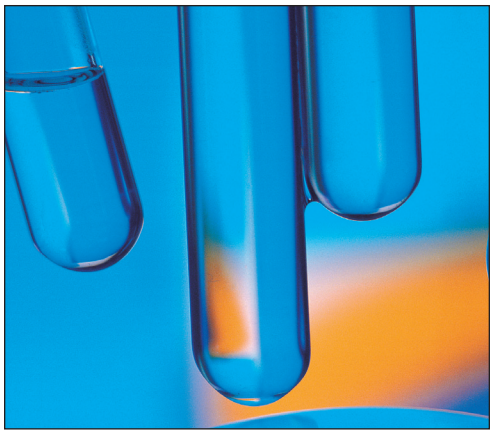
1	GND/M
2	GND/M
3	PE
4	GND/M
5	T x D
6	R x D
7	PB +
8	PB –
9	+ 24 V/L+
10	+ 24 V/L+
11	RTS
12	CTS
13	+ 5 V
14	PB +
15	PB –
16	GND/M

Terminal Assignment X2



1	+24 V/L+	14	+24 V/L+
2	GND/M (0 V)	15	GND/M (0 V)
3	In-Sig. 1– (GND)	16	In-Sig. 2– (GND)
4	In-Sig. 1– (Q_A)	17	In-Sig. 2– (Q_A)
5	Shield 1	18	Shield 2
6	Q 1 input	19	Q 2 input
7	Sync input	20	Autozero input
8	Teach-Sen. 1 (TI)	21	Teach-Sen. 2 (TI)
9	Hold-Sen. 1 (SH)	22	Hold-Sen. 2 (SH)
10	HH output	23	H output
11	LL output	24	L output
12	Go output	25	Error output
13	GND/M	26	+ 24 V/L+

Theory of Operation...Ultrasonic Sensors



About Ultrasonic Sensors

Light and sound are two natural phenomena which let every living being recognize their environment without physical contact and over widely varying distances. Likewise, industrial processes require reliable environmental information. SICK's ultrasonic sensors UM 30 and UM 18 detect objects and measure distances with high accuracy.

The realm of sound is a world of its own, and for this reason ultrasonic sensors are simply the better choice in many industrial applications requiring sensor technology.

Never confused by loud colors

Not even the oddest colors can bias Ultrasonic sensors. Reflecting objects do not irritate them at all. When objects change color, there is no need to readjust the sensors. They just go on working as before – can anyone think of a more convenient way?

Sound has an advantage – even on superficial inspection

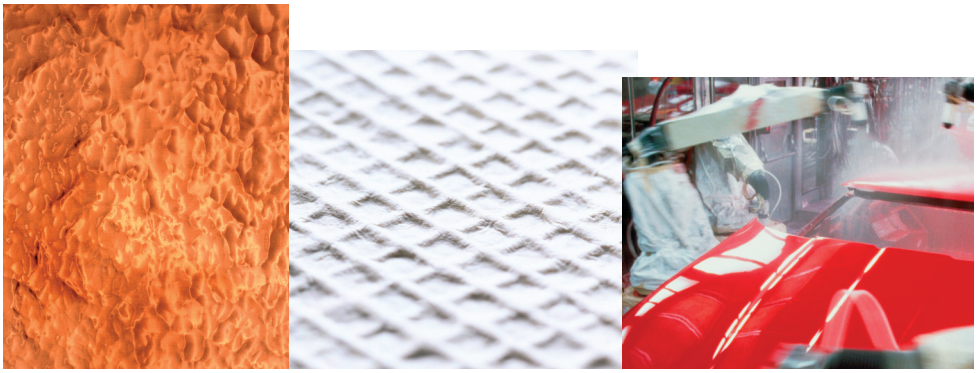
Whether the surface is rough or smooth, reflecting or retro-reflecting, regular or irregular in shape, ultrasonic sensors are generally unaffected. They detect objects reliably and almost independently of their appearance.

Detection and measurement, regardless of material

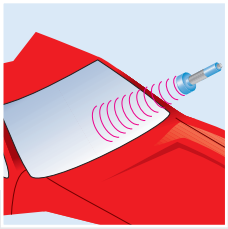
Transparent objects such as glass and film are often a difficult task for sensors, as are clear and colored fluids. But it is hard to deceive ultrasonic sensors. Almost all materials affect and reflect sound waves.

Highly reliable, even under difficult conditions

Dust and dirt, steam and spray are no problem for ultrasonic sensors. Unfavorable environments have little effect on them. Interferences are simply "blanked out." Ultrasonic sensors do not even mind strong light and adverse temperatures.



Detect, measure and switch with the UM 30

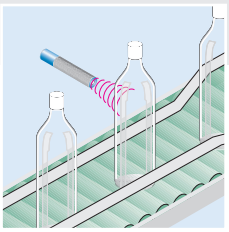


◂ Positioning: object detection and distance measurement independent of material

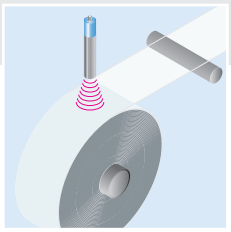
Sensors with a profile – defining the detection area

SICK Ultrasonic Sensors generate an ultrasonic wave by means of a piezo element in the front part of the housing. The wave spreads in the atmosphere in accordance with the laws of physics. The same piezo element can detect and measure the sound reflected by an object. Therefore it functions alternately as sender and receiver (transceiver).

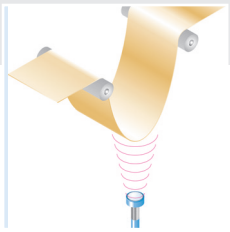
The measurement principle of ultrasonic sensors is based on the time taken for ultrasonic to travel through the medium air. The signals are transmitted in defined "packages". With the help of its processing electronics, the transceiver evaluates the time taken between the transmission of a sound "package" and the arrival of the reflection from an object. As a result, either a signal proportionate to the distance is sent via an analog interface, or a switching signal depending on a previously set distance parameter is sent through a binary output. The accuracy of the measurement and the maximum sensing range lie within a tolerance range which depends mainly on the state of the carrier medium air and the roughness of the object in question.



◂ Detection: recognize transparent objects



◂ Unwind: distance measurement for diameter check



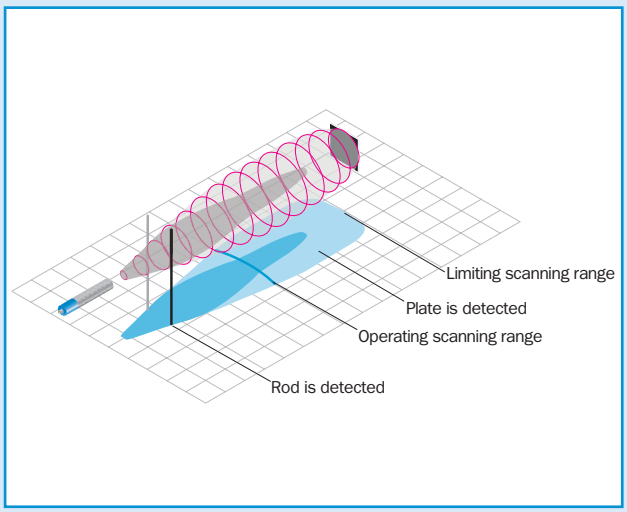
◂ Adjust: Control material looping

Detection range

To determine the detection area of the sensors, a series of measurements are carried out with two standardized objects, a thin round rod and a plate. The three-dimensional area within which the sensor responds to the rod has the form of a thin club. It marks the typical operating scanning range of the sensor.

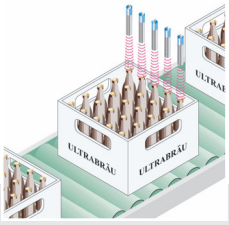
The sensor responds to the plate within the area of a larger beam. This area defines the maximum or limit detection range of the sensor.

When projected onto a two-dimensional grid, typical profiles are created. These are the operating diagrams of the ultrasonic sensors, from which the operating scanning range, the limiting scanning range, the specific shape and the blind zone of the detection range can be read off. Objects which are smaller than the round rod may only be detected within an area smaller than the operating scanning range.



Every ultrasonic sensor has its characteristic club-shaped detection range. It is narrow for smaller objects and wide for larger ones. The typical detection areas are depicted by sound beam diagrams.

Double-sheet detection with SICK UM 18



◂ Package: “engaged” check on package content

Sensors in action – scanning and measuring reflections

Ultrasonic sensors UM 30 are used as non-contact proximity switches which process reflected signals, e.g. from objects on a conveyor belt. An essential benefit of the working principle of ultrasonic sensors is the almost complete blanking of the background, a prerequisite for accurate detection.

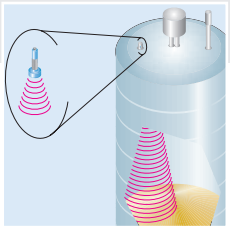
Sensing around corners – thanks to the right accessories

Ultrasonic sensors UM 30 are small and easily installed even in confined spaces. And if things get really tight, the right accessories can help out. Suitable reflectors allow sound to be deflected almost without loss.

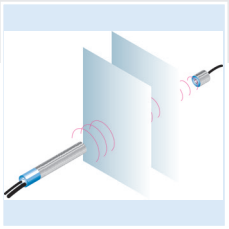
This sound goes right through ...

When an ultrasonic sensor is used to detect two thin sheets, one of which is immediately behind the other, e.g. paper, film or thin sheet material, separate sender and receiver units are required. The continuously transmitted sonic waves packages cause vibrations in the first sheet which it then transmits via the intervening air to the second sheet, which also begins to vibrate. The receiver unit is able to detect these weakened signals via the air.

The sender and receiver units of the UM 18 are only 40 mm apart and work effectively without having to be parametered. They adjust automatically to a wide spectrum of different materials.



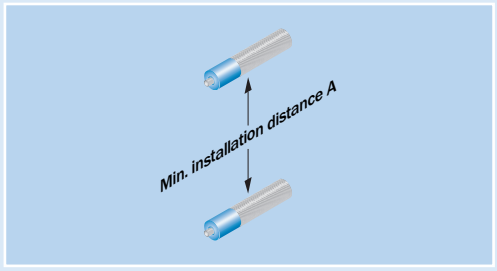
◂ Monitoring: level control in silos and containers



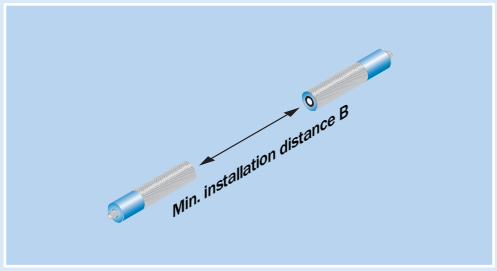
◂ Recognize: detection of double sheet and misfed sheet

Installation

Ultrasonic sensors installed close together or opposite one another may affect each other mutually. For this reason, different axial and lateral distances have to be maintained depending on the detection range. The sensor with the largest detection range determines the minimum distance.



Operating scanning range	Min. installation distance A	Min. installation distance B
0.25 m	10 cm	≥ 100 cm
0.35 m	≥ 30 cm	≥ 170 cm
1.3 m	≥ 60 cm	≥ 540 cm
3.4 m	≥ 160 cm	≥ 1,600 cm
6 m	≥ 260 cm	≥ 3,000 cm



SICK

UM 30 – striking types for almost any application

UM 30 point by point

Highly perceptive

Setting a sensor's parameters can sometimes be time consuming – unless you just show it what to do. We call that "Teach-in". This makes the UM 30 quick and easy to handle. And when changes have to be made, it can be re-taught quickly to cope with the new situation.

Current or voltage – the appropriate signal automatically

The analogue output of the UM 30 sensor switches automatically between current and voltage. With its 4 to 20 A or 0 to 10 V, it fits perfectly into any measuring environment.

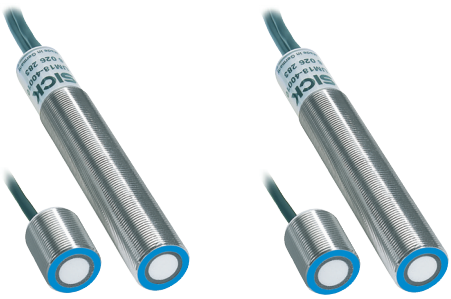
Well balanced and reliable – temperature compensation

Ultrasonic time measurements depend on the state of the medium transmitting the sound, i.e. the air. UM 30 sensors balance temperature fluctuations out automatically, thereby ensuring precision and reliability.

Q or $\overline{Q}$, no problem here

What signal does the application require, Q or $\overline{Q}$? The UM 30 has an invertible switching output and can cope with both.

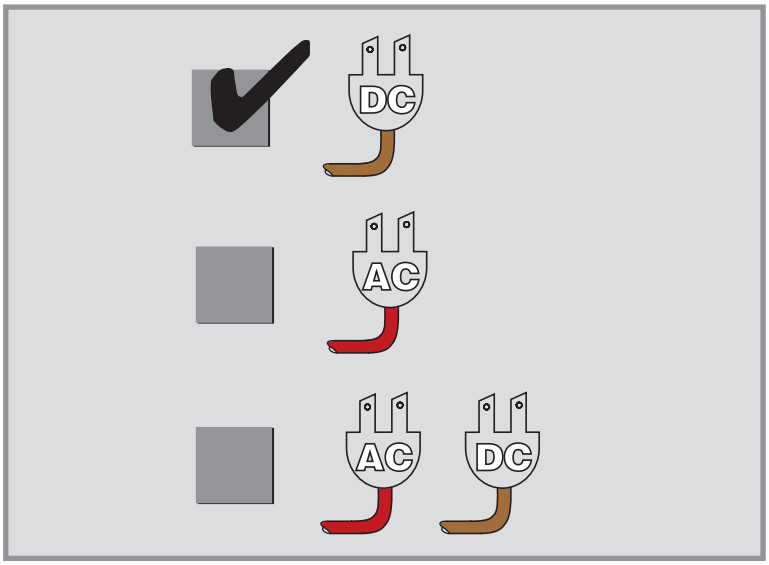
UM 18, a specialist for double layers – the smart sensor that looks beyond



UM 18 point by point

- Double-sheet check for film, paper, corrugated cardboard and fine metal sheet
- Automatic adjustment
  Alignment and Teach-in unnecessary
- Compact design
- Plug and play
- 2 PNP outputs for double- and mis-fed-sheets

Ultrasonic Sensors



SICK

UM 30

Ultrasonic Sensors

1.2...51.2 in (30.1300 mm)

detection range

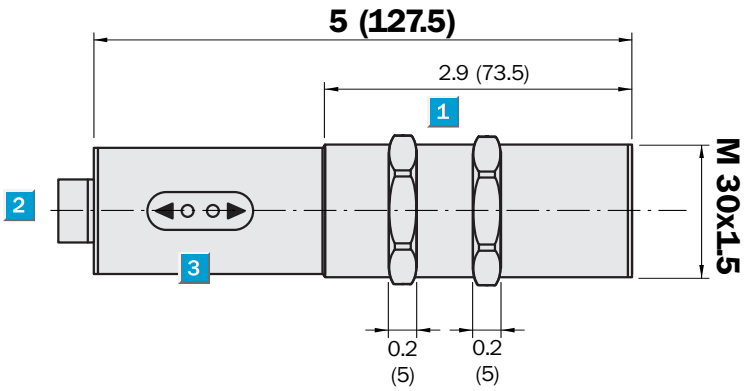
CE

Highlights

- High measurement accuracy thanks to time-of-flight measurement
- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
- Operating scanning range up to 1,300 mm
- Binary outputs or analog output

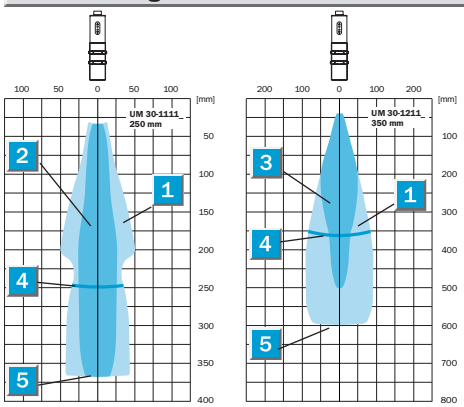
UM 30

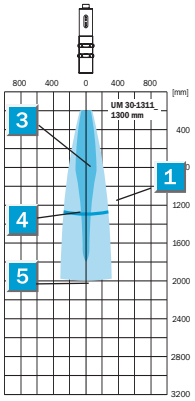
Dimensional Drawing



dimensions in inches (mm)

Detection Ranges

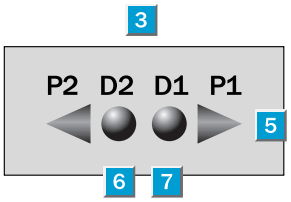




1	Aligned plate 500 x 500 mm
2	Pipe diameter 10 mm
3	Pipe diameter 27 mm
4	Operating detecting range
5	Limiting detecting range

Adjustments

All types



1	Fastening nuts, width across 36 mm
2	Connection plug M12
3	Control and display panel
4	Setting key 2
5	Setting key 1
6	LED 2
7	LED 1

Order Information

Type	Part no.
UM 30-11111	6 025 655
UM 30-12111	6 025 656
UM 30-13111	6 025 657
UM 30-11112	6 025 660
UM 30-12112	6 025 661
UM 30-13112	6 025 662
UM 30-11113	6 025 665
UM 30-12113	6 025 666
UM 30-13113	6 025 667

Accessories

	page
Cables and connectors	926, 927
Mounting systems	909

Technical Data	UM 30-	11111	11112	11113	12111	12112	12113	13111	13112	13113
Operating detection range										
(limiting detection range)	1.2...9.8 in (30 ... 250 mm) [13.8 in (350 mm)]	■	■	■						
	2.4...13.8 in (60 ... 350 mm) [23.6 in (600 in)]				■	■	■			
	7.9...51.2 in (200 ... 1300 mm) [78.7 in (2000)]							■	■	■
Ultrasonic frequency	320 kHz	■	■	■						
	400 kHz				■	■	■			
	200 kHz							■	■	■
Resolution	0.36 mm	■	■	■	■	■	■	■	■	■
Reproducibility	± 0.15% of final value	■	■	■	■	■	■	■	■	■
Accuracy	≤ 2% of final value	■	■	■	■	■	■	■	■	■
Supply voltage V_S	12 ... 30 V DC [1]	■	■	■	■	■	■	■	■	■
Ripple	± 10%	■	■	■	■	■	■	■	■	■
Current consumption [2]	≤ 70 mA	■	■	■	■	■	■	■	■	■
Switching outputs, reversible [3]	Q: PNP, V_S –2 V, I_{max} = 500 mA	■			■			■		
	Q_1, Q_2: PNP, V_S –2 V, I_{max} = 500 mA		■			■			■	
Analog output, reversible [3] [4]	Q_A: 4 ... 20 mA/0 ... 10 V			■			■			■
Response time [5]	50 ms	■	■	■						
	70 ms				■	■	■			
	110 ms							■	■	■
Switching frequency	11/s	■	■							
	8/s				■	■				
	6/s							■	■	
Switching hysteresis	0.8 in (20 mm)							■	■	
	0.2 in (5 mm)				■	■				
	0.09 in (2.5 mm)	■	■							
Standby delay	2 s	■	■	■	■	■	■	■	■	■
Connection type	Plug M12, 5-pin	■	■	■	■	■	■	■	■	■
Enclosure rating	IP 65	■	■	■	■	■	■	■	■	■
Ambient temperature [6]	Operation -4...158°F (-20...70°C)	■	■	■	■	■	■	■	■	■
	Storage -40...185°F (-40...85°C)	■	■	■	■	■	■	■	■	■
Approximate weight	9.2 oz (260 g)	■	■	■	■	■	■	■	■	■
Housing material	Nickel-plated brass	■	■	■	■	■	■	■	■	■

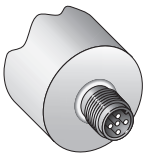
1) Limit values
2) Without load
3) Outputs short-circuit protected
4) Automatic switching between voltage and current outputs dependent on load

Current output 4 ... 20 mA:
R_L ≤ 500 Ω, V_S ≥ 20 V;
R_L ≤ 100 Ω, V_S ≥ 12 V
Voltage output 0 ... 10 V:
R_L ≥ 100 kΩ; V_S > 15 V

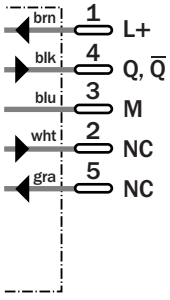
5) Only with UM 30-____3: Recovery time 32 ms according to EMC EN 50 319
6) Temperature compensation at –20 ... +50 °C

Connection Diagram

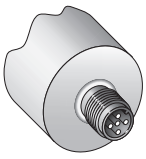
UM 30-11111
UM 30-12111
UM 30-13111



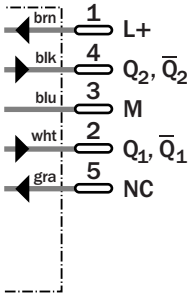
5-pin, M 12



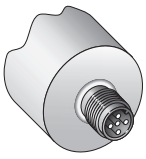
UM 30-11112
UM 30-12112
UM 30-13112



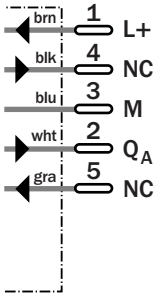
5-pin, M 12



UM 30-11113
UM 30-12113
UM 30-13113



5-pin, M 12



SICK

UM 30

Ultrasonic Sensors

13.8...133.9 in (350...3400 mm)

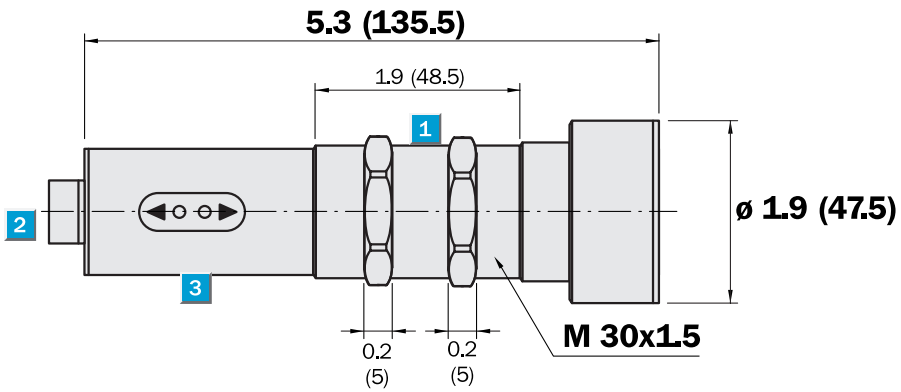
detection range

Highlights

- High measurement accuracy thanks to time-of-flight measurement
- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
- Operating scanning range up to 3,400 mm
- Binary outputs or analog output

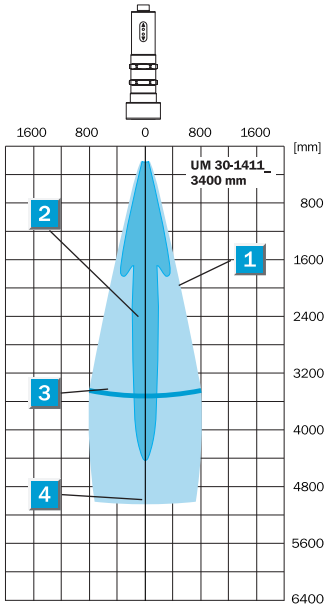
UM 30

Dimensional Drawing



dimensions in inches (mm)

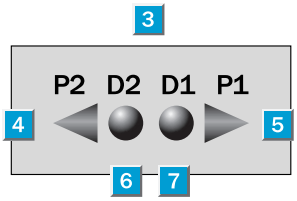
Detection Ranges



1	Aligned plate 500 x 500 mm
2	Pipe diameter 27 mm
3	Operating detecting range
4	Limiting detecting range

Adjustments

All types



1	Fastening nuts, width across 36 mm
2	Connection plug M12
3	Control and display panel
4	Setting key 2
5	Setting key 1
6	LED 2
7	LED 1

Order information

Type	Part no.
UM 30-14111	6 025 658
UM 30-14112	6 025 663
UM 30-14113	6 025 668

Accessories	page
Cables and connectors	926, 927
Mounting systems	909

Technical Data	UM 30-	14111	14112	14113						
Operating detection range										
(limiting detection range)	13.8...133.9 in (350 ... 3400 mm) [196.8 in (5000 mm)]	■	■	■						
Ultrasonic frequency	120 kHz	■	■	■						
Resolution	0.04 in (1 mm)	■	■	■						
Reproducibility	± 0.15% of final value	■	■	■						
Accuracy	≤ 2% of final value	■	■	■						
Supply voltage V_S	12 ... 30 V DC [1]	■	■	■						
Ripple	± 10%	■	■	■						
Current consumption [2]	≤ 70 mA	■	■	■						
Switching outputs, reversible [3]	Q: 1 x PNP, V_S –2 V, I_{max} = 500 mA	■								
	Q_1, Q_2: 2 x PNP, V_S –2 V, I_{max} = 500 mA		■							
Analog output, reversible [3] [4]	Q_A: 4 ... 20 mA/0 ... 10 V			■						
Response time [5]	180 ms	■	■	■						
Switching frequency	3/s	■	■							
Switching hysteresis	2 in (50 mm)	■	■							
Standby delay	2 s	■	■	■						
Connection type	Plug M12, 5-pin	■	■	■						
Enclosure rating	IP 65	■	■	■						
Ambient temperature [6]	Operation -4...158°F (-20...70°C)	■	■	■						
	Storage -40...185°F (-40...85°C)	■	■	■						
Approximate weight	10.9 oz (310 g)	■	■	■						
Housing material	Nickel-plated brass	■	■	■						

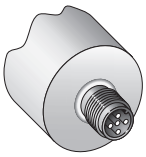
1) Limit values
2) Without load
3) Outputs short-circuit protected
4) Automatic switching between voltage and current outputs dependent on load

Current output 4 ... 20 mA:
R_L ≤ 500 Ω, V_S ≥ 20 V;
R_L ≤ 100 Ω, V_S ≥ 12 V
Voltage output 0 ... 10 V:
R_L ≥ 100 kΩ; V_S > 15 V

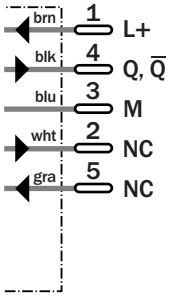
5) Only with UM 30-____3: Recovery time according to EMV EN 50 319
6) Temperature compensation at –20 ... +50 °C

Connection Diagram

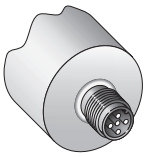
UM 30-14111



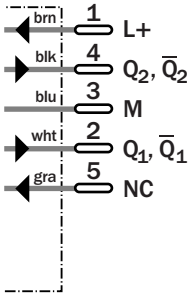
5-pin, M 12



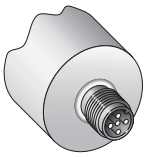
UM 30-14112



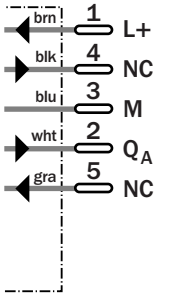
5-pin, M 12



UM 30-14113



5-pin, M 12



SICK

UM 30

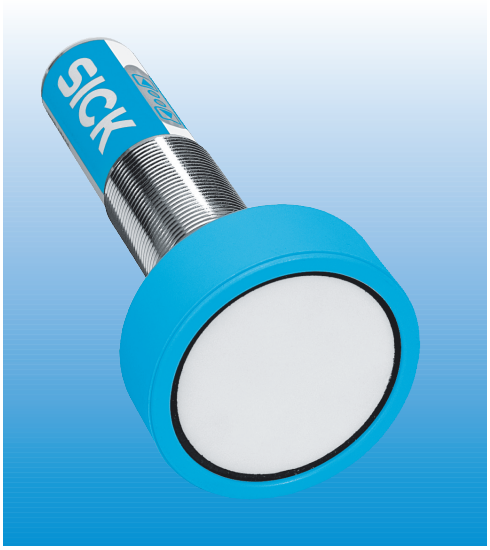
Ultrasonic Sensors

31.5...236.2 in (800...6000 mm)
detection range

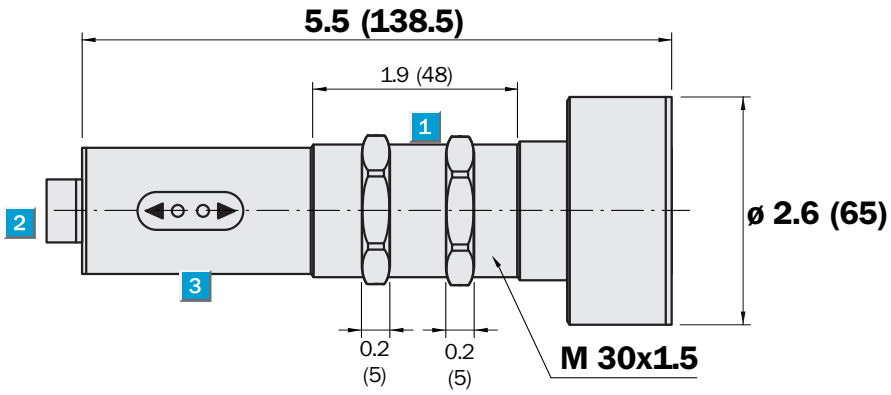
Highlights

- High measurement accuracy thanks to time-of-flight measurement
- Independent of material shape (including films, glass and bottles)
- Teach-in
- Insensitive to dirt, dust and fog
- Operating scanning range up to 6,000 mm
- Binary outputs or analog output

UM 30

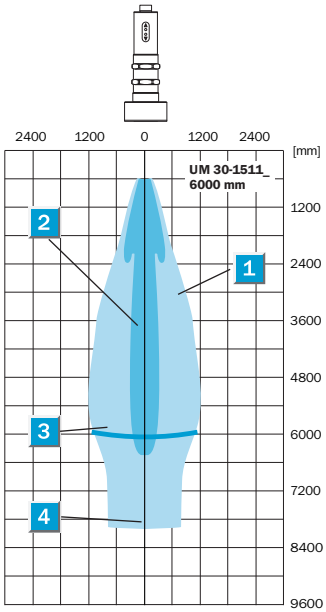


Dimensional Drawing



dimensions in inches (mm)

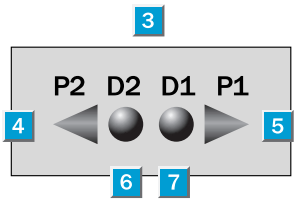
Detection Range



1	Aligned plate 500 x 500 mm
2	Pipe diameter 27 mm
3	Operating detecting range
4	Limiting detecting range

Adjustments

All types



1	Fastening nuts, width across 36 mm
2	Connection plug M12
3	Control and display panel
4	Setting key 2
5	Setting key 1
6	LED 2
7	LED 1

Order information

Type	Part no.
UM 30-15111	6 025 659
UM 30-15112	6 025 664
UM 30-15113	6 025 669

Accessories	page
Cables and connectors	926, 927
Mounting systems	909

Technical Data	UM 30-	15111	15112	15113						
Operating detection range										
(limiting detection range)	31.5...236.2 in (800 ... 6000 mm) [314.9 in (8000 mm)]	■	■	■						
Ultrasonic frequency	80 kHz	■	■	■						
Resolution	0.04 in (1 mm)	■	■	■						
Reproducibility	± 0.15% of final value	■	■	■						
Accuracy	≤ 2% of final value	■	■	■						
Supply voltage V_S	12 ... 30 V DC [1]	■	■	■						
Ripple	± 10%	■	■	■						
Current consumption [2]	≤ 70 mA	■	■	■						
Switching outputs, reversible [3]	Q: PNP, V_S –2 V, I_{max} = 500 mA	■								
	Q_1, Q_2: 2 x PNP, V_S –2 V, I_{max} = 500 mA		■							
Analog output, reversible [3] [4]	Q_A: 4 ... 20 mA/0 ... 10 V			■						
Response time [5]	240 ms	■	■	■						
Switching frequency	2/s	■	■							
Switching hysteresis	3.9 in (100 mm)	■	■							
Standby delay	2 s	■	■	■						
Connection type	Plug M12, 5-pin	■	■	■						
Enclosure rating	IP 65	■	■	■						
Ambient temperature [6]	Operation -4...158°F (-20...70°C)	■	■	■						
	Storage -40...185°F (-40...85°C)	■	■	■						
Approximate weight	12.7 in (360 g)	■	■	■						
Housing material	Nickel-plated brass	■	■	■						

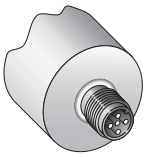
1) Limit values
2) Without load
3) Outputs short-circuit protected
4) Automatic switching between voltage and current outputs dependent on load

Current output 4 ... 20 mA:
R_L ≤ 500 Ω, V_S ≥ 20 V;
R_L ≤ 100 Ω, V_S ≥ 12 V
Voltage output 0 ... 10 V:
R_L ≥ 100 kΩ; V_S > 15 V

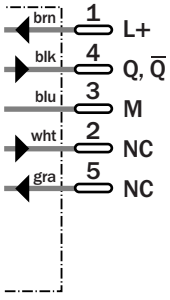
5) Only with UM 30-____3: Recovery time according to EMV EN 50 319
6) Temperature compensation at –20 ... +50 °C

Connection Diagram

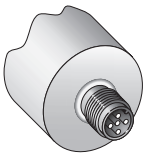
UM 30-15111



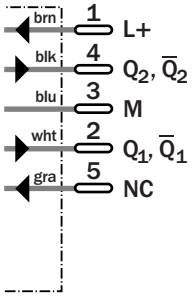
5-pin, M 12



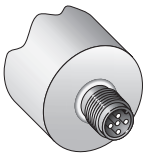
UM 30-15112



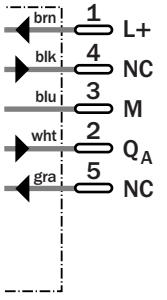
5-pin, M 12



UM 30-15113



5-pin, M 12



SICK

UM 18 Double Sheet Detector

Ultrasonic Sensors

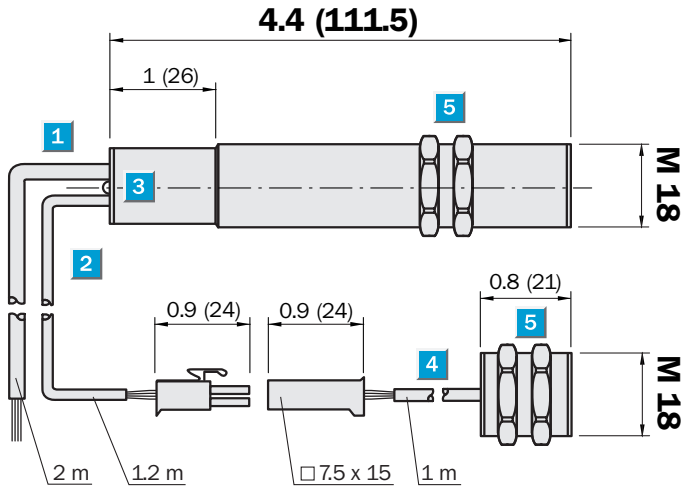
1.6 in ±0.12 in (40 mm ±3 mm)
detection range

Highlights

- Double-sheet detection of foils, metal sheets and ultra-fine corrugated cardboard
- Automatic adjustment, no Teach-in necessary
- Color-independent
- Plug & Play
- 2 PNP outputs for double and mis-fed-sheets

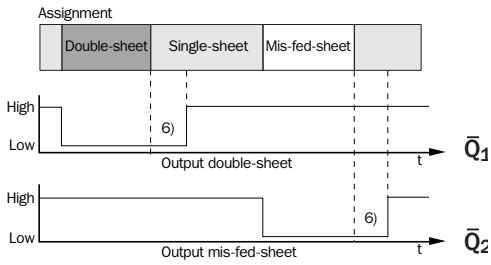
UM 18

Dimensional Drawing



dimensions in inches (mm)

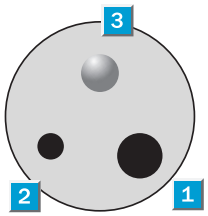
Detection Range



6) Off delay

Adjustments

UM 18-20012



1. Connection cable 2 m (receiver)
2. Connection cable 1.2 m, 2-pin sender and receiver
3. 2-color LED indicator, receiver
4. Connection cable 1 m, 2-pin sender and receiver
5. Fastening nuts, width across 24 mm

Order information

Type	Part no.
UM 18-20012	6 025 670

Accessories

	page
Cables and connectors	925, 926
Mounting systems	909

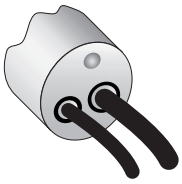
Technical Data	UM 18-	20012								
Installation distance										
sender – receiver	1.6 in ±0.12 in (40 mm ± 3 mm)									
Blind zone	0.3 in (7 mm), each time before sender									
	and receiver									
Permissible angle deviation	± 45° perpendicular to sheet									
Ultrasonic frequency	400 kHz									
Resolution	Double-sheets not completely									
	glued together									
Operational area										
Paper grams per square meter	20 ... 1200 g/m²									
Metal-laminated sheets and films	≤ 0.4 mm thickness									
Self-adhesive films, metal sheets	≤ 0.3 mm									
Ultra-fine corrugated cardboard										
Supply voltage V_S	12 ... 30 V DC [1]									
Ripple	± 10%									
Current consumption [2]	≤ 45 mA									
Double-sheet switching/Q_1 [3]	PNP, V_S –2 V, I_{max} = 500 mA									
Misfed sheet switching output/Q_2 [3]	PNP, V_S –2 V, I_{max} = 500 mA									
Response time [4]	2.5 ms or 6.5 ms									
Off delay	10 ms									
V_S at control unit [4]	Response time 6.5 ms: $V_S > 9$ V DC									
	Response time 2.5 ms: $V_S < 5$ V DC									
Standby delay	300 ms									
Connection type	Cable PVC, 2 m; 5 x 0.25 mm²									
Sender cable [5]	PVC, 1.2 m with 2-pin plug									
Receiver cable [5]	PVC, 1 m with 2-pin plug									
Enclosure rating	IP 65									
Ambient temperature	Operation 41...140°F (5...60°C)									
	Storage -40...185°F (-40...85°C)									
Approximate weight	9.9 oz (280 g)									
Housing material	Nickel-plated brass									

1) Limit values
2) Without load
3) Outputs short-circuit protected, Opener; no switching hysteresis
4) If the control line is laid against a ground, the response time is 2.5 ms. If the control line is laid against L+, the response time is 6.5 ms.
5) Not reverse-polarity protected

Connection Diagram

UM 18-20012*)

Receiver

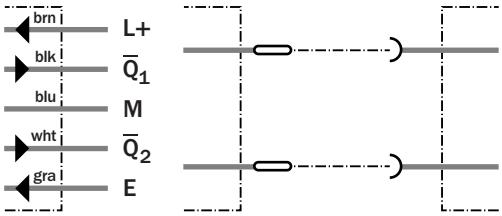


Sender

5 x 0,25 mm²

2-pin

2-pin



*) Sender/receiver pair:
Individual components on request

SICK

Theory of Operation...Distance Sensors

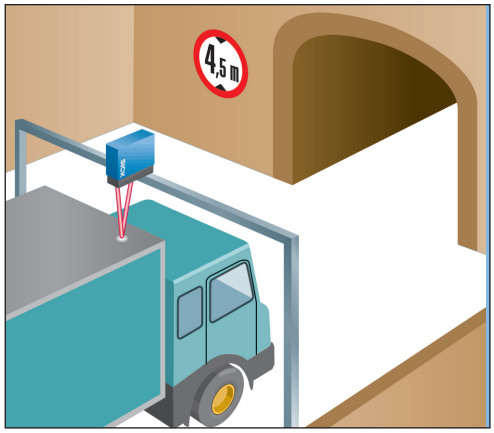


Fig. 1 Color sensor sorting colored products

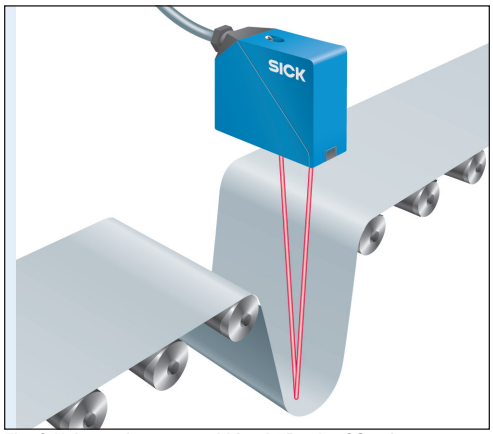


Fig. 2 Using red, green and blue LEDs the CS color sensor can detect even very subtle changes in color

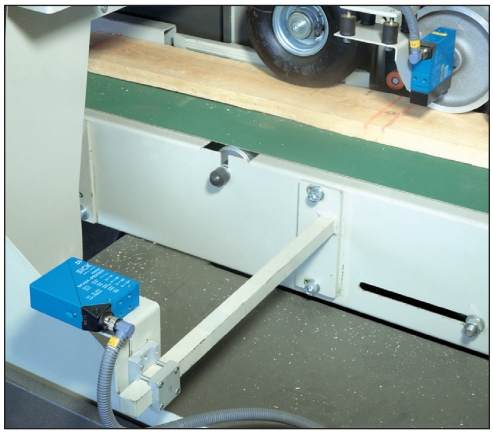
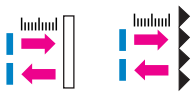


Fig. 3 On circular saws the WTA 24 measures the width of the board continuously while boards are automatically advanced


Fig. 4 DME sensor detects drill holes as part of the inspection/quality control process in automotive assembly



About Distance Sensors

There are two types of distance measurement sensors. The first type uses time-of-flight measurement of laser light to determine the distance. In proximity mode, these devices can detect minute objects with difficult surface characteristics at great distances, even in front of a shiny background. When large measuring ranges are involved, the sensor measures the distance to a reflector. In this way, distances of up to 500 meters can be reliably determined.

The second type uses laser light, red light or infrared light in conjunction with the triangulation measurement method. This user-friendly "teach-in" function is used to adjust and calibrate the sensors. These sensors, which can function as both sensors and measuring devices, can detect minute objects, indentations or unevenness.

The DME 2000, DME 3000 and DME 5000 distance measuring devices use phase correlation to measure the transit time of light from a semiconductor Class II laser and calculate the distance to the target. External data processing can be accomplished with an 8-digit display, a serial interface or an analog current output. The DMEs offer two user-selectable outputs and a user-friendly menu helps customize the device's parameters to individual application needs.

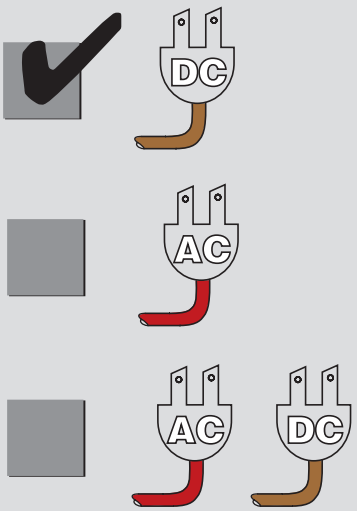
The WTA 24 is also excellent for distance measuring in both short and long distance applications. It uses an infrared light source and a patented system of parabolic mirrors to produce highly accurate, repeatable analog readings regardless of target color or reflectivity. It can even detect objects with as little as 6% reflectivity and can easily be integrated into transfer and processing lines.

The DT 2 is a triangulation sensor, featuring plug and play set up for use in close-range applications.

By means of phase correlation the DT 200 analog laser sensor measures by time-of-flight up to a distance of two meters with millimeter resolution.

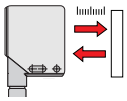
The DMT/DML sensors have sensing ranges of up to 155 meters on white surfaces and more than 1 km if reflectors are used. The pulse-travel time is measured by tiny flashes of laser light, only four nanoseconds long.

Distance Sensors



DT 2

Distance Sensors



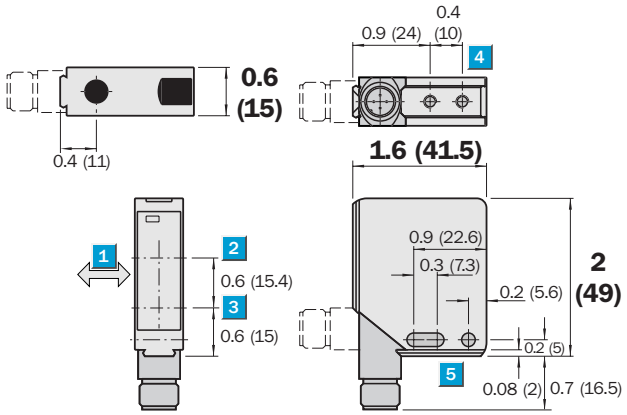

2...11.8 in (50...300 mm)
sensing range

Highlights

- Rugged die cast metal housing
- Analog output
- 1 mm resolution
- M12 cable connections swivel 90° for easy installation

DT 2

Dimensional Drawing



dimensions in inches (mm)

1 Standard direction of object being scanned
2 Center of optical axis, receiver
3 Center of optical axis, sender
4 M4 threaded mounting hole, 4 mm deep
5 Through borehole Ø 4.2 mm

Measurement Range, Repeatability, Accuracy

Sensing range[1)]
90% remission 2...11.8 in (50...300 mm)
6% remission 2...9.8 in (50...250 mm)
Accuracy
Object with 90% remission±8% to current value
Repeatability
Object with 90% remission 3% to 7.9 in (1 mm)
5% to 11.8 in (300 mm)
Resolution
0.04 in (1 mm)

Order Information

Type	Part no.
DT 2-410	1 024 093

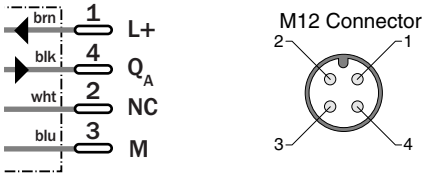
Accessories

	page
Cables and connectors	909
Mounting brackets	921, 922

Technical Data	DT 2-	410								
Sensing range[1]	90% remission 2...11.8 in (50...300 mm)									
	6% remission 2...9.8 in (50...250 mm)									
Accuracy										
Object with 90% remission	±8% to current value									
Repeatability										
Object with 90% remission	3% to 7.9 in (1 mm)									
	5% to 11.8 in (300 mm)									
Light source[2], **light type**	Infrared, 880 nm									
Light spot diameter	3.1 in at 11.8 in (80 mm at 300 mm)									
Supply voltage V_S	18 ... 30 V DC[3]									
Ripple[4]	$< 5\ V_{PP}$									
Current consumption[5]	≤ 100 mA									
Analog output	0...20 mA									
Response time	200 ms									
Resolution	0.04 in (1 mm)									
Connection type	Plug, M12 4-pin									
VDE protection class[6]	⏀									
Enclosure rating	IP 67									
Ambient temperature T_A	Operation 14...113°F (-10...45°C)									
	Storage -13...167°F (-25...75°C)									

1) Falling below the measurement range results in ambiguous values
Exceeding the measurement range results in values = 20.3 mA
2) Average service life 50,000 h at $T_A = 25°C$
3) Limit values, reverse polarity protected
4) May not exceed or fall short of Vs tolerances
5) Without load
6) Reference voltage 50 V DC

Connection Diagram



SICK

WTA 24

Distance Sensors

varies by model

sensing range

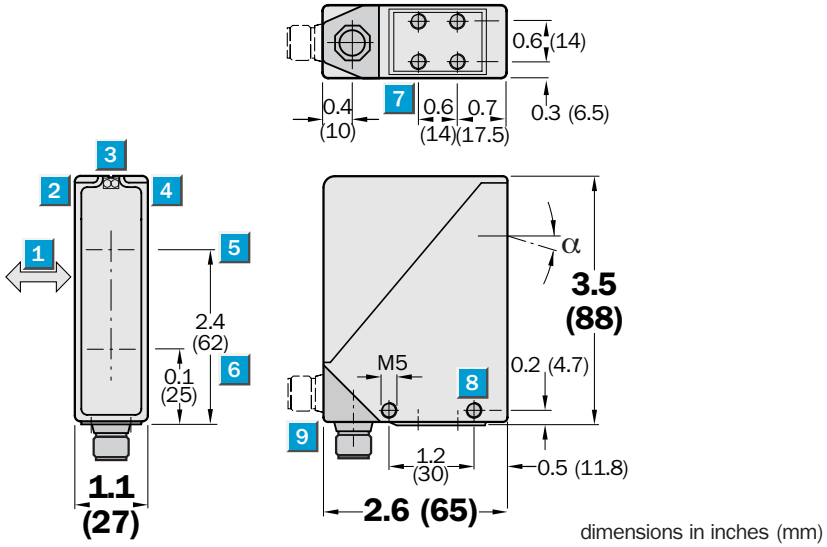
CE

Highlights

- Rugged die cast metal housing
- Analog output
- High resolution
- Two switching outputs set using simple Teach-in
- Signal strength indicator
- Insensitive to ambient light
- Cable connections swivel 90° for easy installation
- Optional dust shield, snow shield or cooling plates available

WTA 24

Dimensional Drawing



dimensions in inches (mm)

Adjustment Instructions

Programming the switching outputs:

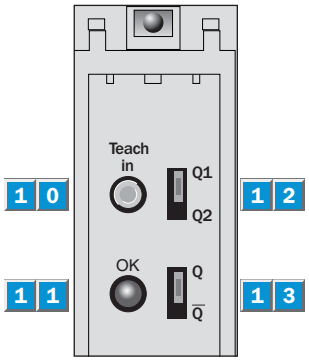
1. Move "Q_1/Q_2" switch to the switching output to be programmed. Move "$Q/\overline{Q}$" switch to the desired switching mode.
2. Place object at the required switching distance.
3. Press "Teach-in" key. "OK" indicator illuminates when the switching limit has been saved to the memory.
4. Repeat steps 1/2/3 for the second switching output.
5. The device is ready for operation.

Note:

* Analog not scalable.
* Flashing front LEDs - insufficient or target out of range.

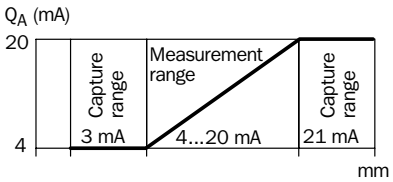
Adjustments

All types



1 Standard direction of object being scanned
2 Output Q_2 function indicator
3 Alignment sight
4 Output Q_1 function indicator
5 Center of optical axis, transmitter
6 Center of optical axis, receiver
7 M5 threaded mounting hole, 6 mm deep
8 M5 threaded mounting hole, through hole
9 Rotatable plug
10 "Teach- in" programming switch
11 "Teach- in" function indicator
12 "Q_1/Q_2" program switch
13 "$Q/\overline{Q}$" program switch

Measurement Range



Order Information

Type	Part no.
WTA 24-P5201	1 011 504
WTA 24-P5401	1 011 505
WTA 24-P5501	1 011 515
WTA 24-P5201 S04	1 015 804
WTA 24-P5201 S01	1 013 228
WTA 24-P5401 S02	1 013 231
WTA 24-P5201 S03	1 013 235

Accessories

	page
Cables and connectors	909
Mounting brackets	923, 935
Cooling plates	958
Weather/dust shield	955

Technical Data	WTA 24-	P5201	P5401	P5501	P5201 S 04	P5201 S 01	P5401 S 02	P5201 S 03		
Light source[1], light type	LED, infrared light	■	■	■	■	■	■	■		
Supply voltage V_S	12...30 V DC[2]	■	■	■	■	■	■	■		
Ripple	< 5 V_{SS}[3]	■	■	■	■	■	■	■		
Current consumption	< 100 mA[4]	■	■	■	■	■	■	■		
Switching outputs										
Q_1, Q_2	PNP, switchable	■	■	■	■	■	■	■		
Output voltage	HIGH = V_S – < 2 V/LOW = < 2 V	■	■	■	■	■	■	■		
Output current I_A max.	100 mA	■	■	■	■	■	■	■		
Response time[5]	5 ms	■	■			■		■		
Max. switching frequency[6]	100 Hz	■	■			■		■		
Response time[5]	50 ms			■			■			
Max. switching frequency[6]	10 Hz			■			■			
Response time[5]	100 ms				■					
Max. switching frequency[6]	5 Hz				■					
Analog output[7] [8]	4...20 mA (fixed)	■	■	■	■	■	■	■		
Connection type	Plug, M12 5-pin	■	■	■	■	■	■	■		
VDE protection class[9]	□	■	■	■	■	■	■	■		
Circuit protection[10]	A, B, C	■	■	■	■	■	■	■		
Enclosure rating	IP 67/NEMA 6	■	■	■	■	■	■	■		
Ambient temperature T_A[8]	Operation -14...131°F (-10...55°C)	■	■	■	■	■	■	■		
	Storage -13...167°F (-25...75°C)	■	■	■	■	■	■	■		
Shock load	To IEC 68	■	■	■	■	■	■	■		
Temperature drift	0.2%/K (relative to measured value)	■	■	■	■	■	■	■		

1) Average service life 100,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) Object 50:50
7) In capture range 3 or 21 mA
8) R_L = 0…500 Ω
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs Q_1 and Q_2 short-circuit protected
C = Interference pulse suppression

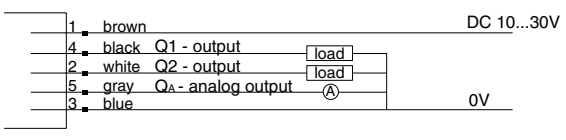
Measurement Range, Reproducibility and Accuracy

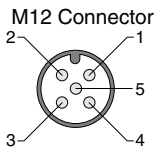
WTA 24-	P5201	P5401	P5501	P5201 S04	P5201 S01	P5401 S02	P5201 S03
Measurement range	250…350 mm	600…1200 mm	1000…3000 mm	100…500 mm	250...600 mm	400...1000 mm	250...450 mm
Capture range	200…250 mm	400…600 mm	500…1000 mm	80…100 mm			
Light spot diameter[4]	4…8 mm	15…30 mm	20…50 mm	8…12 mm	4...20 mm	15...35 mm	4...15 mm
Angle of divergence	7°	2°	0.5°	7°	7°	7°	7°
Repeatability[3]	White (90%) 1.0%	White (90%) 1.5%	White (90%) 4.0%	White (90%) 1.0%	White (90%) 1.5%	White (90%) 1.5%	White (90%) 3.0%
	Grey (18%) 1.0%	Grey (18%) 2.5%	Grey (18%) 10.0%				
	Black (6%) 1.5%	Black (6%)[1] 4.0%	Black (6%)[2] 8.0%	Black (6%) 2.0%	Black (6%) 3.5%	Black (6%) 4.0%	Black (6%) 4.0%
Accuracy[3]	White (90%) 1.5%	White (90%) 3.0%	White (90%) 5.5%	White (90%) 6.5%	White (90%) 2.5%	White (90%) 3.0%	White (90%) ±3.0%
	Grey (18%) 2.0%	Grey (18%) 5.0%	Grey (18%) 13.0%	Grey (18%) 10.5%	Grey (18%) 5.0%	Grey (18%) 5.0%	
	Black (6%) 4.0%	Black (6%)[1] 8.0%	Black (6%)[2] 10.0%	Black (6%) 11.5%	Black (6%) 8.0%	Black (6%) 8.0%	Black (6%) ±5.0%
Resolution[3]	White (90%) 0.5%	White (90%) 1.0%	White (90%) 2.0%	White (90%) 6.5%	White (90%) 1.0%	White (90%) 1.0%	White (90%) 0.5%
	Grey (18%) 0.5%	Grey (18%) 1.5%	Grey (18%) 5.0%	Grey (18%) 10.5%			
	Black (6%) 1.0%	Black (6%)[1] 2.0%	Black (6%)[2] 4.0%	Black (6%) 11.5%	Black (6%) 2.0%	Black (6%) 2.0%	Black (6%) 1.0%

1) up to 1000 mm
2) up to 2000 mm
3) relative to measured value, object 100 x 100 mm, ambient surroundings remain constant)
4) 90% core light

Note: See page xx for metric to English conversions.

Connection Diagram





wire colors refer to standard cable, not included

DT 200

Distance Sensors

Analog

3.9...78.7 in (100...2000 mm)

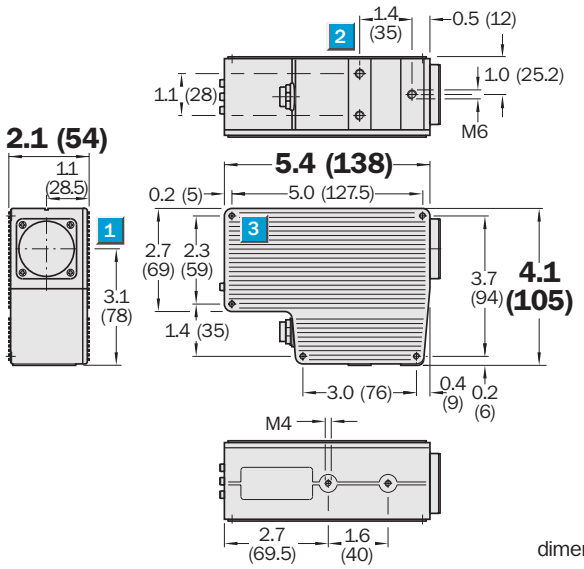
sensing range

Highlights

- Visible red light for easy alignment
- Analog output
- Non-contact distance measurement on any surface
- Perfect for web control, contour detection, coil diameter measurement and small parts detection

DT 200

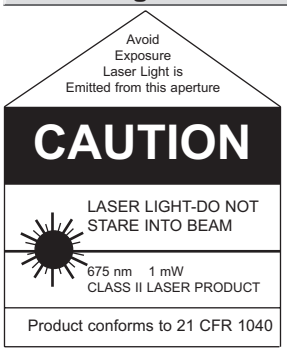
Dimensional Drawing



dimensions in inches (mm)

1 Center of optical axis
2 M6 threaded mounting hole, 10 mm deep
3 M4 threaded mounting hole, 14 mm deep (this side only)
4 M4 threaded mounting hole, 6 mm deep

Laser Warning



Measurement Range, Repeatability, Accuracy

Sensing range[4]	3.9...78.7 in (100...2000 mm)
Accuracy	
Object with 90% remission	±0.20 in (5 mm)
Object with 18% remission	±0.43 in (11 mm)
Object with 6% remission	±2.56 in (65 mm)
Repeatability[7]	
Object with 90% remission	0.04 in (1 mm)
Object with 18% remission	0.12 in (3 mm)
Object with 6% remission	0.98 in (25 mm)
Resolution	1 mm (0.01 mA/mm)

Order Information

Type	Part no.
DT 200-111A01	1 022 946

Accessories	page
Cables and connectors	909
Mounting brackets	934
Special Accessories	
Dust shield	956
Cooling plates	958
Electric heating/cooling	959

Technical Data	DT 200-	111A01
Sensing range[1]	3.9...78.7 in (100...2000 mm)	
Light spot diameter	0.2 in at 78.7 in (5 mm at 2000 mm)	
Light source[2], light type	Laser diode, red light	
Laser category	Class II (EN 825-1/IEC 60825-1/CDRH)	
Accuracy		
Object with 90% remission	±0.20 in (5 mm)	
Object with 18% remission	±0.43 in (11 mm)	
Object with 6% remission	±2.56 in (65 mm)	
Repeatability[7]		
Object with 90% remission	0.04 in (1 mm)	
Object with 18% remission	0.12 in (3 mm)	
Object with 6% remission	0.98 in (25 mm)	
Resolution	1 mm (0.01 mA/mm)	
Supply voltage V_S	18 ... 30 V DC[3]	
Ripple[4]	≤ 5 V_{PP}	
Power consumption[5]	≤ 6 W[4]	
Circuit protection[8]	A	
Output		
Analog	0...20 mA, non-scalable	
Measurement output rate		
Analog	≤ 30 ms response time	
Temperature drift	Typ. 0.4 mm/K	
Connection type	Plug, M12 4-pin	
VDE protection class[6]	□	
Enclosure rating	IP 65	
Ambient temperature T_A	Operation 14...113°F (-10...45°C)	
	Storage -13...167°F (-25...75°C)	
Approximate weight	34.6 oz (980 g)	

1) Falling below the measurement range results in values < 0.1 mA
Exceeding the measurement range results in ambiguous values (Example: Scanning distance of 3 m = 10 mA with sufficient reflectance

2) Average service life 50,000 h at T_A = 25°C

3) Limit values, reverse polarity protected

4) May not exceed or fall short of V_S tolerances

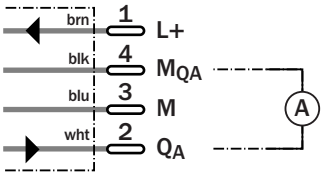
5) Without load

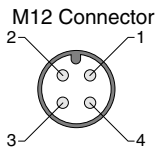
6) Reference voltage 50 V DC

7) Environmental conditions constant, 30 min. warm-up period

8) A = V_S connections reverse-polarity protected

Connection Diagram

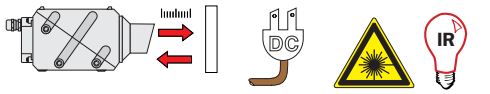




SICK

DMT 5

Distance Sensors



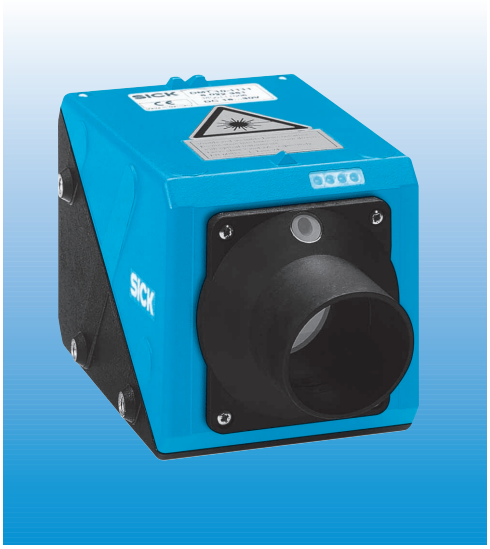
1.6...180.4 ft (0.5...55 m)
sensing range

RS 232
RS 422
Analog

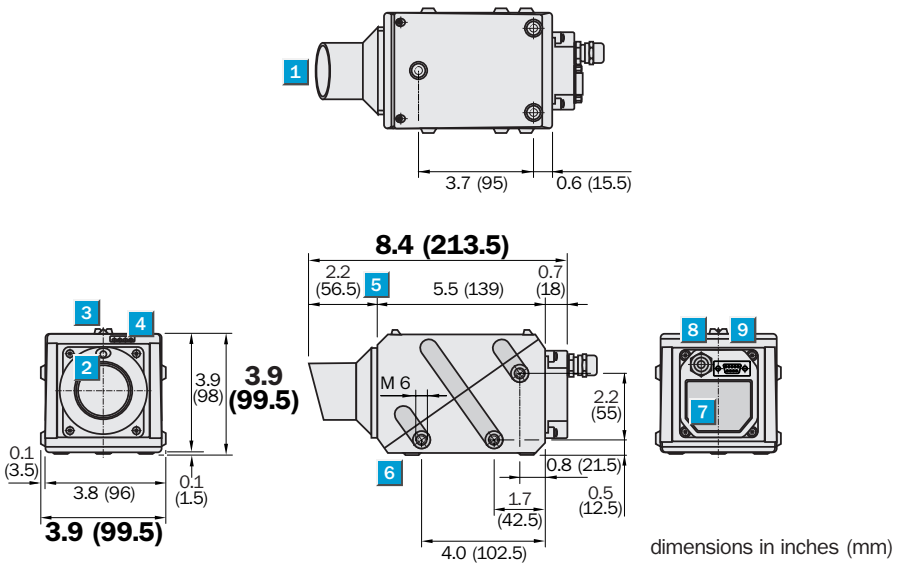
Highlights

- Visible red light for easy alignment
- Non-contact distance measurement on any surface
- Easy programmability using RS 232 for system flexibility
- Two programmable switching outputs
- Analog output

DMT 5

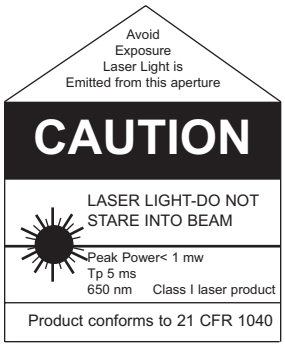


Dimensional Drawing



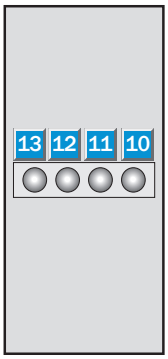
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1	Dust protection tube
2	Laser pointer pilot light - Class I
3	Alignment sight
4	Function indicator (4 LEDs)
5	Measurement zero point
6	Mounting hole M6 threaded – 6 mm deep
7	Plug cover
8	PG 9 terminal chamber
9	Plug, sub D 9-pin
10	Plausibility (measurement error) LED red
11	Power indicator, LED green
12	Q_1 output indicator
13	Q_2 output indicator

Measurement Range, Repeatability, Accuracy

Sensing range[1]	1 m	10 m	40 m
Accuracy			
Object with 90% remission	10 mm	10 mm	10 mm
Object with 18% remission	10 mm	10 mm	10 mm
Object with 6% remission	10 mm	10 mm	10 mm
Repeatability[7]			
Object with 90% remission	7 mm	7 mm	7 mm
Object with 18% remission	7 mm	7 mm	10 mm
Object with 6% remission	7 mm	7 mm	--
Resolution	0.04 in (1 mm)		

Note: See page 1012 for metric to English conversions.

Order Information

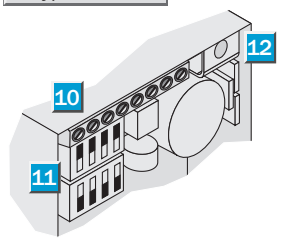
Type	Part no.
DMT 5-1111	6 022 339
DMT 5-1211	6 022 350

Accessories

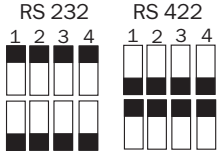
	page
Mounting brackets	934

Connection Diagram

All types



DIP Switch Setting



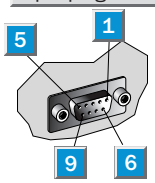
10	Terminals
11	DIP switch RS 232/RS 422 switch
12	Cable shield ground

Technical Data	DMT 5-	1111	1211
Sensing range	90% white 1.6...180.4 ft (0.5 ... 55 m)		
	6% black 1.6...49.2 ft (0.5 ... 15 m)		
Light spot diameter/distance	1.2 in at 3.3 ft (30 mm at 1 m),		
	11.4 in at 180.4 ft (290 mm at 55 m)		
Light source[1], light type	Laser diode, infrared light		
Laser category	Class I (IEC 60825-1/EN 60825-1:Nov. 2001)		
Alignment laser	21 CFR 1040-10, Class I (IEC 60825), visible red		
Accuracy	± 0.4 in (10 mm)		
Repeatability	0.3 in (7 mm)		
Resolution	0.04 in (1 mm)		
Supply voltage V_S	18...30 V DC[2]		
Ripple	≤ 5 V_{PP}[3]		
Power consumption	≤ 6 W[4]		
Circuit protection[6]	A, B		
Outputs			
Output type	Open collector[10]		
Voltage	+5....30 V DC, supply Q1/Q2[8]		
Maximum current	100 mA		
Switching distance	Programmable upper and lower switch points		
Output logic	Invertible Q/$\overline{Q}$		
Averaging	16/64/256/1024 values[9]		
Analog	4...20 mA, scalable		
Temperature drift	Typ. 0.3 mm/K		
Interface	RS 232 and RS 422, ASCII text or Binary		
Baud rate	1.2, 2.4, 4.8, 9.6, 19.2, 38.4 kBaud		
Profibus	Uses RS 232, auto. baud detection, recommended 19.2k		
Measurement output rate			
Profibus Average	16/64/256/1024 values, output rate 16, 64, 256, 1024 ms		
Serial interface	RS 232, 422 switchable, output rate 16, 64, 256, 1024 ms[11]		
Analog	500 ms		
Initialization period	6 s		
Connection type	Plug, Sub D 9-pin, PG 9 terminal chamber		
VDE protection class[5]	⏀		
Enclosure rating	IP 65		
Ambient temperature T_A	Operation 32...104°F (0...40°C)		
	Storage -13...158°F (-25...70°C)		
Approximate weight	42.3 oz (1200 g)		

1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Reference voltage 50 V DC, PELV voltage (EN 50178)
6) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
7) Environmental conditions constant, minimal switching period 30 min
8) Must use isolated power supply (PELV)
9) Moving or block average output
10) Q_2 not available when analog is active
11) Dependent on averaging value

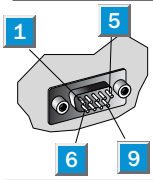
Connection Diagram

9-pin plug Sub D Female



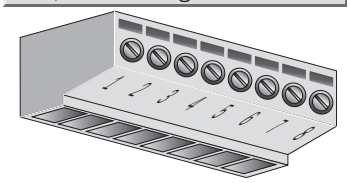
	Signal	Significance
1	NC	Not connected
2	NC	Not connected
3	B	Profibus line B 9RXD/TXD+)
4	RTS	Control signal (direction detection LWL)
5	GND	Signal ground
6	+ 5 V	With reference to GND, pin 5
7	NC	Not connected
8	A	Profibus line A (RXD/TXD+)
9	NC	Not connected

9-pin plug Sub D Male RS 232/422



	Signal	Significance
1	nRESET	Reset input (hardware reset)
2	RxD	RS 232 input
3	TxD	RS 232 output
4	NC	Not connected
5	GND	Signal ground
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

PG 9, terminal assignment



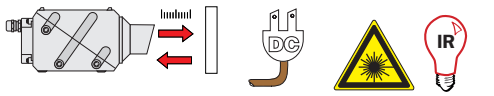
	Signal	Significance
1	L+	18...30 V DC
2	M	Ground 0V
3	Q_1	Output
4	Q_2[10]	Output
5	L+/Q	VDC in Q1 Q2 output*
6	M/Q_A	Analog ground
7	Q_A	Analog out
8	NC	Not connected

*External voltage 5...30 V DC supply only with protective extra low voltage (100 ma max supply current)

SICK

DMT 10

Distance Sensors



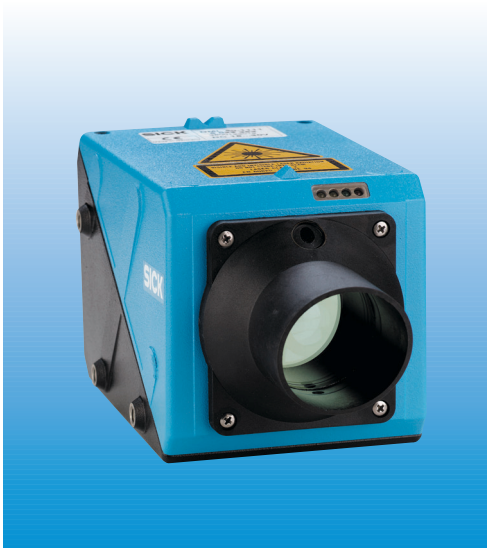
1.6...508.3 ft (0.5...155 m)
sensing range

RS 232
RS 422
Analog

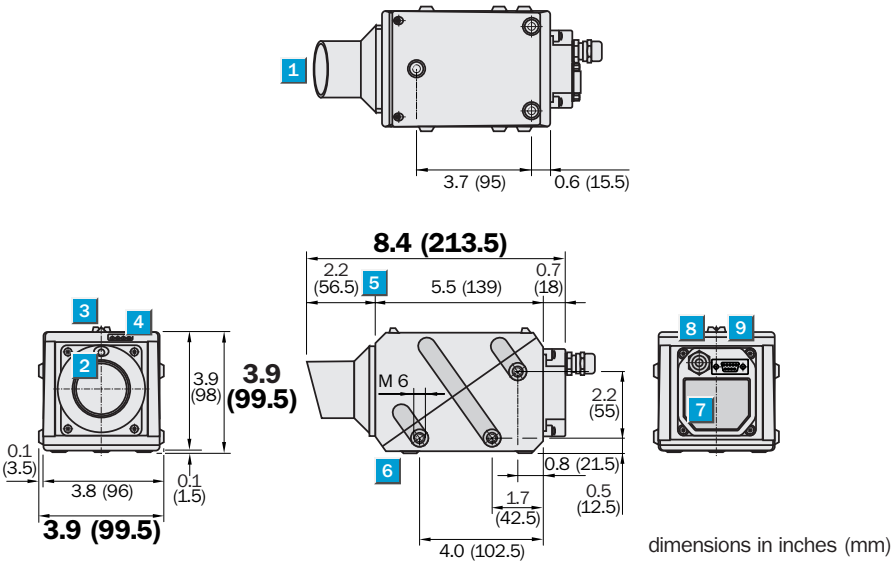
Highlights

- Visible red light for easy alignment
- Long range distance measurement on any surface
- Easy programmability using RS 232 for system flexibility
- Two programmable switching outputs
- Analog output

DMT 10

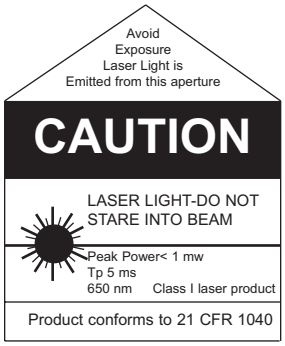


Dimensional Drawing



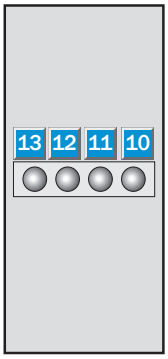
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1	Dust protection tube
2	Laser pointer pilot light - Class I
3	Alignment sight
4	Function indicator (4 LEDs)
5	Measurement zero point
6	Mounting hole M6 threaded – 6 mm deep
7	Plug cover
8	PG 9 terminal chamber
9	Plug, sub D 9-pin
10	Plausibility (measurement error) LED red
11	Power indicator, LED green
12	Q_1 output indicator
13	Q_2 output indicator

Measurement Range, Repeatability, Accuracy

Sensing range[4]	1 m	10 m	40 m
Accuracy			
Object with 90% remission	10 m	10 m	10 m
Object with 18% remission	10 m	10 m	10 m
Object with 6% remission	10 m	10 m	10 m
Repeatability[7]			
Object with 90% remission	7 m	7 m	7 m
Object with 18% remission	7 m	7 m	7 m
Object with 6% remission	7 m	7 m	10 m
Resolution	0.04 in (1 mm)		

Note: See page 1012 for metric to English conversions.

Order Information

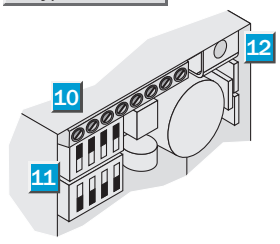
Type	Part no.
DMT 10-1111	6 022 351
DMT 10-1211	6 022 352

Accessories

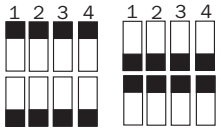
	page
Mounting brackets	934

Connection Diagram

All types



DIP Switch Setting



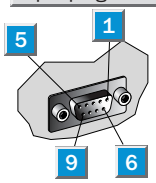
Terminals
DIP switch RS 232/RS 422 switch
Cable shield ground

Technical Data		DMT 10-	1111	1211							
Sensing range		6% black / 1.6...180.4 ft (0.5 ... 55 m)									
		90% white / 1.6...508.5 ft (0.5 ... 155 m)									
Light spot diameter/distance		1.0 in at 3.3 ft (25 mm at 1 m)									
		31.3 in at 508.5 ft (795 mm at 155 m)									
Light source[1], light type		Laser diode, infrared light									
Laser category		Class Im (IEC 60825-1/EN 60825-1)									
Alignment laser		21 CFR 1040-10, Class I (IEC 60825), visible red									
Accuracy		± 0.4 in (10 mm)									
Repeatability		0.3 in (7 mm)									
Resolution		0.04 in (1 mm)									
Supply voltage V_S		18...30 V DC[2]									
Ripple		≤ 5 V_{PP}[3]									
Power consumption		≤ 6 W[4]									
Circuit protection[6]		A, B									
Outputs											
Output type		Open collector[10]									
Voltage		+5....30 V DC, supply Q1/Q2[8]									
Maximum current		100 mA									
Switching distance		Programmable upper and lower switch points									
Output logic		Invertible Q/$\overline{Q}$									
Averaging		16/64/256/1024 values[9]									
Analog		4...20 mA, scalable									
Temperature drift		Typ. 0.3 mm/K									
Interface		RS 232 and RS 422, ASCII text or Binary									
Baud rate		1.2, 2.4, 4.8, 9.6, 19.2, 38.4 kBaud									
Profibus		Uses RS 232, auto. baud detection, recommended 19.2k									
Measurement output rate											
Profibus	Average	16/64/256/1024 values, output rate 16, 64, 256, 1024 ms									
Serial interface		RS 232, 422 switchable, output rate 16, 64, 256, 1024 ms[11]									
Analog		500 ms									
Initialization period		6 s									
Connection type		Plug, Sub D 9-pin, PG 9 terminal chamber									
VDE protection class[5]		⏀									
Enclosure rating		IP 65									
Ambient temperature T_A		Operation 32...104°F (0...40°C)									
		Storage -13...158°F (-25...70°C)									
Approximate weight		42.3 oz (1200 g)									

1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Reference voltage 50 V DC, PELV voltage (EN 50178)
6) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
7) Environmental conditions constant, minimal switching period 30 min
8) Must use isolated power supply (PELV)
9) Moving or block average output
10) Q_2 not available when analog is active
11) Dependent on averaging value

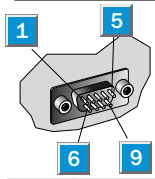
Connection Diagram

9-pin plug Sub D Female



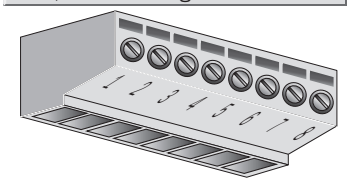
	Signal	Significance
1	NC	Not connected
2	NC	Not connected
3	B	Profibus line B 9RXD/TXD+)
4	RTS	Control signal (direction detection LWL)
5	GND	Signal ground
6	+ 5 V	With reference to GND, pin 5
7	NC	Not connected
8	A	Profibus line A (RXD/TXD+)
9	NC	Not connected

9-pin plug Sub D Male RS 232/422



	Signal	Significance
1	nRESET	Reset input (hardware reset)
2	RxD	RS 232 input
3	TxD	RS 232 output
4	NC	Not connected
5	GND	Signal ground
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

PG 9, terminal assignment



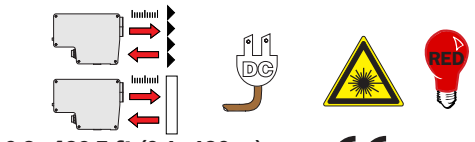
	Signal	Significance
1	L+	18...30 V DC
2	M	Ground 0V
3	Q_1	Output
4	Q_2[10]	Output
5	L+/Q	VDC in Q1 Q2 output*
6	M/Q_A	Analog ground
7	Q_A	Analog out
8	NC	Not connected

*External voltage 5...30 V DC supply only with protective extra low voltage (100 ma max supply current)

SICK

DME 2000

Distance Sensors



0.3...426.5 ft (0.1...130 m)
3.9...80.6 in (100...2047 mm)
sensing range

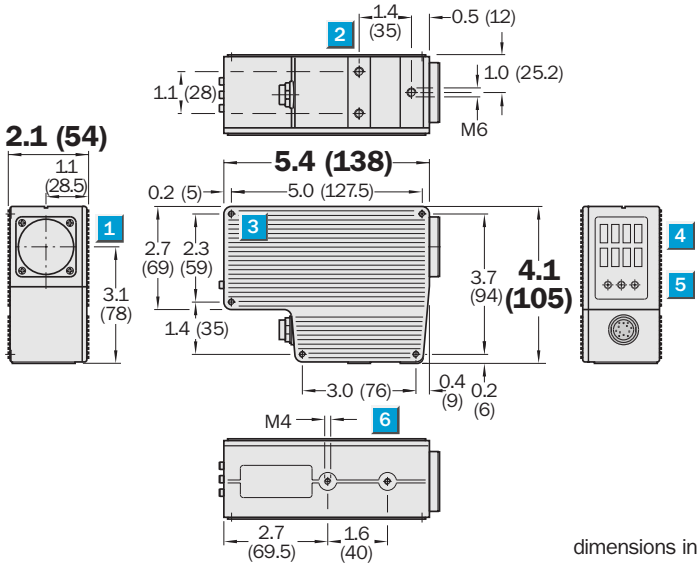
RS 232
Analog

Highlights

- Visible red light for easy alignment
- Non-contact distance measurement; reflex and proximity in one unit
- Windows™-based programmability for system flexibility
- Analog output
- Two programmable discrete outputs
- Plausibility and service outputs

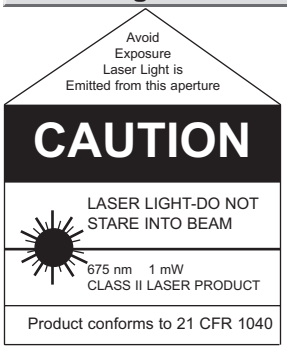
DME 2000

Dimensional Drawing



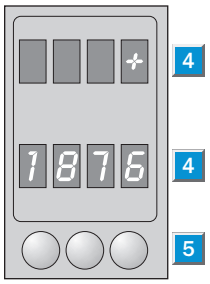
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1 Center of optical axis
2 M6 threaded mounting hole, 10 mm deep
3 M4 threaded mounting hole, 14 mm deep (this side only)
4 8-digit alphanumeric indicator
5 Keypad
6 M4 threaded mounting hole, 6 mm deep

Measurement Range, Repeatability, Accuracy

Sensing range
In proximity mode: 3.9...80.6 in (100...2047 mm)
In reflex mode:0.3...426.5 ft (0.1...130 m) with RTAPM tape
9.8...328.1 ft (3...100 m) with diamond grade tape
0.3...295.3 ft (0.1...90 m) with 7610 tape
0.3...131.2 ft (0.1...40 m) with 3290 tape
Accuracy[8]
In proximity mode: ±0.098 in (5 mm) at 90% remission
±0.43 in (11 mm) at 18% remission
±2.56 in (65 mm) at 6% remission
In reflex mode:+ 0.20/- 0.79 in (+ 5/- 20 mm)
Repeatability[8]
In proximity mode: ±0.04 in (1 mm) at 90% remission
±0.11 in (3 mm) at 18% remission
±0.98 in (25 mm) at 6% remission
In reflex mode:0.08 in (2 mm)[11]
Resolution
0.04 in (1 mm)

Order Information

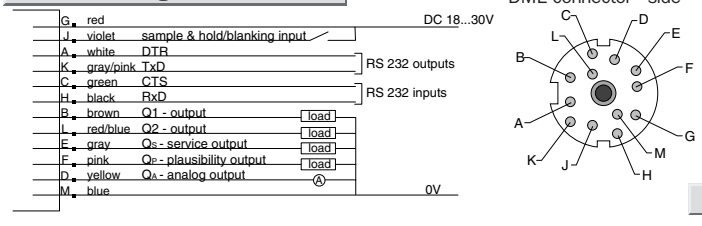
Standard Type	Part no.
DME 2000-000S01	1 013 484
DME 2000-000A01	7 022 818

Accessories	page
Cables and connectors	912
Mounting brackets	934
Reflectors	936
Special Accessories	
Dust shield	956
Cooling plates	958
Electric heating/cooling	959

Technical Data		DME 2000-	000 S01	000 A01							
Sensing range	In proximity mode:	3.9...80.6 in (100...2047 mm)	■	■							
	In reflex mode:	0.3...426.5 ft (0.1...130 m) with RTAPM tape	■	■							
		9.8...328.1 ft (3...100 m) with diamond grade tape	■	■							
		0.3...295.3 ft (0.1...90 m) with 7610 tape	■	■							
		0.3...131.2 ft (0.1...40 m) with 3290 tape	■	■							
Light source[1], **light type**		Laser diode, red light	■	■							
Light spot diameter	In proximity mode:	0.2 in at 6.6 ft (5 mm at 2 m)	■	■							
	In reflex mode:	9.8 in at 426.5 ft in (250 mm at 130 m)	■	■							
Laser category		Class II (IEC 825-1/EN 60825-1) 21 CFR 1040.10	■	■							
NIR blocking filter, high temp. targets		For high temp. targets up to 1600°F (871.1°C)		■							
Accuracy[8]	In proximity mode:	±0.098 in (5 mm) at 90% remission	■	■							
		±0.43 in (11 mm) at 18% remission	■	■							
		±2.56 in (65 mm) at 6% remission	■	■							
	In reflex mode:	+ 0.20/- 0.79 in (+ 5/- 20 mm)	■	■							
Repeatability[8]	In proximity mode:	±0.04 in (1 mm) at 90% remission	■	■							
		±0.11 in (3 mm) at 18% remission	■	■							
		±0.98 in (25 mm) at 6% remission	■	■							
	In reflex mode:	0.08 in (2 mm)[11]	■	■							
Resolution		0.04 in (1 mm)	■	■							
Supply voltage V_S		18...30 V DC [2]	■	■							
Ripple		≤ 5 V_{PP}[3]	■	■							
Power consumption		≤ 6 W[4]	■	■							
Circuit protection[6]		A, B	■	■							
Outputs	Output type	PNP	■	■							
Voltage		Active: V_S – ≤2 V; Deactive: ≤2 V	■	■							
Maximum current		100 mA	■	■							
Switching distance		Adjustable in 1 mm increments	■	■							
Switching hysteresis		0...10 in (0...254 mm) adjustable in 2 mm increments	■	■							
Output logic		Invertible Q/$\overline{Q}$	■	■							
Plausibility Q_P		Active: measurement correct; Deactive: measurement error	■	■							
Service Q_S		Active: device OK; Deactive: early failure warning	■	■							
Analog		0...20 mA or 4...20 mA, selectable, scalable	■	■							
Effect of compressed air		In reflex mode: 0.3 ppm/mbar	■	■							
Effect of air temperature		In reflex mode: 1 ppm/K	■	■							
Temperature drift		Typical 0.3 mm/K	■	■							
Interface		RS 232	■	■							
Baud rate		4.8/9.6/19.2 kBaud	■	■							
Measurement output rate			■	■							
Serial interface		In proximity mode: 29 ms; In reflex mode: 100 ms	■	■							
Analog		≤30 ms	■	■							
Maximum running speed		In reflex mode: 12 m/s	■	■							
Connection type		Plug	■	■							
VDE protection class[5]		□	■	■							
Enclosure rating		IP 65/NEMA 4	■	■							
Ambient temperature T_A		Operation 14...113°F (-10...45°C)	■	■							
		Storage -13...167°F (-25...75°C)	■	■							
Mechanical load		IEC 68	■	■							
Approximate weight		2.2 lb (980 g)	■	■							

1) Average service life 50,000 h at T_A =25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Reference voltage 50 V DC
6) A=V_S connections reverse-polarity protected
B = Output Q reverse-polarity protected
7) Relative to front edge of object
8) Environmental conditions constant at 30 min. minimum warm-up period
9) Measurement distance 1 m, 90% remission
10) 20°C ambient temperature, 1013 mbar, 30 min. switching period, re-calibration recommended after 25,000 h
11) Analog is 12 bits over spanned distance and full analog range

Connection Diagram



DME connector - side

SICK

DME 3000-1 Reflex

Distance Sensors

0.3...1640 ft (0.1...500 m)
sensing range

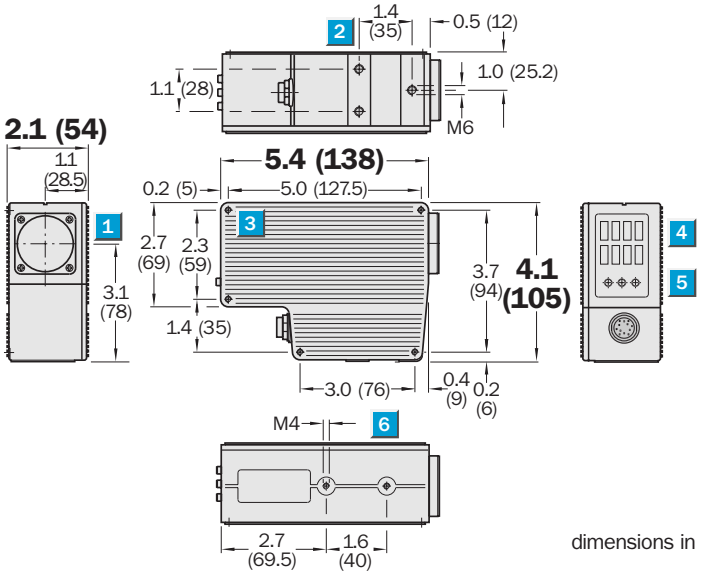
RS 422

Highlights

- Visible red light for easy alignment
- Super-long distance measurement with a reflector
- Remote programmability for system flexibility
- Two programmable discrete outputs (invertible)
- Plausibility and service outputs

DME 3000-1

Dimensional Drawing



dimensions in inches (mm)

Measurement Range, Repeatability, Accuracy

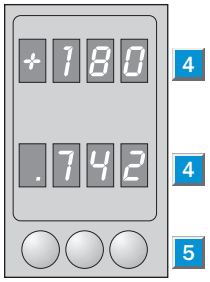
Repeatability	**0.5 mm**
Measurement range with reflector	
Reflective tape 3290	0.1 m...20 m
Reflective tape 7610	0.1 m...40 m
Reflective tape «Diamond Grade»	3.0 m...90 m
Multi-reflector PL240F	0.1 m...250 m
Multi-reflector PL560F	0.1 m...270 m
Multi-reflector PL880F	10 m...300 m

Repeatability	**2 mm**
Measurement range with reflector	
Reflective tape 3290	0.1 m...40 m
Reflective tape 7610	0.1 m...90 m
Reflective tape «Diamond Grade»	0.5 m...250 m
Multi-reflector PL240F	0.1 m...300 m
Multi-reflector PL560F	0.1 m...350 m
Multi-reflector PL880F	8.0 m...500 m

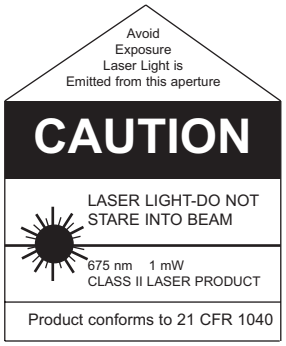
Note: See page 1012 for metric to English conversions.

Adjustments

All types



1 Center of optical axis
2 M6 threaded mounting hole, 10 mm deep
3 M4 threaded mounting hole, 14 mm deep (this side only)
4 8-digit alphanumeric signal indicator
5 Keypad
6 M4 threaded mounting hole, 6 mm deep



Order Information

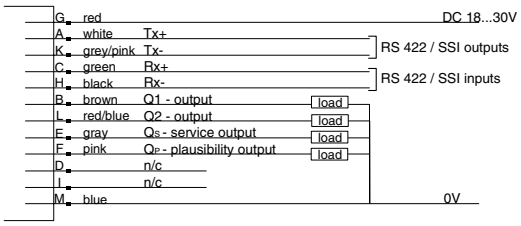
Type	Part no.
DME 3000-111S01	1 015 921
DME 3000-311S14	1 022 082
DME 3000-111P01	1 018 575

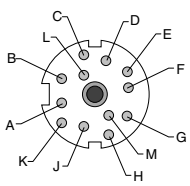
Accessories	page
Cables and connectors	912
Mounting brackets	934
Reflectors	936
Special Accessories	
Dust shield	956
Cooling plates	958
Electric heating/cooling	959

Technical Data	DME 3000-	111 S01	311 S14	111 P01
Sensing range	0.3...1640 ft (0.1…500 m), dependent on reflector, see measurement range chart on prior page	■	■	■
Light source[4], **light type**	Laser diode, red light	■	■	■
Light spot diameter	3.3 ft at 1640 ft (1 m at 500 m)	■	■	■
Laser category	Class II (IEC 825-1/EN 60825-1) 21 CFR 1040.10	■	■	■
Accuracy[1] [2]	± 0.2 in (5 mm)	■	■	■
Repeatability[3]	0.5 mm max. dependent on range, see prior page	■	■	■
Resolution	SSI: 0.005 in (0.125 mm); RS 422: 0.04 in (1 mm)	■	■	■
Supply voltage V_S	18...30 V DC[5]	■	■	■
Ripple	≤ 5 V_{PP}[6]	■	■	■
Power consumption[7]	Standard: ≤ 6 W[7] Profibus: ≤ 8 W[7]	■	■	■
Circuit protection[9]	A, B	■	■	■
Outputs Output type	PNP/NPN	■	■	■
Voltage	Active: V_S – ≤ 2 V; Deactive: ≤ 2 V	■	■	■
Maximum current I_A	100 mA	■	■	■
Switching distance	Limit adjustable in 1 mm increments	■	■	■
Switching hysteresis	Hysteresis adjustable in 2 mm increments 0...254 mm	■	■	■
Output logic	Invertible Q/$\overline{Q}$	■	■	■
Plausibility Q_P	Active: measurement correct; Deactive: error	■	■	■
Service Q_S	Active: device OK; Deactive: early failure warning	■	■	■
Effect of compressed air	0.3 ppm/mbar	■	■	■
Effect of air temperature	1 ppm/K	■	■	■
Temperature drift	Typical 0.3 mm/K	■		■
	Typical 0.2 mm/K		■	
Interfaces				
SSI	SSI: GRAY/BINARY, 24 or 25 bits	■	■	
Serial interface	RS 422: 4.8/9.6/19.2/38.4 kBaud	■	■	
Profibus	Uses RS 485, automatic baud rate detection, Max. 12 MBaud			■
Measurement output rate				
SSI	1 ms	■	■	
Serial interface	RS 422 at 38.4 kBaud = 5 ms	■	■	
Profibus	1.5 ms			■
Initialization period	4 s	■		■
Max. running speed	10 m/s	■	■	■
Connection type	Plug	■	■	■
VDE protection class[8]	□	■	■	■
Enclosure rating	IP 65/NEMA 4	■	■	■
Ambient temperature T_A	Operation 14...113°F (-10...45°C)	■	■	■
	Storage -13...167°F (-25...75°C)	■	■	■
Mechanical load	IEC 68	■	■	■
Approximate weight	2.2 lb (980 g)	■	■	■

1) 23°C air temperature, 977 hPa, min warm-up period 30 min
2) Re-calibration recommended after 25,000 h
3) Environmental conditions constant, min. switching period 30 min.
4) Average service life 50,000 h at T_A = 25°C
5) Limit values
6) May not exceed or fall short of V_S tolerances
7) Without load
8) Reference voltage 32 V DC
9) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected

Connection Diagram - Standard

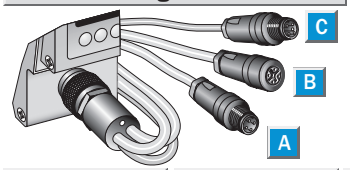


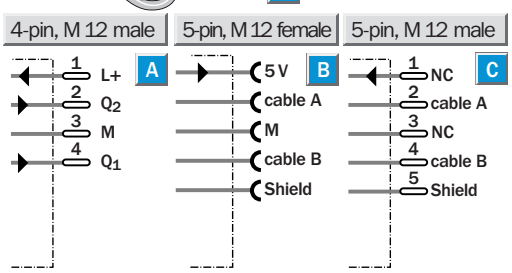


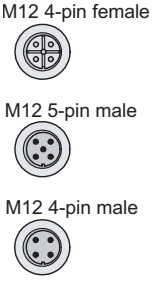
wire colors refer to standard cable, not included

Connection Diagram - Profibus

Adapter not included in delivery



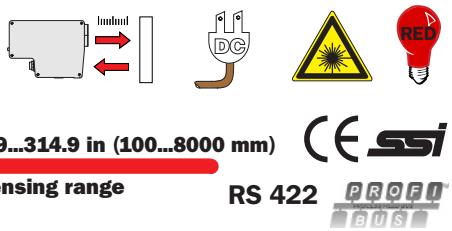




SICK

DME 3000-2 Proximity

Distance Sensors



3.9...314.9 in (100...8000 mm)
sensing range

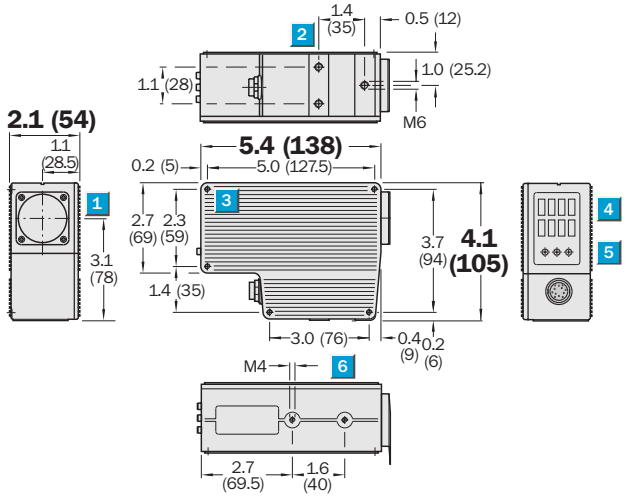
RS 422

Highlights

- Visible red light for easy alignment
- Non-contact distance measurement on any surface
- Remote programmability for system flexibility
- Two programmable discrete outputs (invertible)
- Plausibility and service outputs

DME 3000-2

Dimensional Drawing



dimensions in inches (mm)

Measurement Range, Repeatability, Accuracy

Measurement distance	1 m	2 m
Repeatability[1]		
White, 90% remission	1 mm	2 mm
Grey, 18% remission	2 mm	5 mm
Black, 6% remission	5 mm	25 mm
Accuracy[2][3]		
White, 90% remission	±5 mm	±5 mm
Grey, 18% remission	±5 mm	±10 mm
Black, 6% remission	±10 mm	±20 mm

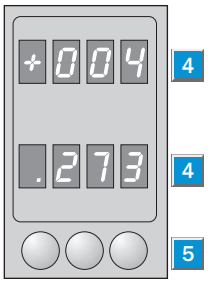
Measurement distance	4 m	6 m
Repeatability[1]		
White, 90% remission	5 mm	10 mm
Grey, 18% remission	25 mm	–
Black, 6% remission	–	–
Accuracy[2][3]		
White, 90% remission	±10 mm	±20 mm
Grey, 18% remission	±30 mm	–
Black, 6% remission	–	–

Measurement distance	8 m
Repeatability[1]	
White, 90% remission	25 mm
Accuracy[2][3]	
White, 90% remission	±30 mm

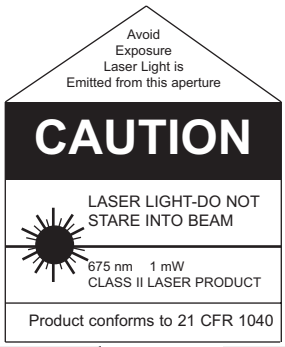
Note: See page 1012 for metric to English conversions.

Adjustments

All types



1 Center of optical axis
2 M6 threaded mounting hole, 10 mm deep
3 M4 threaded mounting hole, 14 mm deep (this side only)
4 8-digit alphanumeric indicator
5 keypad
6 M4 threaded mounting hole, 6 mm deep



Order Information

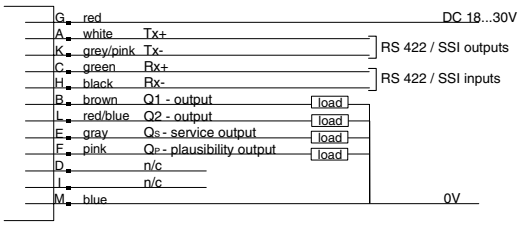
Type	Part no.
DME 3000-211S02	1 015 922
DME 3000-212	1 015 906
DME 3000-211P02	1 018 576

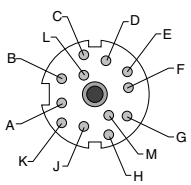
Accessories	page
Cables and connectors	912
Mounting brackets	934
Special Accessories	
Dust covers	956
Cooling plates	958
Electric heating/cooling	959

Technical Data		DME 3000-	211 S02	212	211 P02						
Sensing range		3.9...314.9 in (100...800 mm), dependent on reflector, see measurement range chart on prior page	■	■	■						
Light source[4], light type		Laser diode, red light	■	■	■						
Light spot diameter		0.2 in at 26.2 ft (5 mm at 8 m)	■	■	■						
Laser category		Class II (IEC 825-1/EN 60825-1) 21 CFR 1040.10	■	■	■						
NIR blocking filter, high temp. targets		For high temp. targets up to 1600°F		■							
Accuracy[2) 3)]		± 0.2 in (5 mm), see prior page	■	■	■						
Repeatability[1)]		1 mm max. see prior page	■	■	■						
Resolution		SSI: 0.005 in (0.125 mm)/RS 422: 0.04 in (1 mm)	■	■	■						
Supply voltage V_S		18...30 V DC[5)]	■	■	■						
Ripple		≤ 5 V_{PP}[6)]	■	■	■						
Power consumption[7)]		Standard: ≤ 6 W Profibus: ≤ 8 W	■	■	■						
Circuit protection[9)]		A, B	■	■	■						
Outputs	Output type	PNP/NPN	■	■	■						
Voltage		Active: V_S – ≤ 2 V; Deactive: ≤ 2 V	■	■	■						
Maximum current I_A		100 mA	■	■	■						
Switching distance		Limit adjustable in 1 mm increments	■	■	■						
Switching hysteresis		Hysteresis adjustable in 2 mm increments 0...254 mm	■	■	■						
Output logic		Invertible Q/$\overline{Q}$	■	■	■						
Averaging		1, 2, 4, 8, 16, 32, 64, 128 values; moving avg. output	■	■	■						
Plausibility Q_P		Active: measurement correct/Deactive: error	■	■	■						
Service Q_S		Active: device OK/Deactive: early failure warning	■	■	■						
Temperature drift		Typical 0.3 mm/K	■	■	■						
Interfaces											
SSI		SSI: GRAY/BINARY, 24 or 25 bit	■	■							
Serial interface		RS 422: 4.8/9.6/19.2/38.4 kBaud	■	■							
Profibus		Uses RS 485, automatic baud rate detection, Max. 12 MBaud			■						
Measurement output rate											
SSI		21 ms min.	■	■							
Serial interface		RS 422 at 19.2 kBaud and higher: 21 ms min.	■	■							
Profibus		21 ms min.			■						
Initialization period		5 s	■	■	■						
Connection type		Plug	■	■	■						
VDE protection class[8)]		⧈	■	■	■						
Enclosure rating		IP 65/NEMA 4	■	■	■						
Ambient temperature T_A		Operation 14...113°F (-10...45°C)	■	■	■						
		Storage -13...167°F (-25...75°C)	■	■	■						
Mechanical load		IEC 68	■	■	■						
Approximate weight		2.2 lb (980 g)	■	■	■						

1) Environmental conditions constant, min. switching period 30 min.
2) 23°C air temp, 977 hPA, min. switching period 30 min.
3) Re-calibration recommended after 25,000 h.
4) Average service life 50,000 h at T_A = 25°C
5) Limit values
6) May not exceed or fall short of V_S tolerances
7) Without load
8) Reference voltage 32 V DC
9) A=V_S connections reverse-polarity protected
B= Output Q short-circuit protected

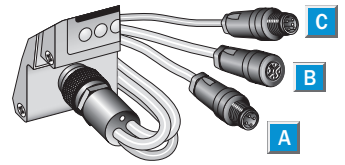
Connection Diagram - Standard



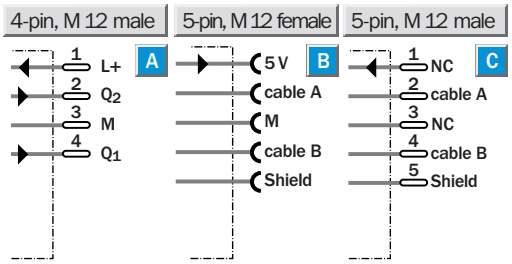


wire colors refer to standard cable, not included

Connection Diagram - Profibus



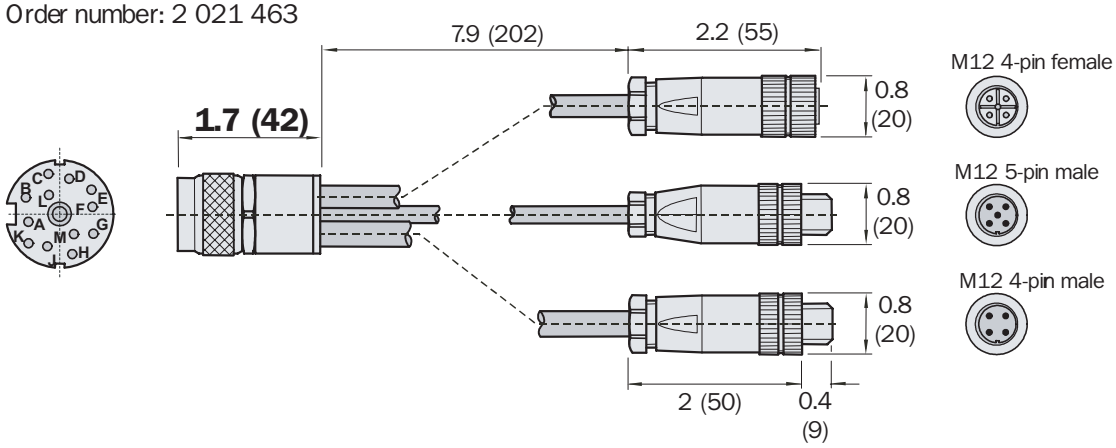
Adapter not included in delivery



SICK

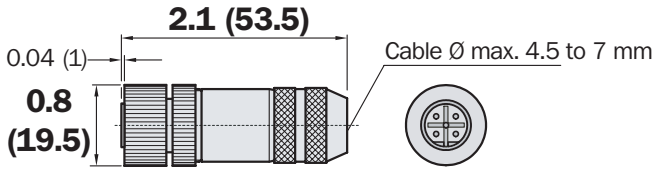
Profibus connection cable

Order number: 2 021 463



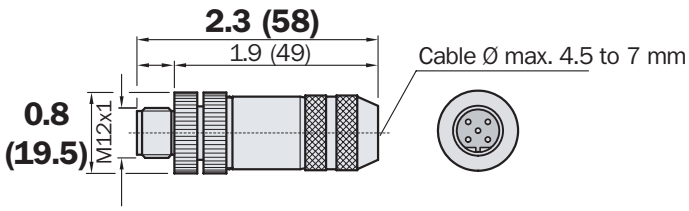
Profibus cable receptacle

Order number: 6 021 353, 5-pin female reversed keyed



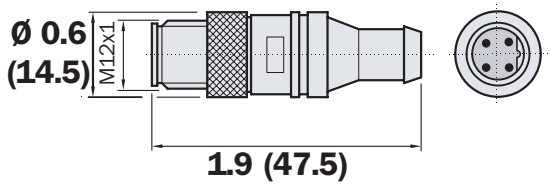
Profibus cable connector

Order number: 6 021 354, 5-pin male reversed keyed



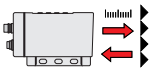
Profibus terminal resistance (plug)

Order number: 6 021 156, 4-pin male reversed keyed



DME 5000

Distance Sensors



0.5...492.1 ft (0.15...150 m)
sensing range

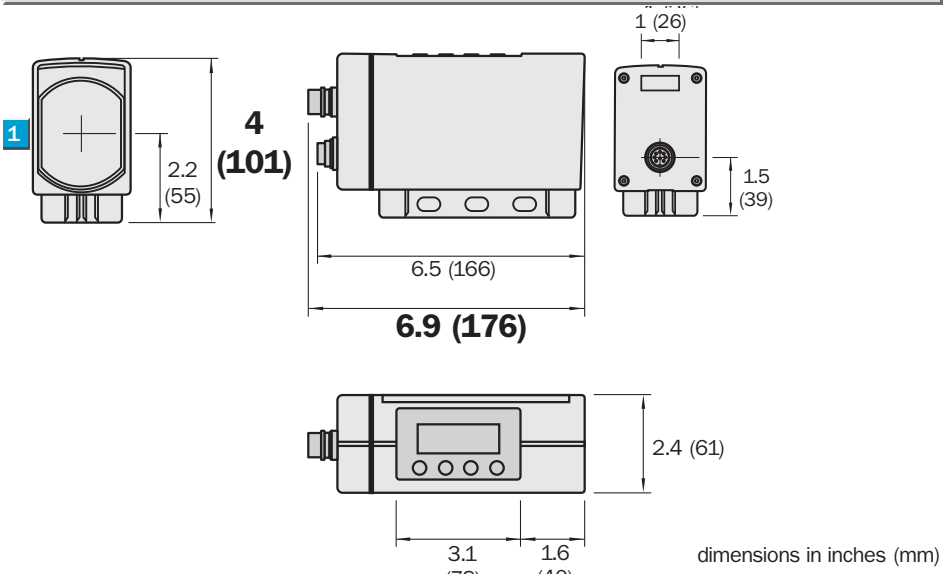
RS 422

Highlights

- Visible red light for easy alignment
- Non-contact distance measurement on reflective tape
- Two programmable switching outputs
- Preset function for simple set up
- Very fast measurement and communication for quick closed loop positioning
- Special bracket for easy assembly, alignment and replacement

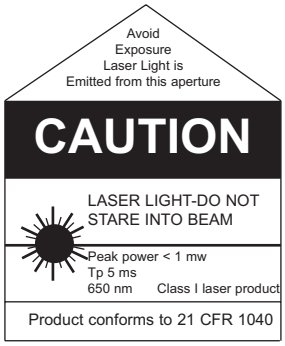
DME 5000

Dimensional Drawing



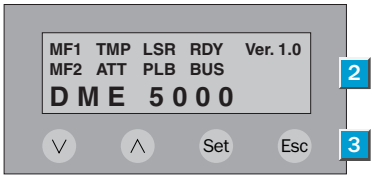
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1 Center of optical axis
2 LCD display
3 keypad

Measurement Range, Repeatability, Accuracy

Sensing range		
	0.15...70 m	0.15...150 m
Accuracy[1)]		
	2 mm	3 mm
Repeatability[1)]		
	0.5 mm	1 mm
Resolution		
(adjustable)	0.05...5 mm	0.05...5 mm

Note: See page 1012 for metric to English conversions.

Order Information

Type	Part no.
DME 5000-111	1 022 949
DME 5000-113	1 025 248
DME 5000-211	1 024 081
DME 5000-213	1 025 250
DME 5000-121	1 024 083
DME 5000-123	1 025 249
DME 5000-221	1 024 085
DME 5000-223	1 025 251

Accessories	page
Cables and connectors	913
Mounting brackets	934
Special Accessories	
Dust covers	957
Corner mirror	954

Technical Data		DME 5000-	111	113	211	213	121	123	221	223
Sensing range		0.5...229.7 ft (0.15...70 m)	■	■			■	■		
		0.5...492.1 ft (0.15...150 m)			■	■			■	■
Accuracy[1]		±0.08 in (2 mm)	■	■			■	■		
		±0.11 in (3 mm)			■	■			■	■
Repeatability[1]		0.019 in (0.5 mm)	■	■			■	■		
		0.04 in (1 mm)			■	■			■	■
Light spot diameter		Approx. 5.1 in at 229.7 (130 mm at 70 m)	■	■			■	■		
		Approx. 10.6 in at 492.1 ft (270 mm at 150 m)			■	■			■	■
Resolution (adjustable)		0.019...0.2 in (0.05...5 mm)	■	■	■	■	■	■	■	■
Light source[2], **light type**		Laser diode, red light	■	■	■	■	■	■	■	■
Laser category		Class II (IEC 60825-1/EN 60825-1) 21 CFR 1040.10	■	■	■	■	■	■	■	■
Supply voltage V_S[3]		18...30 V DC	■	■	■	■	■	■	■	■
Ripple[4]		≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Power consumption		≤ 250 mA at DC 24 V	■	■	■	■				
	with heating	≤ 1000 mA					■	■	■	■
Circuit protection[6]		A, B	■	■	■	■	■	■	■	■
Outputs										
Output type		PNP, NPN	■	■	■	■	■	■	■	■
Voltage	Output (MF1/MF2)	Active: V_S ≤3 V; Deactive: <2 V	■	■	■	■	■	■	■	■
	Input (MF1)	Active: >12 V; Deactive: <3 V								
Maximum current		100 mA	■	■	■	■	■	■	■	■
Switching distance		Set upper and lower switch points, 1 mm increments	■	■	■	■	■	■	■	■
Output logic		Outputs invertible (active, deactive)	■	■	■	■	■	■	■	■
Plausibility Q_p		Active - faulty measured value	■	■	■	■	■	■	■	■
Service Q_S		Programmable; active - prefailure warning	■	■	■	■	■	■	■	■
Effect of compressed air		0.3 ppm/mbar	■	■	■	■	■	■	■	■
Effect of air temperature		1 ppm/K	■	■	■	■	■	■	■	■
Temperature drift		Typ. 0.1 mm/K	■	■	■	■	■	■	■	■
Interface		SSI (GRAY/Binary 24 or 25 bit)	■		■		■		■	
		RS 422		■		■		■		■
Serial/SSI Baud rate		4.8k, 9.2k, 19.2k, 38.4k, 115.2k, Baud	■	■	■	■	■	■	■	■
Measurement output rate										
		1 ms	■				■			
		2 ms		■	■	■		■	■	■
Initialization period		500 ms	■	■	■	■	■	■	■	■
Max. travel speed		10 m/s	■	■	■	■	■	■	■	■
Connection type		Plug, 8-pin M16	■	■	■	■	■	■	■	■
VDE protection class [5]		⧈	■	■	■	■	■	■	■	■
Enclosure rating		IP 65	■	■	■	■	■	■	■	■
Ambient temperature		Operation 14...131°F (-10...55°C)	■	■	■	■				
	with heating	Operation -40...131°F (-40...55°C)					■	■	■	■
		Storage -13...167°F (-25...75°C)	■	■	■	■	■	■	■	■
Approximate weight		58.2 oz (1650 g)	■	■	■	■	■	■	■	■
EMC		EN 61000-6-2, EN 55011: class B	■	■	■	■	■	■	■	■
Mechanical load		Shock: IEC 68-2-27, IEC 68-2-29	■	■	■	■	■	■	■	■
		Sine: IEC 68-2-6, Noise: IEC 68-2-64	■	■	■	■	■	■	■	■

1) Environmental conditions constant, 10 min. warm-up period

2) Average service life 50,000 h at T_A = +25 °C

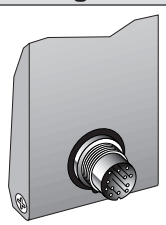
3) Limit values

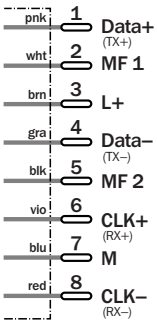
4) May not exceed or fall short of V_S tolerances

5) Reference voltage 32 V DC

6) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected

Connection Diagram

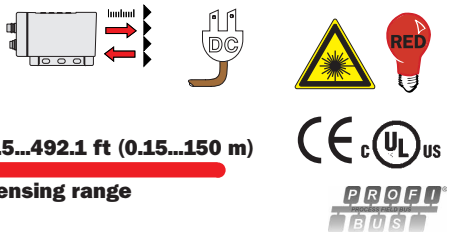




SICK

DME 5000 Profibus

Distance Sensors



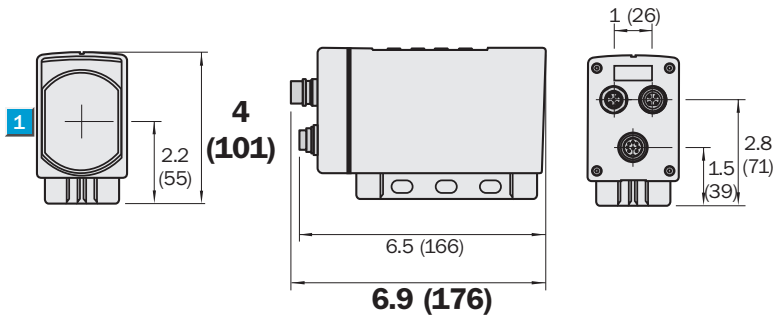
0.5...492.1 ft (0.15...150 m)
sensing range

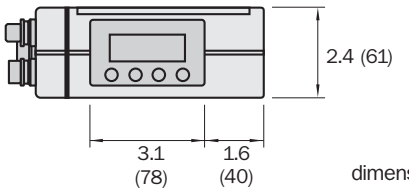
Highlights

- Visible red light for easy alignment
- Non-contact distance measurement on reflective tape
- Two programmable switching outputs
- Preset function for simple set up
- Very fast measurement and communication for quick closed loop positioning
- Special bracket for easy assembly, alignment and replacement

DME 5000

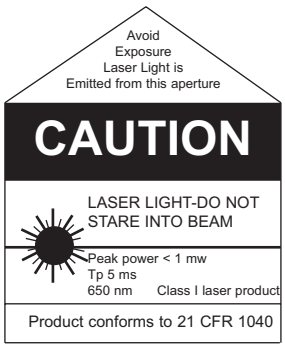
Dimensional Drawing





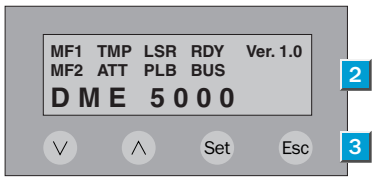
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1 Center of optical axis
2 LCD display
3 keypad

Measurement Range, Repeatability, Accuracy

Sensing range		
	0.15...70 m	0.15...150 m
Accuracy[1)]		
	2 mm	3 mm
Repeatability[1)]		
	0.5 mm	1 mm
Resolution		
(adjustable)	0.05...5 mm	0.05...5 mm

Note: See page 1012 for metric to English conversions.

Order Information

Type	Part no.
DME 5000-112	1 023 668
DME 5000-212	1 024 082
DME 5000-122	1 024 084
DME 5000-222	1 024 086

Accessories	page
Cables and connectors	909, 913
Mounting brackets	934
Special Accessories	
Dust covers	957
Corner mirror	954

Technical Data		DME 5000-	112	212	122	222
Sensing range		0.5...229.7 ft (0.15...70 m)	■		■	
		0.5...492.1 ft (0.15...150 m)		■		■
Accuracy[1]		±0.08 in (2 mm)	■		■	
		±0.11 in (3 mm)		■		■
Repeatability[1]		0.019 in (0.5 mm)	■		■	
		0.04 in (1 mm)		■		■
Light spot diameter		Approx. 5.1 in at 229.7 (130 mm at 70 m)	■		■	
		Approx. 10.6 in at 492.1 ft (270 mm at 150 m)		■		■
Resolution (adjustable)		0.019...0.2 in (0.05...5 mm)	■	■	■	■
Light source[2], **light type**		Laser diode, red light	■	■	■	■
Laser category		Class II (IEC 60825-1/EN 60825-1) 21 CFR 1040.10	■	■	■	■
Supply voltage V_S[3]		18...30 V DC	■	■	■	■
Ripple[4]		≤ 5 V_{PP}	■	■	■	■
Power consumption		≤ 250 mA at DC 24 V	■	■		
	with heating	≤ 1000 mA			■	■
Circuit protection[6]		A, B	■	■	■	■
Outputs						
Output type		PNP, NPN	■	■	■	■
Voltage	Output (MF1/MF2)	Active: V_S ≤3 V; Deactive: <2 V	■	■	■	■
	Input (MF1)	Active: >12 V; Deactive: <3 V				
Maximum current		100 mA	■	■	■	■
Switching distance		Set upper and lower switch points, 1 mm increments	■	■	■	■
Output logic		Outputs invertible (active, deactive)	■	■	■	■
Plausibility Q_p		Active - faulty measured value	■	■	■	■
Service Q_S		Programmable; active - prefailure warning	■	■	■	■
Effect of compressed air		0.3 ppm/mbar	■	■	■	■
Effect of air temperature		1 ppm/K	■	■	■	■
Temperature drift		Typ. 0.1 mm/K	■	■	■	■
Interface						
Profibus		ENCODER and SICK profile.	■	■	■	■
Baud rate		12 M Baud	■	■	■	■
Measurement output rate						
Profibus		2 ms	■	■	■	■
Initialization period		500 ms	■	■	■	■
Max. running speed		10 m/s	■	■	■	■
Connection type		Plug, 8-pin M16, 5-pin M12	■	■	■	■
VDE protection class[5]		□	■	■	■	■
Enclosure rating		IP 65	■	■	■	■
Ambient temperature		Operation 14...131°F (-10...55°C)	■	■		
	with heating	Operation -40...131°F (-40...55°C)			■	■
		Storage -13...167°F (-25...75°C)	■	■	■	■
Approximate weight		58.2 oz (1650 g)	■	■	■	■
EMC		EN 61000-6-2, EN 55011: class B	■	■	■	■
Mechanical load		Shock: IEC 68-2-27, IEC 68-2-29	■	■	■	■
		Sine: IEC 68-2-6, Noise: IEC 68-2-64	■	■	■	■

1) Environmental conditions constant, 10 min. warm-up period

2) Average service life 50,000 h at T_A = +25 °C

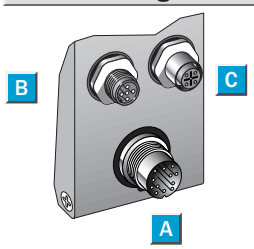
3) Limit values

4) May not exceed or fall short of V_S tolerances

5) Reference voltage 32 V DC

6) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected

Connection Diagram



8-pin, M16

pnk	1	Data+ (TX+)	A
wht	2	MF 1	
brn	3	L+	
gra	4	Data– (TX–)	
blk	5	MF 2	
vio	6	CLK+ (RX+)	
blu	7	M	
red	8	CLK– (RX–)	

5-pin, M12
Bus in

	1	NC	B
grn	2	A	
	3	NC	
red	4	B	
	5	NC	

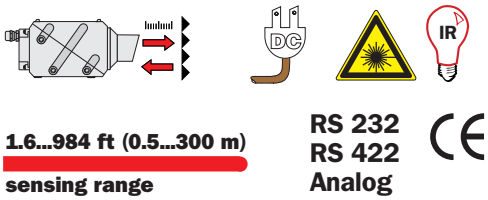
5-pin, M12
Bus out

	1	+ 5 V	C
grn	2	A	
	3	GND	
red	4	B	
	5	NC	

SICK

DML 40

Distance Sensors



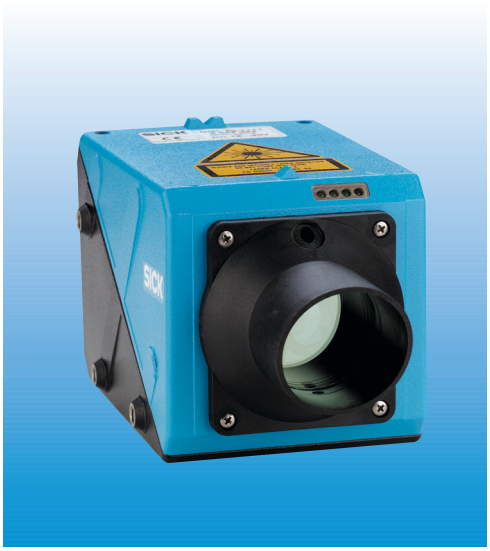
1.6...984 ft (0.5...300 m)
sensing range

RS 232
RS 422
Analog

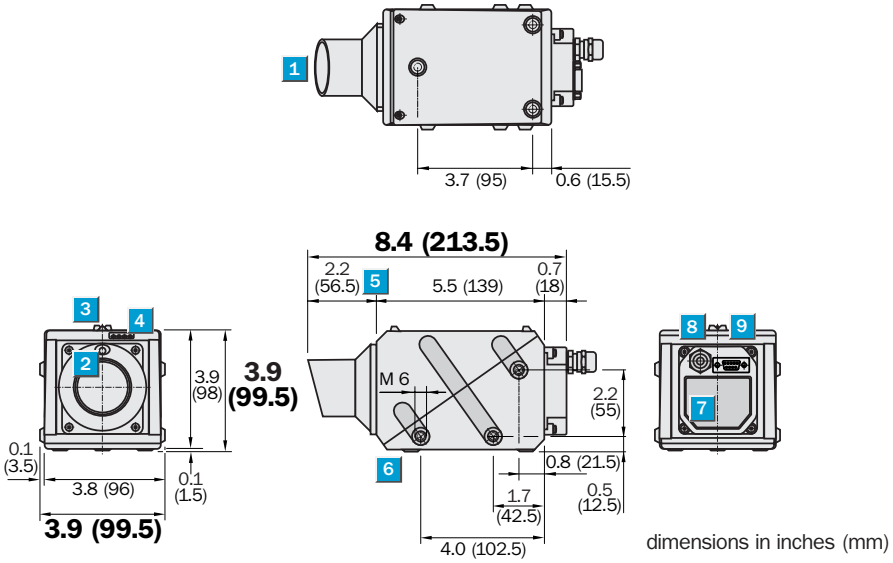
Highlights

- Infrared light
- Long range distance measurement on a reflector
- Easy programmability using RS 232 for system flexibility
- Analog output
- Two programmable switching outputs

DML 40

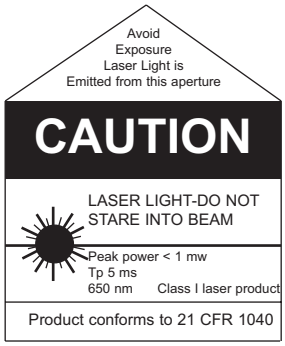


Dimensional Drawing



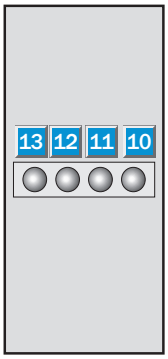
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1	Dust protection tube
2	Laser pointer pilot light - Class I
3	Alignment sight
4	Function indicator (4 LEDs)
5	Measurement zero point
6	Mounting hole M6 threaded – 6 mm deep
7	Plug cover
8	PG 9 terminal chamber
9	Plug, sub D 9-pin
10	Plausibility (measurement error) LED red
11	Power indicator, LED green
12	Q_2 output indicator
13	Q_1 output indicator

Measurement Range, Repeatability, Accuracy

Sensing range

1.6...3609 ft (0.5...1100 m) / OP 55 reflector

1.6...1968.5 ft (0.5...600 m) / PL 880F reflector

1.6...984 ft (0.5...300 m) / diamond grade tape

Accuracy[7)8)9)]

± 0.4 in (10 mm)

Repeatability[7)8)9)]

0.2 in (6 mm)

Resolution

0.04 in (1 mm) maximum

Order Information

Type	Part no.
DML 40-1111	6 022 353

Accessories

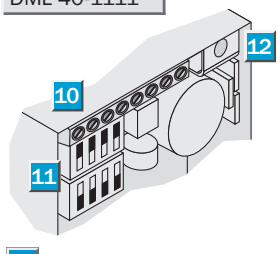
	page
Mounting brackets	934
Reflectors - RTC - Tape	936

Technical Data	DML 40-	1111								
Sensing range	1.6...3609 ft (0.5...1100 m) / OP 55 reflector									
	1.6...1968.5 ft (0.5...600 m) / PL 880F reflector									
	1.6...984 ft (0.5...300 m) / diamond grade tape									
Light spot diameter	1.0 in at 3.3 ft (25 mm at 1 m), 2.8 in at 32.8 ft									
	(70 mm at 10 m), 20.5 in at 328.1 ft (520 mm at 100 m)									
Light source[1], light type	Laser diode, infrared light									
Laser category	Class I (IEC 825-1/EN 60825-1:Nov 2001)									
Alignment laser	Class II (IEC 60825), visible red, 21 CFR 1040-10									
Accuracy[7)8)9)]	± 0.4 in (10 mm)									
Repeatability[7)8)9)]	0.2 in (6 mm)									
Resolution	0.04 in (1 mm) maximum									
Supply voltage V_S	18...30 V DC[2]									
Ripple	≤ 5 V_{PP}[3]									
Power consumption	≤ 6 W[4]									
Circuit protection[6]	A, B									
Outputs										
Output type	Open collector[10]									
Voltage	Input L+/Q +5...+30 V DC supply for Q_1/Q_2 [11]									
Maximum current	100 mA									
Switching distance	Set upper and lower switch points									
Output logic	Invertible Q/$\bar{Q}$									
Averaging	16/64/256/1024 values; moving or block average output									
Analog	4...20 mA, scalable									
Temperature drift	Typ. 0.3 mm/K									
Interface										
Serial	RS 232 and RS 422, ASCII text or binary									
Baud rate	1.2, 2.4, 4.8, 9.6, 19.2, 38.4 kBaud									
Measurement output rate										
Serial interface	3.2/12.8/50/200 ms dependent on averaging value									
Analog	500 ms									
Initialization period	6 s									
Connection type	Plug, Sub D 9-pin/PG 9 terminal chamber									
VDE protection class[5]	III									
Enclosure rating	IP 65									
Ambient temperature T_A	Operation 32...104°F (0...40°C)									
	Storage-13...158°F (-25...70°C)									
Approximate weight	42.3 oz (1200 g)									

1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Reference voltage 50 V DC PELV voltage (EN 50178)
6) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
7) Environmental conditions constant, minimal switching period 30 min
8) 23°C air temperature, 977 hPa, minimal switching period 30 min
9) Recalibration recommended after 25,000 h
10) Q_2 not available when analog is active
11) Must use isolated power supply PELV (Protective Extra Low Voltage)

Connection Diagram

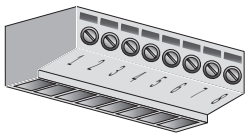
DML 40-1111



10 Terminals
11 DIP switch RS 232/RS 422 switch
12 Cable shield ground

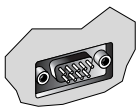
DIP Switch Setting

PG 9, terminal assignment



	Signal	Significance
1	L+	18...30 V DC
2	M	Ground 0V
3	Q_1	Output
4	Q_2[10]	Output
5	L+/Q[11]	V DC in Q1 Q2 output (PELV)
6	M/Q_A	Analog ground
7	Q_A	Analog out
8	NC	Not connected

9-pin plug Sub D

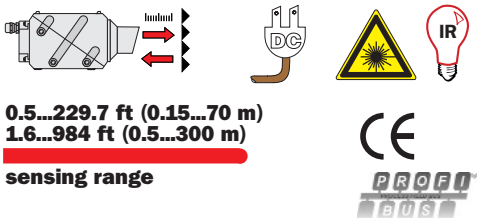


	Signal	Significance
1	NC	Not connected
2	RxD	RS 232 input
3	TxD	RS 232 output
4	NC	Not connected
5	GND	Signal ground
6	Tx +	RS 422 output
7	Tx -	RS 422 output
8	Rx +	RS 422 input
9	Rx -	RS 422 input

SICK

DML 40 Profibus

Distance Sensors

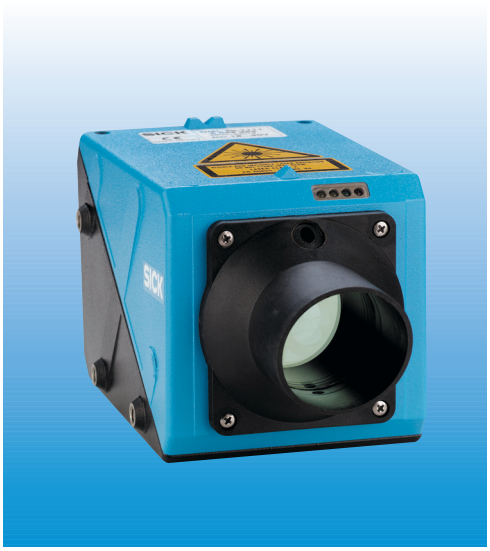


0.5...229.7 ft (0.15...70 m)
1.6...984 ft (0.5...300 m)
sensing range

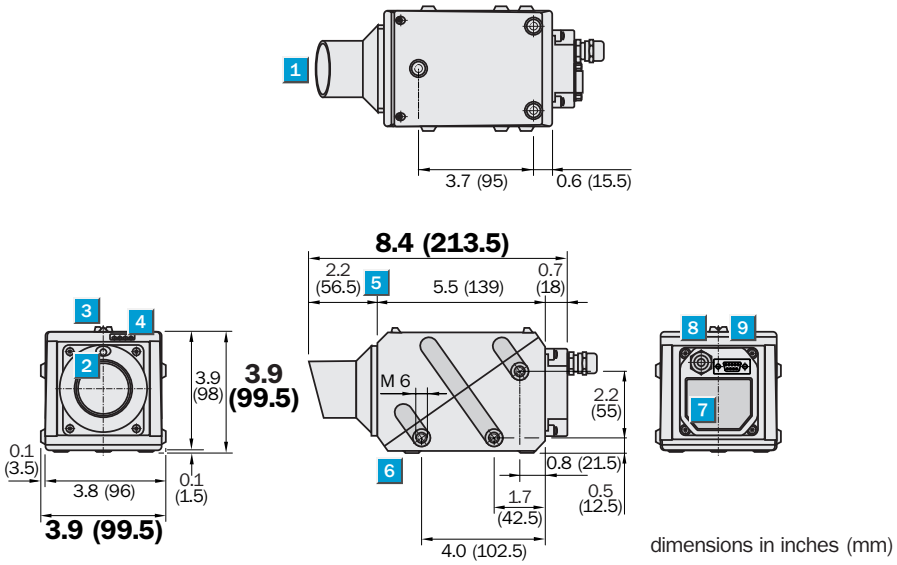
Highlights

- Infrared light
- Long range distance measurement on a reflector
- Easy programmability using RS 232 for system flexibility
- Analog output
- Two programmable switching outputs

DML 40 Profibus

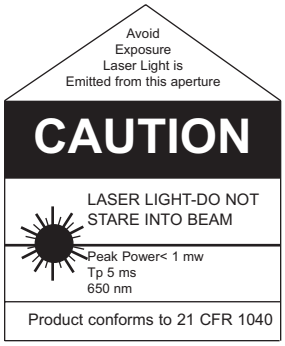


Dimensional Drawing



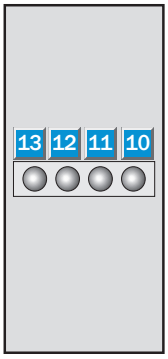
dimensions in inches (mm)

Laser Warning



Adjustments

All types



1	Dust protection tube
2	Laser pointer pilot light - Class I
3	Alignment sight
4	Function indicator (4 LEDs)
5	Measurement zero point
6	Mounting hole M6 threaded – 6 mm deep
7	Plug cover
8	PG 9 terminal chamber
9	Plug, sub D 9-pin
10	Plausibility (measurement error) LED red
11	Power indicator, LED green
12	Q_2 output indicator
13	Q_1 output indicator

Measurement Range, Repeatability, Accuracy

Sensing range
1.6...3609 ft (0.5...1100 m) / OP 55 reflector
1.6...1968.5 ft (0.5...600 m) / PL 880F reflector
1.6...984 ft (0.5...300 m) / diamond grade tape
Accuracy[7)8)9)]
± 0.4 in (10 mm)
Repeatability[7)8)9)]
0.2 in (6 mm)
Resolution
0.04 in (1 mm) maximum

Order Information

Type	Part no.
DML 40-1211	6 022 354

Accessories	page
Mounting brackets	934
Reflectors - RTC - Tape	936

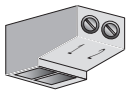
Technical Data	DML 40-	1211								
Sensing range	1.6...3609 ft (0.5...1100 m) / OP 55 reflector									
	1.6...1968.5 ft (0.5...600 m) / PL 880F reflector									
	1.6...984 ft (0.5...300 m) / diamond grade tape									
Light spot diameter	1.0 in at 3.3 ft (25 mm at 1 m), 2.8 in at 32.8 ft									
	(70 mm at 10 m), 20.5 in at 328.1 ft (520 mm at 100 m)									
Light source[1], light type	Laser diode, infrared light									
Laser category	Class I (IEC 825-1/EN 60825-1:Nov 2001)									
Alignment laser	Class II (IEC 60825), visible red, 21 CFR 1040-10									
Accuracy[7)8)9)]	± 0.4 in (10 mm)									
Repeatability[7)8)9)]	0.2 in (6 mm)									
Resolution	0.04 in (1 mm) maximum									
Supply voltage V_S	18...30 V DC[2)]									
Ripple	≤ 5 V_{PP}[3)]									
Power consumption	≤ 6 W[4)]									
Circuit protection[6)]	A, B									
Interface										
Profibus	Uses RS 232, automatic baud detection,									
	recommended 19.2 kBaud									
Measurement output rate										
Profibus	Average 16/64/256/1024 values									
	3.2/12.8/50/200 ms									
Temperature drift	Typ. 0.3 mm/K									
Initialization period	6 s									
Connection type	Plug, Sub D 9-pin/PG 9 terminal chamber									
VDE protection class[5)]	⏀									
Enclosure rating	IP 65									
Ambient temperature T_A	Operation 32...104°F (0...40°C)									
	Storage-13...158°F (-25...70°C)									
Approximate weight	42.3 oz (1200 g)									

1) Average service life 50,000 h at T_A = 25°C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Reference voltage 50 V DC PELV voltage (EN 50178)
6) A = V_S connections reverse-polarity protected
B = Output Q short-circuit protected
7) Environmental conditions constant, minimal switching period 30 min
8) 23°C air temperature, 977 hPa, minimal switching period 30 min
9) Recalibration recommended after 25,000 h
10) Q_2 not available when analog is active
11) Must use isolated power supply PELV (Protective Extra Low Voltage)

Connection Diagram

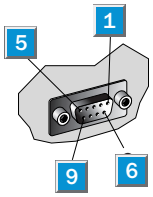
DML 40-1211

Terminal Block



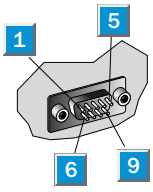
	Assignment	Significance
1	24 V DC	Supply
2	GND	Supply

9-pin plug Sub D Female



	Signal	Significance
1	NC	Not connected
2	NC	Not connected
3	B	Profibus line B 9RXD/TXD+)
4	RTS	Control signal (direction detection LWL)
5	GND	Signal ground
6	+ 5 V	With reference to GND, pin 5
7	NC	Not connected
8	A	Profibus line A (RXD/TXD+)
9	NC	Not connected

9-pin plug Sub D Male



	Signal	Significance
1	nRESET	Reset input (hardware reset)
2	RxD	RS 232 input
3	TxD	RS 232 output
4	NC	Not connected
5	GND	Signal ground
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

SICK

Theory of Operation...Dimensional Multifunctional Sensors

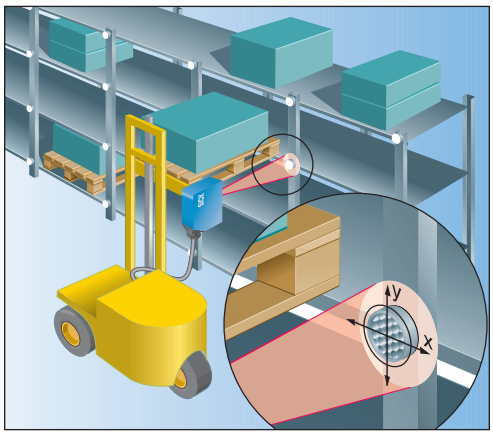


Fig. 1 DMP for fine positioning in the X and Y axis in handling and warehousing systems

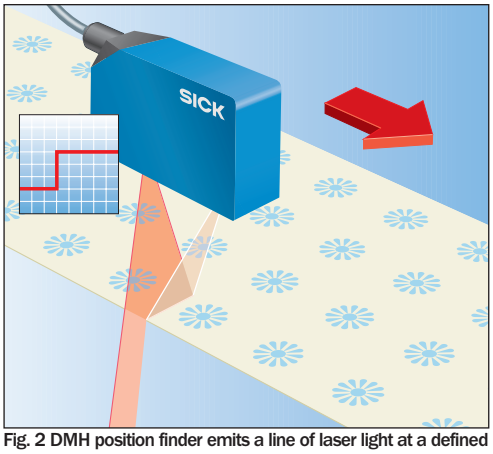


Fig. 2 DMH position finder emits a line of laser light at a defined angle across the object to be sensed for edge detection

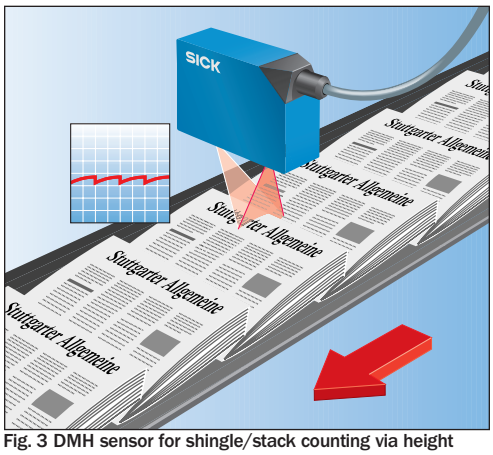


Fig. 3 DMH sensor for shingle/stack counting via height profile monitoring

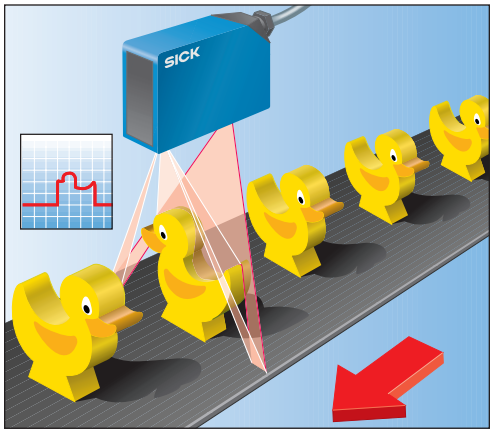


Fig. 4 DMP position finder for position verification/object detection

About Dimensional Multifunctional Sensors

Dimensional multifunctional sensors can position objects or sense the height of objects in industrial environments. The Dimensional Multifunctional Position Finder sensor (DMP) is the sensor of choice for automated storage and retrieval systems. The DMP can control the drives of shelf-supplying devices for precision placement.

Based on a new technology, a two-dimensional receiver array allows fine positioning in both the X- and Y-axis. The device works on the auto-collimation principle. The transmitted light emitted by the DMP is returned by the reflector and mapped on the receiver array. The position of the reflector is determined from this image. The reflected light is concentrated in the center of the receiver array, by tracking the handling unit. This process completes the required fine positioning so the load handling can begin.

The handling unit is pre-positioned via the central control unit in the capture range (visual range) of the DMP, in which the reflector is detected by the DMP. After rough positioning, the DMP can then be used to control the drives for fine positioning up to the final position. Two analog outputs are available for fine positioning, one for the X- and one for the Y-axis, and two switching outputs (QR "reflector detected", Q "correct position"). The relative distance of the reflector to the middle point of the receiver array is continually signaled by the analog outputs.

The switching output QR switches as soon as the reflector is mapped in the capture range (visual range) of the DMP ("reflector detected).

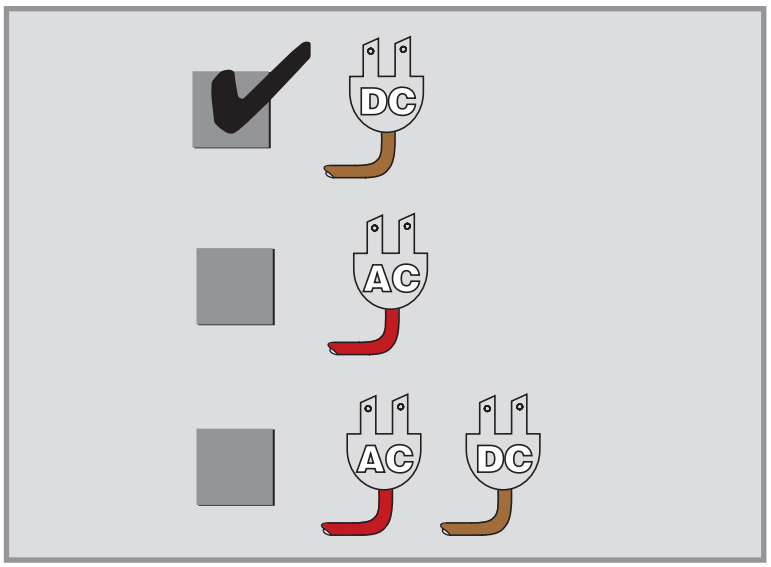
The switching output Q switches as soon as the reflector is mapped in the center of the receiver array ("correct position").

The DMH height profile sensor can count shingled objects such as newspapers and cardboard boxes. The DMH can be used to replace vision systems in many counting and profile verification applications.

The DMH operates using a Class II laser light and shines a laser beam over the sampled object at a defined angle. The laser light that impinges the object is then imaged on a detector array as a contour. This contour corresponds to the height profile of the object. The device transmits an analog value of 4 to 20 mA depending on the selected mode. In addition, each software variant has a switching output. Two switching outputs are available for checking filling levels.

The height information is programmed during the teach-in procedure. A reference object is positioned below the linear light of the DMH and the teach-in is initiated by pressing a button on the unit or via the external teach-in wire. During the teach-in procedure, the light distribution on the photo-array of the receiver is evaluated and stored as a reference value against the selected tolerance position. The function indicator on the unit signals the status of the teach-in procedure. The program selector switch on the DMH is then set to the RUN or RUN DELAY position and the sensor is ready for operation.

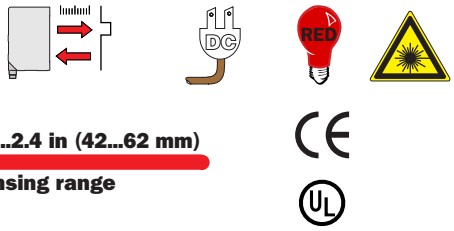
Dimensional Multi-Functional Sensors



Sensors	Page
DMH	682
DMH	684
DMP	686
DMP	688
ICS 100	690
ICS 110	692

DMH

Distance Sensors



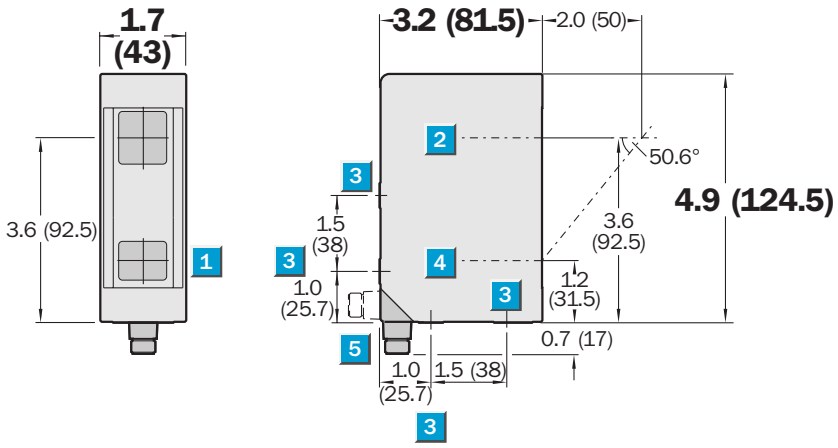
1.7...2.4 in (42...62 mm)
sensing range

Highlights

- No programming- - just select one of 5 modes and press Teach button
- Economical alternative to CCD-based vision systems
- Ideal for any industry from packaging to electronics
- Rugged die cast metal housing
- No external lighting required
- Cable connections swivel 90° for easy installation

DMH

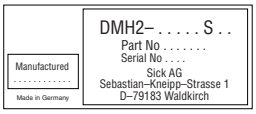
Dimensional Drawing

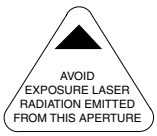


dimensions in inches (mm)

Beam Attenuator

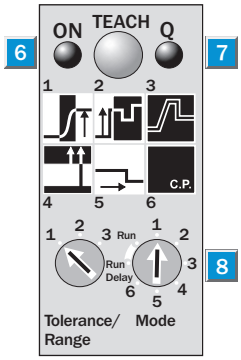
DMH sensors are equipped with a quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.





Adjustments

All types



1 Exit window for transmitted light
2 Receiver axis
3 Mounting hole, M6 threaded, 8 mm deep
4 Sender axis
5 8-pin, M12 plug, rotatable by 90°
6 Operating indicator
7 Output indicator
8 Selector switches

Order Information

Type	Part no.
DMH 2-P11111S01	1 017 838
DMH 2-N11111S02	1 017 839

Accessories	page
Cables and connectors	910
Mounting brackets	928

Technical Data	DMH 2-	P1111 1S01	N1111 1S02							
Sensing distance SD[1]	1.7...2.4 in (42…62 mm)	■	■							
Supply voltage V_S[2]	18…30 V DC	■	■							
Current consumption[3]	< 250 mA	■	■							
Ripple[4]	≤ 5 V_{SS}	■	■							
Light source	Laser diode, red light, (670 nm)	■	■							
	average service life 50,000 h[5]									
Laser protection class	2 (IEC 825-1/EN 60825-1)	■	■							
Length of light line	Approx. 25 mm (when SD = 52 mm)	■	■							
Switching outputs Q_1, Q_2	PNP	■								
	NPN		■							
Output voltage	HIGH = V_S – (≤ 2 V)/LOW = 0 V	■								
	HIGH = V_S /LOW ≤ 2 V		■							
Output current I_A	100 mA, dependent on selected mode	■	■							
Response time[6]	4.5 ms	■	■							
		■	■							
Analog output[8]	4 mA…20 mA[9]; 3 mA[10]	■	■							
Timing options	20 ms (no delay, OFF delay)	■	■							
Blanking input AT										
Blanked	PNP: > 18 V…< V_S max.	■								
	NPN: 0 V…V_S – (≥ 18 V)		■							
Free-running	PNP: < 2 V	■								
	NPN: V_S – (≤ 2 V)		■							
Operating mode	Permanent or synchronized (blanked)	■	■							
VDE protection class[11]	⧈	■	■							
Enclosure rating	IP 67/NEMA 6	■	■							
Ambient temperature T_A[12]	Operation 14...122°F (-10…50°C)	■	■							
	Storage -13...167°F (-25…75°C)	■	■							
Approximate weight	35.3 oz (1000 g)	■	■							

1) From front screen
2) Limit values, reverse-polarity protected
3) Without load
4) May not exceed or fall short of tolerance values
5) Where T_A = 25°C
6) Signal transit time with resistive load
7) Light/dark ratio 1:1, no time delay
8) At $R_{L\,max.}$ = 700 Ω
9) Within the measuring range (for mode position with available analog outputs, see table)
10) Outside measuring range
11) Reference voltage 50 V DC
12) Do not bend below 0°C

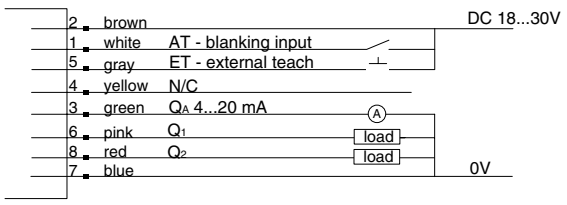
Software Modes 1-5	Tolerance Position 1	Tolerance Position 2	Tolerance Position 3
1 Start & end height difference	**Start end:** 4 mm[2]	**Start end:** 7 mm[2]	**Start end:** 10 mm[2]
2 Height peak evaluation	Peak value recording (between largest and smallest height level)	Evaluation of all height jumps greater than the required min. jump	Not assigned
3 Profile recognition[1]	0.7 mm (fine)	2.1 mm (average)	2.8 mm (coarse)
4 Fill level measurement	Evaluation of entire light line	Evaluation of half light line	Evaluation of & light line
5 Shingle counting/edge guide[1]	Fine	Average	Coarse
Software Modes 1-5	**Characteristics**	**Min. Jump/min. Height**	**Resolution of Analog Output**
1 Capture/final range	Analog[3]/switching output Q_1	± 2.0 mm	0.5 mm
2 Height peak evaluation			
1 Peak-value recording	Analog[3]/switching output Q_1	3.8 mm	1 mm
2 > Min. jump	Switching output Q_1	3.8 mm	–
3 Spare	–	–	–
3 Profile recognition	Switching output Q_1	0.7 mm (tol. 1, SD = 52 mm)	–
4 Fill level measurement	Analog[3]/2 switching outputs Q_1, Q_2	< 1 mm	1 mm
5 Shingle counting/edge guide[1]	Analog[3]/switching output Q_1	> 3.8 mm	1 mm

1) The tolerance band width is specified with the tolerance switch 2) When SD = 52 mm 3) Analog output values: within the measuring range: 4 mA – 20 mA, outside measuring range: 3 mA

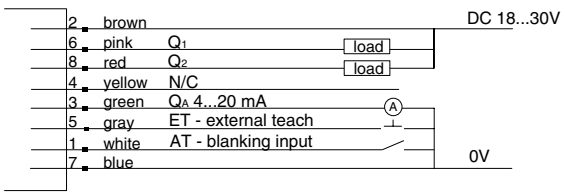
Note: See page 1012 for metric to English conversions.

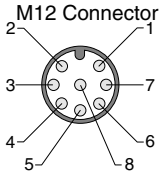
Connection Diagram

-P11111 Models



-N11111 Models

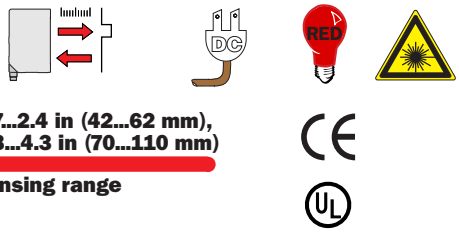




SICK

DMH Counter

Shingle Counter Sensors



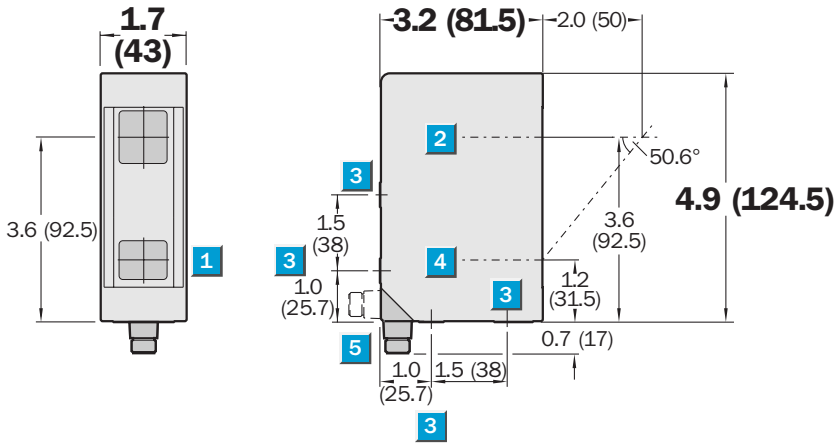
1.7...2.4 in (42...62 mm),
2.8...4.3 in (70...110 mm)
sensing range

Highlights

- Special high precision version of the DMH for counting
- Reliable counting despite movement and fluctuations of the conveyor belt
- Accurate counting even when shingle flow is interrupted
- Rugged die cast metal housing
- Cable connections swivel 90° for easy installation
- Specially designed for counting in the printing and packaging industries

DMH

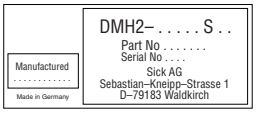
Dimensional Drawing

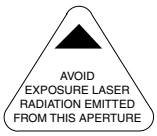


dimensions in inches (mm)

Beam Attenuator

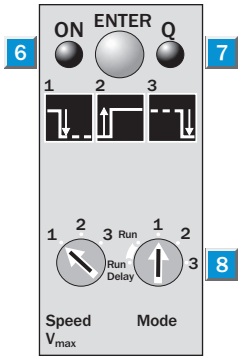
DMH sensors are equipped with a quick disconnect. The cable can be removed quickly and easily in the event that personnel require access to the area where the sensor is mounted.





Adjustments

All types



1 Exit window for transmitted light
2 Receiver axis
3 Mounting hole, M6 threaded, 8 mm deep
4 Sender axis
5 8-pin, M12 plug, rotatable by 90°
6 Operating indicator
7 Function indicator
8 Selector switches

Order Information

Type	Part no.
DMH 2-P23111S03	1 017 840
DMH 2-N23111S04	1 017 841
DMH 2-P24111S05	1 017 842
DMH 2-N24111S06	1 017 843

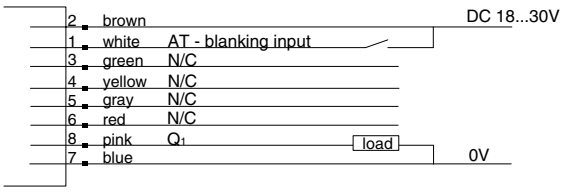
Accessories	page
Cables and connectors	910
Mounting brackets	928

Technical Data	DMH 2-	P231 11S03	P231 11S04	P241 11S05	N241 11S06					
Sensing distance SD[1]	1.7...2.4 in (42…62 mm)	■	■							
	2.8...4.3 in (70…110 mm)			■	■					
Supply voltage V_S[2]	18…30 V DC	■	■	■	■					
Ripple[3]	≤ 5 V_{SS}	■	■	■	■					
Current consumption[4]	< 250 mA	■	■	■	■					
Light source	Laser diode, red light[5]	■	■	■	■					
Laser protection class	2 (IEC 825-1/EN 60825-1)	■	■	■	■					
Length of light line	Approx. 0.3 in (7 mm) [when SD = 2.0 in (52 mm)]	■	■							
	Approx. 0.4 in (9 mm) [when SD = 3.5 in (90 mm)]			■	■					
Accuracy (layer height)	> 0.06 in (1.6 mm)	■	■							
	> 0.1 in (3.1 mm)			■	■					
Switching outputs	PNP	■		■						
	NPN		■		■					
Output voltage	HIGH = V_S – (≤ 2 V)/LOW = 0 V	■		■						
	HIGH = V_S /LOW ≤ 2 V		■		■					
Output current I_A	100 mA, short-circuit protected	■	■	■	■					
Response time[6]	3 ms	■	■	■	■					
Switching frequency[7]	250 Hz	■	■	■	■					
Max. band speed	1.3 m/s	■	■							
	1.7 m/s			■	■					
Timing element	20 ms, selectable	■	■	■	■					
Blanking input AT										
Blanked	PNP: > 18 V…< V_S max.	■		■						
	NPN: 0 V…V_S – (≥ 18 V)		■		■					
Free-running	PNP: < 2 V	■		■						
	NPN: V_S – (≤ 2 V)		■		■					
Operating mode	Continuous or synchronized (blanked)	■	■	■	■					
VDE protection class[8]	□	■	■	■	■					
Enclosure rating	IP 67/NEMA 6	■	■	■	■					
Ambient temperature T_A[9]	Operation 14...122°F (-10…50°C)	■	■	■	■					
	Storage -13...167°F (-25…75°C)	■	■	■	■					
Approximate weight	35.3 oz (1000 g)	■	■	■	■					

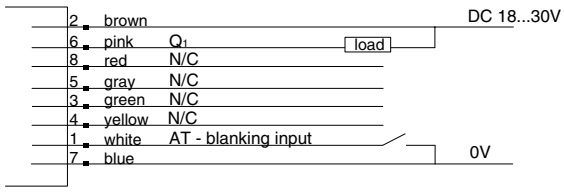
1) From front screen
2) Limit values, reverse-polarity protected
3) Without load
4) May not exceed or fall short of tolerance values
5) Average service life at T_A = 25°C
6) Signal transit time with resistive load
7) Light/dark ratio 1:1, no time delay
8) Reference voltage 50 V DC
9) Do not bend below 0°C

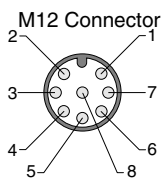
Connection Diagram

PNP



NPN

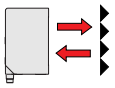




SICK

DMP

Position Finder Sensors



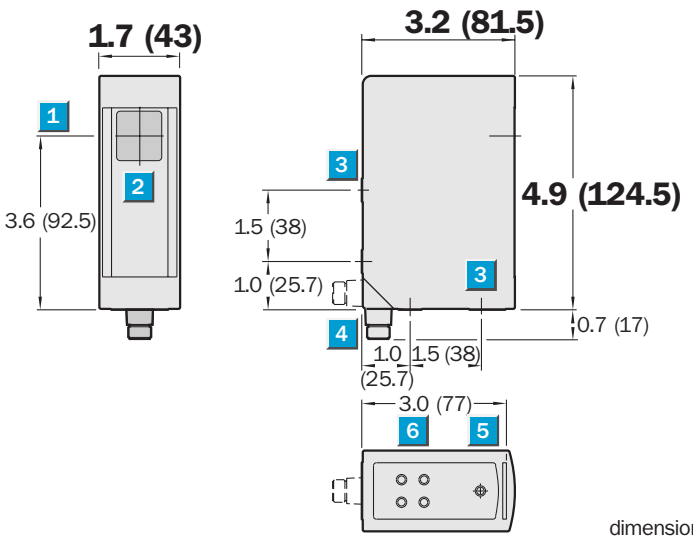

7.9...78.7 in (200...2000 mm)
sensing range

Highlights

- Reception area of up to two square feet
- Ultra-precise final positioning sensor
- Two-dimensional receiver provides repeatability to 0.15 mm
- Rugged die cast metal housing
- Cable connections swivel 90° for easy installation
- 5 switching outputs

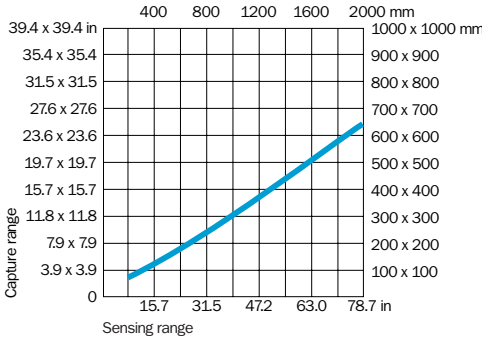
DMP

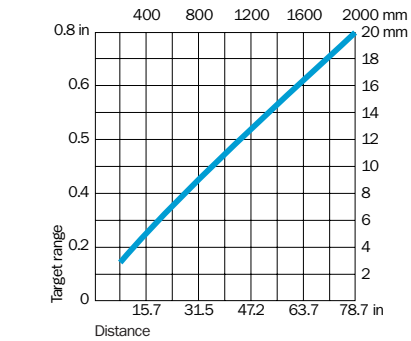
Dimensional Drawing

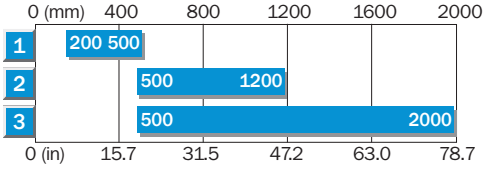


dimensions in inches (mm)

Sensing Range

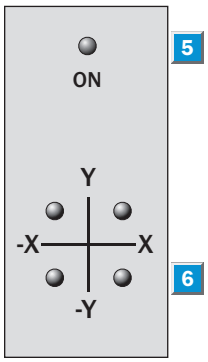






Adjustments

All types



1	Center of optical axis, sender/receiver
2	Receiver array
3	Mounting hole M6 threaded, 8 mm deep
4	8-pin, M12 plug, rotatable through 90°
5	Operating signal
6	Alignment aid

Order Information

Type	Part no.
DMP 2-P21111	1 016 237
DMP 2-N21111	1 016 238

Accessories

	page
Cables and connectors	910
Mounting brackets	928
Reflectors	936

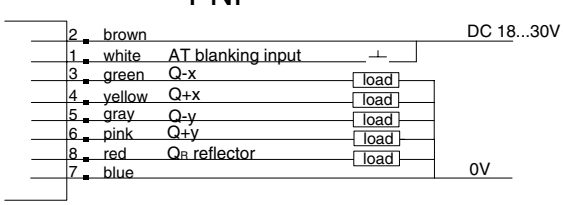
1	Sensing range on reflector PL 22
2	Sensing range on reflector PL 50 A
3	Sensing range on reflector PL 80 A

Technical Data	DMP 2-	P 21111	N 21111							
Sensing range	7.9...78.7 in (200…2000 mm)	■	■							
	(dependent on reflector)									
Repeatability	0.006 in (0.15 mm) [at 11.8 in (300 mm)]	■	■							
Sensing angle	± 10° in all axes vertical to the	■	■							
	reflector (PL 22, PL 50 A, PL 80 A)									
Light source[1], **light type**	LED, red	■	■							
Supply voltage V_S[2]	18…30 V DC	■	■							
Ripple[3]	< 5 V_{SS}	■	■							
Current consumption[4]	< 250 mA	■	■							
Switching outputs	PNP: HIGH = V_S – ≤ 2 V/LOW = 0 V	■								
	NPN: HIGH = V_S / LOW ≤ 2 V		■							
Operating mode	Continuous or synchronized	■	■							
Blanking input AT										
Blanked (triggered)	PNP: > 18 V…< V_S max.	■								
	NPN: 0 V…V_S (≥ 18 V)		■							
Free-running	PNP: < 2 V or open circuit	■								
	NPN: V_S – (≤ 2 V)		■							
Output voltage I_A max.	100 mA	■	■							
Switching frequency[5]	250 Hz	■	■							
Response time[6]	3 ms	■	■							
Connection type	Plug, M12 8-pin	■	■							
VDE protection class[7]	□	■	■							
Circuit protection[8]	A, B, C	■	■							
Enclosure rating	IP 67/NEMA 6	■	■							
Ambient temperature T_A[9]	Operation -13...131°F (-25…55°C)	■	■							
	Storage -13...167°F (-25…75°C)	■	■							
Shock/vibration	To IEC 68	■	■							
Approximate weight	35.3 oz (1000 g)	■	■							
Housing material	Metal	■	■							

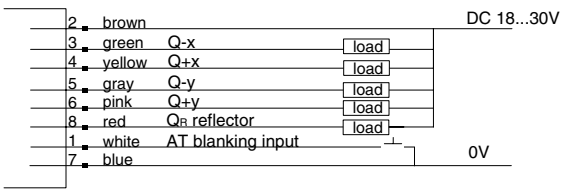
1) Average service life 100,000 h at T_A = 25°C
2) Limit values, reverse-polarity protected
3) May not exceed or fall short of V_S tolerances
4) Without load
5) With light/dark ratio 1:1, no time delay
6) Signal transit time with resistive load
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs Q short-circuit protected
C = Interference pulse suppression
9) Do not bend below 0°C

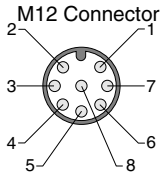
Connection Diagram

PNP



NPN

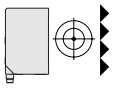




SICK

DMP

Position Finder Sensors



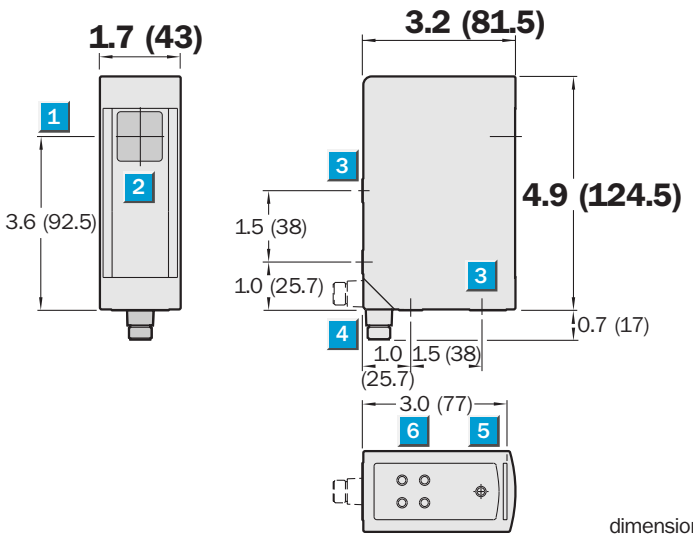

7.9...78.7 in (200...2000 mm)
sensing range

Highlights

- Ultra-precise final positioning sensor
- Two analog outputs (for x-and y-axis)
- Two-dimensional receiver provides repeatability to 0.15 mm
- Rugged die cast metal housing
- Cable connections swivel 90° for easy installation

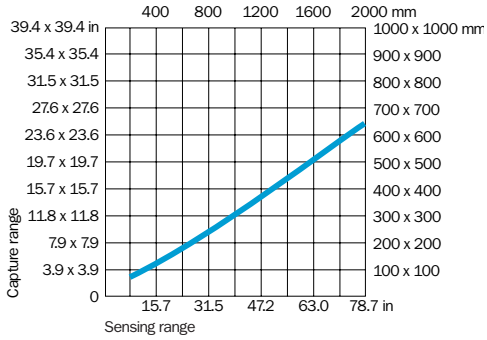
DMP

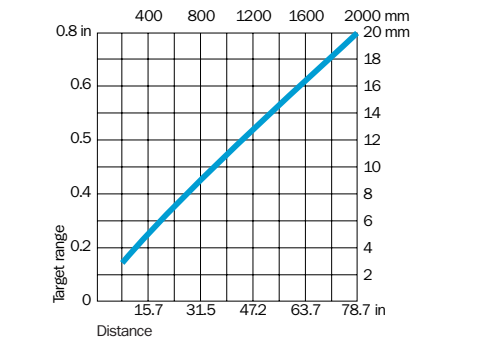
Dimensional Drawing

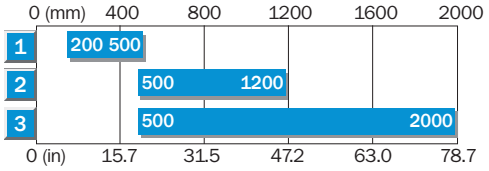


dimensions in inches (mm)

Sensing Range

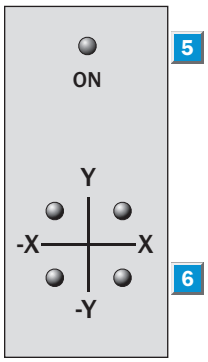






Adjustments

All types



1	Center of optical axis, sender/receiver
2	Receiver array
3	Mounting hole M6 threaded, 8 mm deep
4	M12 plug, rotatable through 90°
5	Power indicator
6	Position indicators

Order Information

Type	Part no.
DMP 2-P11111	1 016 235
DMP 2-N11111	1 016 236

Accessories

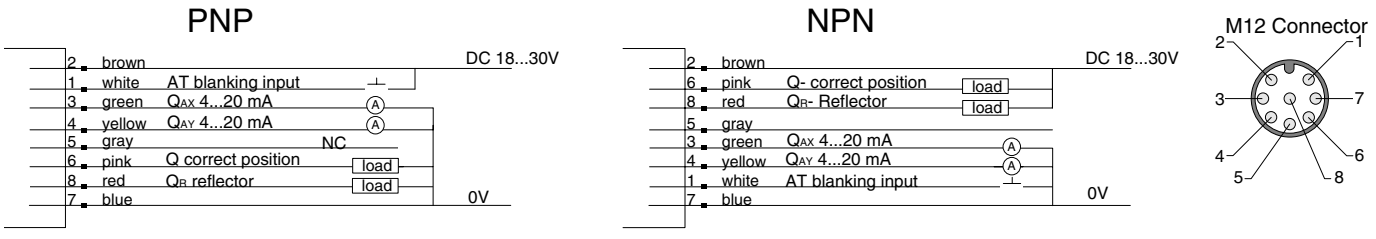
	page
Cables and connectors	910
Mounting brackets	928
Reflectors	936

1	Sensing range on reflector PL 22
2	Sensing range on reflector PL 50 A
3	Sensing range on reflector PL 80 A

Technical Data	DMP 2-	P 11111	N 11111
Sensing range	7.9...78.7 in (200…2000 mm)	■	■
	(dependent on reflector)		
Repeatability	0.006 in (0.15 mm) [at 11.8 in (300 mm)]	■	■
Sensing angle	± 10° in all axes vertical to the	■	■
	reflector (PL 22, PL 50 A, PL 80 A)		
Light source[1], **light type**	LED, red	■	■
Supply voltage V_S[2]	18…30 V DC	■	■
Ripple[3]	< 5 V_{SS}	■	■
Current consumption[4]	< 250 mA	■	■
Switching outputs	PNP: HIGH = V_S – ≤ 2 V/LOW = 0 V	■	
	NPN: HIGH = V_S / LOW ≤ 2 V		■
Operating mode	Continuous or synchronized	■	■
Blanking input AT			
Blanked (triggered)	PNP: > 18 V…< V_S max.	■	
	NPN: 0 V…V_S (≥ 18 V)		■
Free-running	PNP: < 2 V or open circuit	■	
	NPN: V_S – (≤ 2 V) or open circuit		■
Output voltage I_A max.	100 mA	■	■
Analog output[5]	4 mA…20 mA	■	■
	(within the capture range)		
	3 mA (outside the capture range)	■	■
Switching frequency[6]	250 Hz	■	■
Response time[7]	3 ms	■	■
Connection type	Plug, M12 8-pin	■	■
VDE protection class[8]	⧈	■	■
Circuit protection[9]	A, B, C	■	■
Enclosure rating	IP 67/NEMA 6	■	■
Ambient temperature T_A[10]	Operation -13...131°F (-25…55°C)	■	■
	Storage -13...167°F (-25…75°C)	■	■
Shock/vibration	To IEC 68	■	■
Approximate weight	35.3 oz (1000 g)	■	■
Housing material	Metal	■	■

1) Average service life 100,000 h at T_A = 25°C
2) Limit values, reverse-polarity protected
3) May not exceed or fall short of V_S tolerances
4) Without load light/dark ratio 1:1, no time delay
5) On $R_{L\,max.}$ = 700 W
6) Light/dark ratio 1:1, no time delay
7) Signal transit time with resistive load
8) Reference voltage 50 V DC
9) A = V_S connections reverse-polarity protected
B = Outputs Q short-circuit protected
C = Interference pulse suppression
10) Do not bend below 0°C

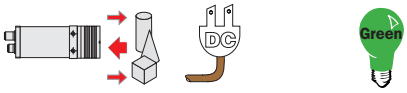
Connection Diagram



SICK

ICS 100

Intelligent Camera Sensor



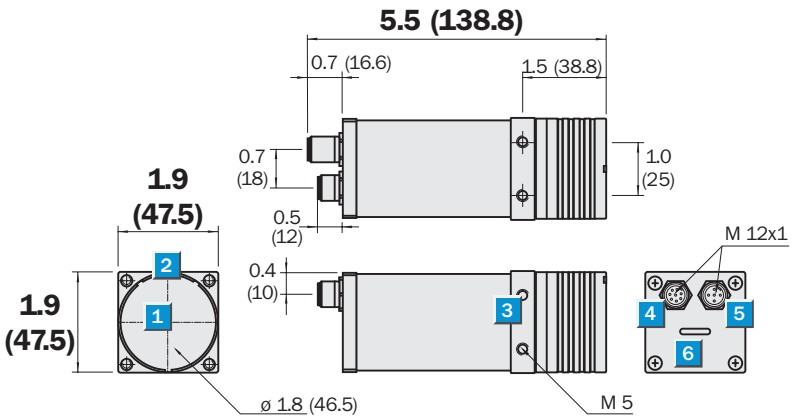
2.8 in (70 mm)
sensing distance

Highlights

- Independent, compact unit has an IP 64 rating
- Extremely simple to set up and program
- Integrated illumination with individually lensed LEDs
- Lightning fast processing speed

ICS 100

Dimensional Drawing



dimensions in inches (mm)

1 Lens
2 Ring light, 15x LED/green lens combination
3 Mounting hole M5, 4-times
4 User output, 8-pin, M12
5 Operating unit connection, 5-pin, M12
6 Display of output switching state

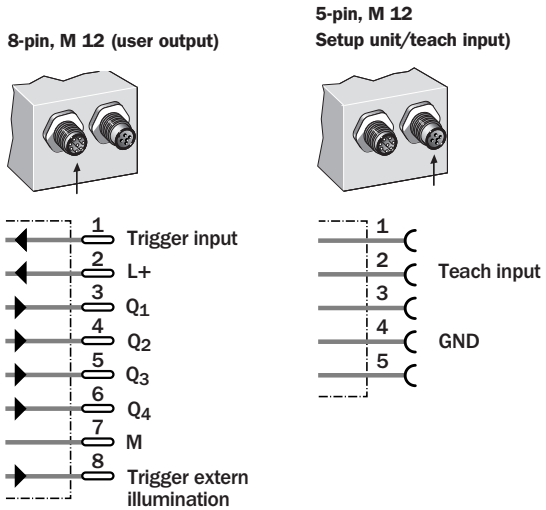
Order Information	
Type	**Part no.**
ICS 100-B1111	1 022 631

Accessories	page
Cables and connectors	909, 910
Reflectors	936

Technical Data	ICS 100-	B1111								
Sensing distance[1]	2.8 in (70 mm)									
Field of view	0.8 in x 0.8 in (20 mm x 20 mm)									
Teach window	0.08 in x 0.08 in…0.8 in x 0.8 in									
	(2 mm x 2 mm…20 mm x 20 mm)									
Search window	Adjustable, store up to 12 programs in memory									
Image sensor	CMOS, 512 x 512 pixels, usable with integrated									
	lens: 320 x 320 pixels (high);									
	160 x 160 pixels (standard)									
Memory										
Memory	Store up to 12 algorithms									
Number of teach windows	1…4 per algorithm									
Light source[2]	15 x LED green/lens combination									
Flash length	30 µs to 1 ms, normally 500 µs									
Supply voltage U_S[3]	24 V DC									
Ripple[4]	< 5 V pp									
Current consumption[5]	< 450 mA									
Switching outputs	4 x B (NPN/PNP)									
Output current I_A Max.[6]	< 100 mA									
Response time [7], cycle time[7]	≥ 2.5 ms									
Switching frequency Max.[8]	200/s									
Trigger input[9]	Falling edge, HIGH = 10 V…U_S									
Trigger input for ext. lighting	5 V when sender OFF (TTL)									
Connection type setup unit[10]	Connectors 5-pin, M12;									
	VSC 100: connectors 5-pin, M12									
Connection type user output	Plug, M12 8-pin									
Operating unit display	16 gray levels									
Protection type	IP 64; VSC 100: IP 40									
Ambient temperature										
	Operating: 32…122°F (0…50°C)									
	Storage: -13…158°F (25…70°C);									
	VSC 100 storage: -4…140°F (-20…60°C)									
Shock load	15 g, 6 directions									
Weight	Approx. 12.3 oz (350 g);									
	VSC 100: 8.5 oz (240 g)									
Housing material	Aluminum;									
	VSC 100: plastic									

1) Range depending on object and parameters; e.g. ± 8 mm with shape check and threshold = 95%
2) Average service life at room temperature 50,000 h at T_U = 25° C
3) Limit values ±20%
4) Must be within U_S tolerances
5) Without load
6) Amount total for all four outputs
7) With resistive load
8) With light/dark ratio 1:1
9) 1000ms > trigger pulse ≥ 2.5 ms; trigger active when HIGH ≥ 1000 ms
10) Cable length 2 m, PVC, ø 5 mm, do not distort cable below 0° C

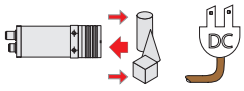
Connection Diagram



SICK

ICS 110

Intelligent Camera Sensor



0.8 x 0.8 in (20 x 20 mm)
field of view

CE

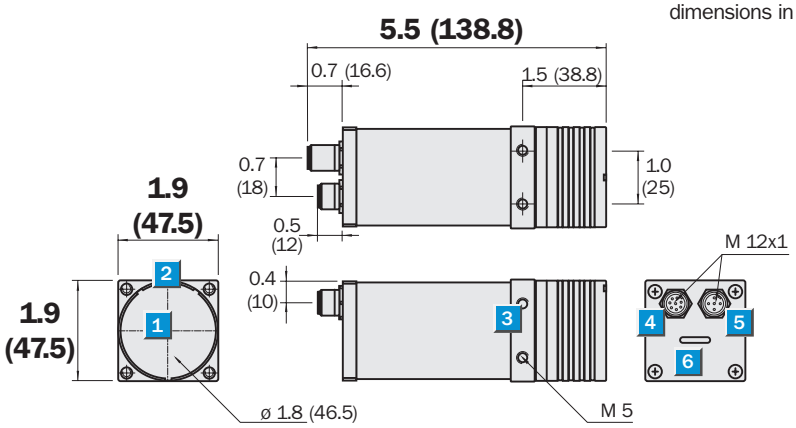
Highlights

- Detection of rotated objects
- Independent, compact unit
- Fast system architecture
- Simple integration
- Intensive and homogenous illumination
- Suitable for a wide range of applications
- Presence monitoring
- Shape, position and dimension check
- Object detection
- Completeness check

ICS 110

Dimensional Drawing

dimensions in inches (mm)



1 Lens
2 Ring light, 15x LED/focussing lenses
3 Mounting hole M5, 4-times
4 User output, 8-pin, M12
5 Operating unit connection, 5-pin, M12
6 Display of output switching state
7 LC Display
8 Keyboard
9 VSC 100: W x H x D = 150 x 82 x 31 mm³

Order information

Type	Part no.
ICS 110-B1111	1 023 983
VSC 100-1111	2 025 857
VSC 100-0111	2 027 408
Mounting bracket	4 035 008
Rod mount. clamp	2 022 464

Accessories

Type	Part no.
Cable, 2 m, with receptacles M 12, 8-pin	7 024 488
Cable ICS-VSC, 2 m, with plug M 12, 5-pin	7 027 023

Technical Data

		ICS110 -B1111	VSC110 -1111	VSC110 -0111
Sensing distance[1]	2.8 in (70 mm)	■		
Field of view	0.8 in x 0.8 in (20 mm x 20 mm)	■		
Teach/search window	0.08 in x 0.08 in…0.8 in x 0.8 in	■		
	(2 mm x 2 mm…20 mm x 20 mm)			
Image sensor	CMOS; 512 x 512 pixel	■		
Light source[2]	15 x LED green, with focusing lenses	■		
Flash length	30 µs to 1 ms, normally 500 µs	■		
Number of storable teach windows	12 in memory + 4 in working memory	■		
Supply voltage V_S[3]	24 V DC	■		
Ripple[4]	< 5 V_{PP}	■		
Current consumption[5]	< 450 mA	■		
Switching outputs	4 x B (NPN/PNP)	■		
Output current I_A max.[6]	< 100 mA	■		
Response time[7], cycle time[7]	≥ 2.5 ms	■		
Switching frequency max.	200/s	■		
Number of tests max.	400/s	■		
Trigger input[8]	Falling edge; HIGH = 10 V…V_S	■		
Trigger output for ext. lighting	5 V when sender OFF (TTL)	■		
Connection type				
Setup unit[9]	M12 plug, 5-pin	■	■	■
User output	M12 plug, 8-pin	■		
Operating unit display	16 gray levels		■	■
SICK logo in display			■	
Protection class	IP 64	■		
	IP 40		■	■
Ambient temperature	Operation 32…122°F (0…50°C)	■	■	■
	Storage -13…158°F (-25…70°C)	■		
	Storage -4…140°F (-20…60°C)		■	■
Shock load	15 g, 6 directions	■	■	■
Approximate weight	12.3 oz (350 g)	■		
	8.5 oz (240 g)		■	■
Housing material	Aluminum	■		
	Plastic		■	■

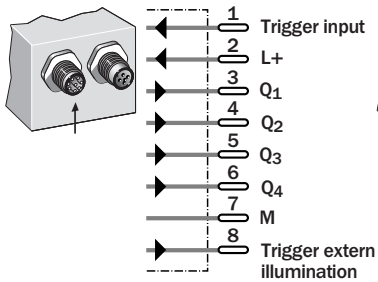
1) Range depending on object and parameters; e.g.: ± 8 mm with shape check and threshold = 95 %
2) Average service life at room temperature 50,000 h at T_A = +25°C
3) Limit values ± 20 %
4) Must be within V_S tolerances
5) Without load
6) Amount total for all four outputs
7) With resistive load
8) Trigger pulse > 0.5 ms
9) Cable length 2 m, PVC, Ø 5 mm, do not distort cable below 0°C

Check Mode	Procedure [1]	Typical Applications
Rotational contour check	The contours taught are sought in the image being checked, even when rotated and/or shifted	Shape, position and dimension check, object detection, presence monitoring, completeness
Shape check (pattern matching)	The patterns taught are sought in the image being checked, even when shifted	Shape, position and dimension check, object detection, presence monitoring, completeness
Multi-area-evaluation	Blobs are compared with respect to number and area	Presence monitoring, completeness monitoring
Minimum pixel sum	Checking for pixel number exceeding a limit	Presence monitoring, e.g., for transparent bodies with reflecting surfaces, completeness monitoring, especially with gloss [2]
Pixel sum	Comparison of the absolute number of white and black dots	Presence monitoring, completeness check

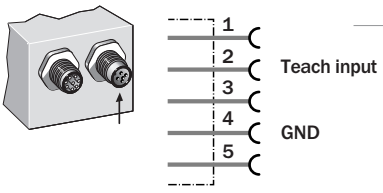
1) All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked.
2) Made possible by the special resistance of the sensor against overshooting

Connection Diagram

8-pin, M 12 (user output)



5-pin, M 12
Setup unit/teach input)



Shape of tought-in reference image

Rectangular	Shape of reference image = rectangle
Autoshape	Shape of reference image = shape of object in reference image (only possible for closed areas)

Theory of Operation...Infrared Data Transmission Sensors

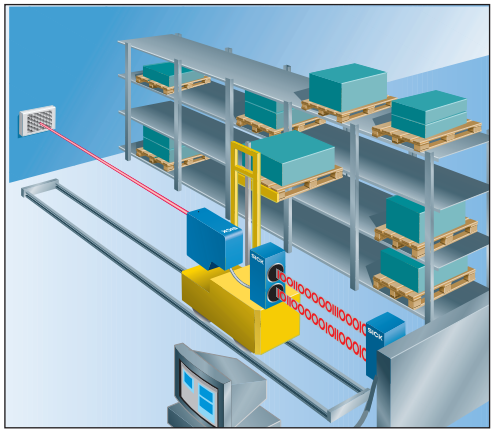


Fig. 1 Distance measurement and cable free transmission work together in warehouse operations allowing no trailing cables

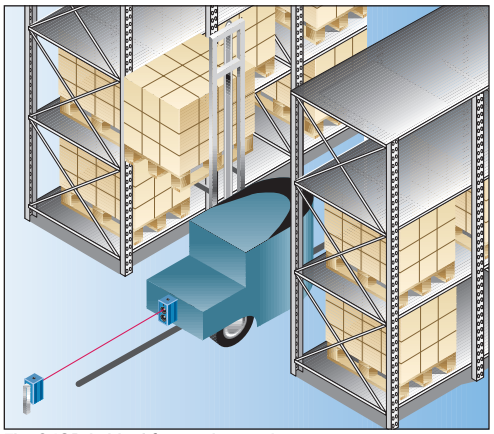


Fig. 2 ISD is ideal for use in warehouses

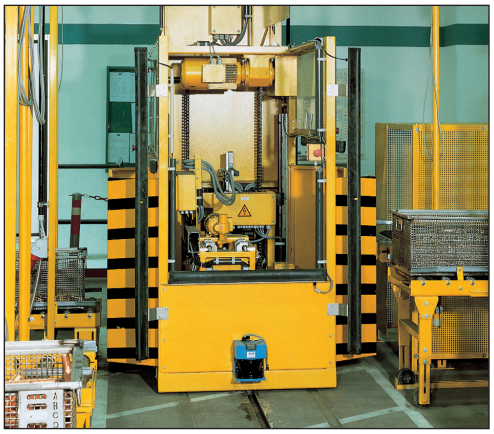


Fig. 3 ISD enables connection of high bat stackers to control components of, for example, Profibus DP

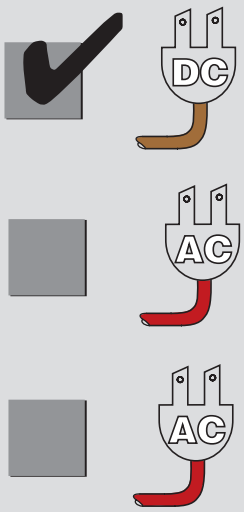
About Infrared Data Transmission Sensors

The infrared data transmission sensors (ISD) are used to establish a wireless link for transferring serial data in full-duplex mode using infrared light. The link, in this sense, always comprises a pair of devices (2 units) with different carrier frequencies. Depending on the type of link, the units are either installed at a fixed and mobile station (variable link) or at two fixed stations (fixed link).

The ISD substitutes a cable link with an infrared transmission line. The point-to-point light beam is monitored during data transmission. Interruption of the light beam is indicated both optically on the device and signaled via a special function interface. For example, the systems realized the data transmission of automatic guided vehicles (AGVs) or substitute the loop and trailing of cables from retrieval units in a high bay warehouse. The ISD systems guarantee high functionality, reliable transmission, simple assembly and fast alignment.

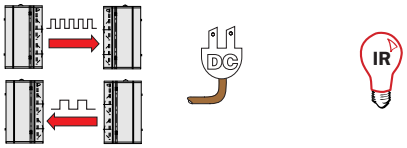
The ISD data transmission system is ideal for use in aisles of high bay warehouses. The system ensures high functionality, reliable transmission, simple installation and fast system alignment. (See Fig. 2)

Data Transmission Sensors



ISD 230

Infrared Data Transmission Sensors



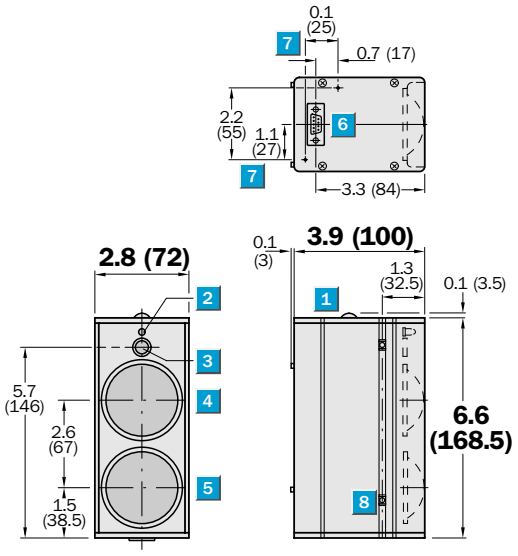
0.7...656.1 ft (0.2...200 m)
sensing range

Highlights

- Duplex operation
- Closed loop analog, RS 232
- RS 422/485
- 38,000 bit/s

ISD 230

Dimensional Drawing



dimensions in inches (mm)

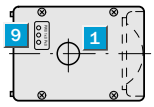
Notes

Two equivalent devices are required to create a data transfer section. The data transfer frequencies are set via jumpers (see Operating Instructions, Part no. 8 008 207).

The ISD 230 unit pairs must be set to different transmission frequencies before installation.

Adjustments

All types



1 Optical adjustment aid (cross-hair)
2 Warning LED
3 Optical adjustment aid lens
4 Receiver lens
5 Sender lens
6 9-pin D-sub plug
7 Mounting hole M3 threaded – 5 mm deep, for plug cover
8 M5 T-nut (in groove), max. screwing depth 10 mm from housing surface
9 LED function indicators Power on, RxD and TxD

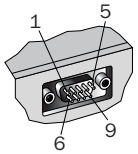
Order Information

Type	Part no.
ISD 230-2111	1 017 388
ISD 230-4111	1 017 389
ISD 230-5111	1 017 390
ISD 230-4121	1 017 543
ISD 230-5121	1 017 544

Accessories	page
Mounting bracket	928

Technical Data	ISD 230-	2111	4111	5111	4121	5121
Sensing range	0.7...656.1 ft (0.2...200 m)	■	■	■	■	■
Light source	Infrared diode	■	■	■	■	■
Carrier frequency	3 MHz ± 0.5 MHz	■	■	■	■	■
Transmit/receive angle	Approx. ± 4° / approx. ± 0.8°	■	■	■	■	■
Light spot diameter	Approx. 2.3 ft at 164 ft (0.7 m at 50 m),	■	■	■	■	■
	Approx. 4.6 ft at 328 ft (1.4 m at 100 m)	■	■	■	■	■
Data transfer rate	Max. 38.4 kBd	■	■	■	■	■
Signal delay (optical)	Max. 10 µs	■	■	■	■	■
LED indicators	4 status functions: light beam status,	■	■	■	■	■
	Power on, RxD, TxD					
Data interface	Closed loop, 20 mA, active, passive selectable	■	■		■	
	RS 232/RS 422/RS 485		■		■	
	Sinec L1 (for bus terminals BT 777)			■		■
Switching inputs	Sender off, 24 V, (5 mA)	■	■	■	■	■
Switching outputs	Light path free, PNP, 24 V, 20 mA max.	■	■	■	■	■
	Contamination alarm, PNP, 24 V, 20 mA max.	■	■	■	■	■
Electrical connections	9-pin D-sub plug	■	■	■	■	■
Supply voltage V_S	With heating 24 V DC + 20%/– 5%				■	■
	24 V DC ± 20%	■	■	■		
Current consumption	Max. 0.4 A	■	■	■		
	With heating max. 2.5 A				■	■
Enclosure rating	IP 54, DIN 40 050,	■	■	■	■	■
	With plug cover IP 65	■	■	■	■	■
Protection class	⏀ to VDE 0106	■	■	■	■	■
EMC vibration test	IEC 801/IEC 68-2-6 Test FC	■	■	■	■	■
Mounting	4 M5 running nuts, 4x M5 T-nuts	■	■	■	■	■
Ambient temperature	Operation 32...131°F (0...55°C)	■	■	■		
	-36.4...131°F (-38...55°C)				■	■
	(with heating)					
	Storage -4...158°F (-20...70°C)	■	■	■	■	■
Max. relative humidity	90%, uncondensed	■	■	■	■	■
Approximate weight per unit	2.2 lb (1 kg) (excluding accessories)	■	■	■	■	■
Housing material	Aluminum (treated), glass lens	■	■	■	■	■

Connection Diagram and Data Interfaces



9-pin plug

	Function Interfaces	Data Interfaces		
		CL 20 mA RS 422 RS 485 (4L)	RS 485 (2L)	RS 232
1	DC + 24 V			
2	Switching output [2], contamination			
3	Switching output [2], light path free			
4	Switching input, sender off			
5	GND/0 V	GND/0 V	GND/0 V	GND/0 V
6		R+ [3]	R+/T+ [3] or B [4]	R x D
7		R– [3]	R–/T– [3] or A [4]	–
8		T+	–	T x D
9		T–	–	–

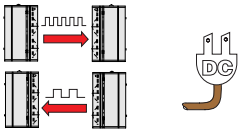
1) Wire cross-section on device with heating; min. 0.25 mm² with 5 m cable
2) PNP

3) With additional cable connection (cable termination)
4) Symbols A and B apply to PROFIBUS and PROFIBUS-DP

SICK

ISD 260/280

Infrared Data Transmission Sensors



0.7...492.1 ft (0.2...150 m)/
0.7...590.6 ft (0.2...180 m)

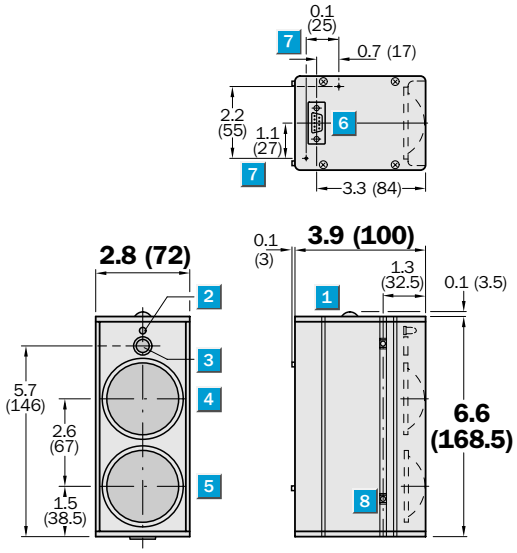
sensing range

Highlights

- Duplex operation
- RS 422 /485
- Profibus
- Interbus-S

ISD 260/280

Dimensional Drawing



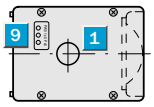
dimensions in inches (mm)

Notes

A pair of devices with numbers ending in 1 and 2 are required.

Adjustments

All types



1	Optical adjustment aid (cross-hair)
2	Warning LED
3	Optical adjustment aid lens
4	Receiver lens
5	Sender lens
6	9-pin D-sub plug
7	5-pin M12 round plug (power supply and function interfaces)
8	Mounting hole M3 threaded – 5 mm deep, for plug cover
9	M5 T-nut (in groove), max. screwing depth 10 mm from housing surface
10	LED function indicators Power on, RxD and TxD

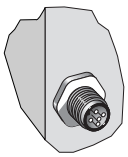
Order Information

Type	Part no.
ISD 260-1111	1 017 379
ISD 260-1112	1 017 380
ISD 260-1121	1 017 381
ISD 260-1122	1 017 382
ISD 280-1111	1 017 046
ISD 280-1112	1 017 047
ISD 280-1121	1 017 375
ISD 280-1122	1 017 376

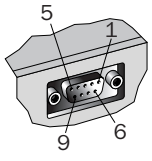
Accessories	page
Mounting bracket	928

Technical Data		ISD-	260 -1111 -1112	260 -1121 -1122	280 -1111 -1112	280 -1121 -1122
Sensing range	0.7...590.6 ft (0.2...180 m)		■	■		
	0.7...492.1 ft (0.2...150 m)				■	■
Light source	Infrared diode		■	■	■	■
Carrier frequency	4 MHz ± 0.5 MHz/11 MHz ± 0.75 MHz		■	■	■	■
Transmit/receive angle	Approx. ± 4° / approx. ± 0.8°		■	■	■	■
Light spot diameter	Approx. 2.3 ft at 164 ft (0.7 m at 50 m)		■	■	■	■
	Approx. 4.6 ft at 328 ft (1.4 m at 100 m)		■	■	■	■
Data transfer rate	Max. 0.5 MBd		■	■		
	Max. 1.5 MBd				■	■
Signal delay (optical)	Max. 2 µs		■	■	■	■
LED indicators	4 status functions: light beam status		■	■	■	■
	Power on, RxD, TxD					
Data interfaces	RS 422 or RS 485 in 2 or 4 line configuration		■	■	■	■
	Profibus, Interbus					
Switching inputs	Sender off, 24 V, (5 mA)		■	■	■	■
Switching outputs	Light path free, PNP, 24 V, 20 mA max.		■	■	■	■
Electrical connections	9-pin sub-D female		■	■	■	■
	5-pin round plug		■	■	■	■
Supply voltage V_S	With heating 24 V DC + 20%/– 5%			■		■
	24 V DC ± 20%		■		■	
Current consumption	Max. 0.4 A		■		■	
	With heating max. 2.5 A			■		■
Enclosure rating	IP 54 to DIN 40 050,		■	■	■	■
	With plug cover IP 65		■	■	■	■
Protection class	⏀ to VDE 0106		■	■	■	■
EMC vibration test	IEC 801/IEC 68-2-6 Test FC		■	■	■	■
Mounting	4 - M5 running nuts, 4x M5 T-nuts		■	■	■	■
Ambient temperature	Operation	32...104°F (0...40°C)	■		■	
		-36...104°F (-38...40°C) (with heating)		■		■
	Storage	-4...158°F (-20..70°C)	■	■	■	■
Max. relative humidity	90%, non-condensing		■	■	■	■
Approximate weight per unit	2.2 lb (1 kg) (excluding accessories)		■	■	■	■
Housing material	Aluminum (treated), glass/plastic lens		■	■	■	■

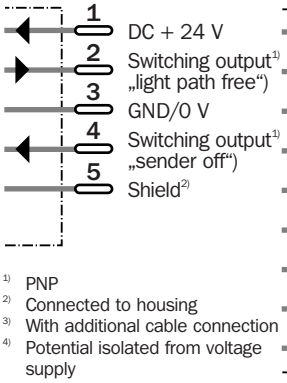
Connection Diagram and Data Interfaces



5-pin, M 12



9-pin sub-D female



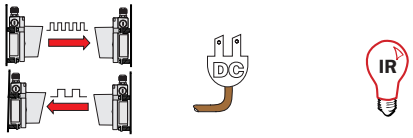
[1] PNP
[2] Connected to housing
[3] With additional cable connection
[4] Potential isolated from voltage supply

Data Interface		
RS 422	RS 485 (2L)	Profibus
RS 485 (4L)		Profibus-DP
NC	NC	NC
NC	NC	NC
R+	R+/T+	B
T+	Reserved	Reserved
GND	GND	GND
+ 5 V	+ 5 V	+ 5 V
NC	NC	NC
R –	R –/T–	A
T–	Reserved	Reserved

SICK

ISD 300 Profibus

Infrared Data Transmission Sensors



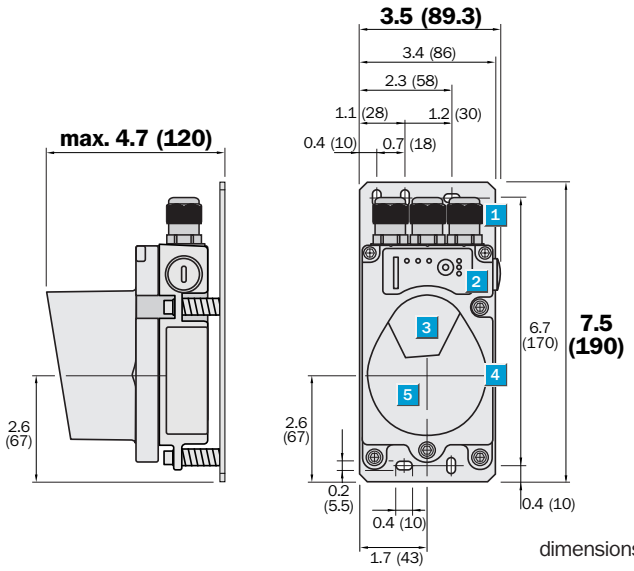
0.7...393.7 ft (0.2...120 m)
0.7...656.1 ft (0.2...200 m)
sensing range

Highlights

- Profibus interface
- Removable optics
- Front access control panel
- Easy one-man set up and alignment
- Up to 1.5 Mbit/s transfer rate
- Signal strength indicator

ISD 300 Profibus

Dimensional Drawing



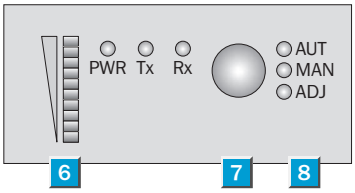
dimensions in inches (mm)

Notes

A pair of devices with numbers ending in 1 and 2 are required.

Adjustments

All types



1 M16 cable gland
2 Control panel
3 Sender lens
4 Center of receiver optical axis
5 Receiver lens
6 Signal level display
7 Function button
8 LED indicator

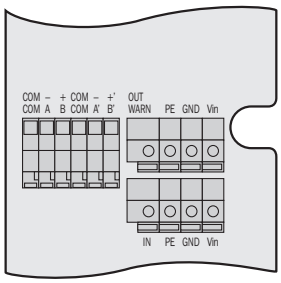
Order Information

Type	Part no.
ISD 300-1211	6 024 759
ISD 300-1212	6 024 760
ISD 300-1221	6 024 838
ISD 300-1222	6 024 839
ISD 300-1111	6 024 761
ISD 300-1112	6 024 837
ISD 300-1121	6 024 840
ISD 300-1122	6 024 841

Accessories	page
Mounting bracket	928

Technical Data		ISD-	300 -1211 -1212	300 -1221 -1222	300 -1111 -1112	300 -1121 -1122					
Sensing range	0.7...393.7 ft (0.2 ... 120 m)				■	■					
	0.7...656.1 ft (0.2 ... 200 m)		■	■							
Light source	Infrared light		■	■	■	■					
Transmit/receive angle	± 0.5° for optical axis		■	■	■	■					
Light spot diameter	3 ft at 16.4 ft (0.9 m at 50 m)/5.7 ft at 328 ft		■	■	■	■					
	(1.75 m at 100 m)/11.4 ft at 656.1 ft (3.5 m at 200 m)		■	■	■	■					
Data transfer rate	1.5 Mbit/s Profibus RS 485		■	■	■	■					
Signal delay (optical)	1.5 µs + 1 Tbit		■	■	■	■					
LED indicators	Power, function mode		■	■	■	■					
	data transfer, signal level		■	■	■	■					
Data interface	Profibus/RS 485		■	■	■	■					
Switching inputs	Sender/receiver off, 0...2 V DC		■	■	■	■					
	Sender/receiver on, 18...30 V DC		■	■	■	■					
Switching outputs	Normal operation, 0...2 V DC		■	■	■	■					
	Contamination alarm, V_{in}-2 V DC		■	■	■	■					
Electrical connections	Terminals		■	■	■	■					
Supply voltage V_S	18...30 V DC		■	■	■	■					
Current consumption	200 mA at 24 V DC (without heating)		■		■						
	800 mA at 24 V DC (with heating)			■		■					
Enclosure rating	IP 65		■	■	■	■					
Protection class	1		■	■	■	■					
EMC vibration test	EN 61326 (1998) + A1 (1999)		■	■	■	■					
Ambient temperature	Operation	41...122°F (5…50°C) (without heating)	■		■						
		-22...122°F (-30..50°C) (with heating)		■		■					
	Storage	-22...158°F (-30…70°C)	■	■	■	■					
Max. relative humidity	Max. 90%, non-condensing		■	■	■	■					
Approximate weight per unit	42.3 oz (1200 g)		■	■	■	■					
Housing material	Aluminum die cast, glass lenses		■	■	■	■					

Connection Type and Data Interface

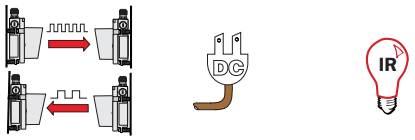


Terminals, general		Terminals, Profibus	
Vin	L+	A, –	A wire
GND	M	B, +	B wire
PE	Shield	COM	Common
OUT/WARN	Q	A', –'	A wire
IN	Switch. input	B', +'	B wire

SICK

ISD 300 Interbus RS 422

Infrared Data Transmission Sensors



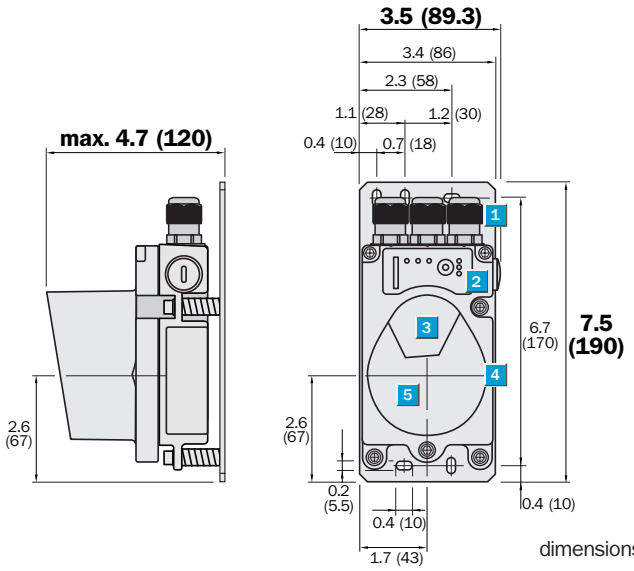
0.7...393.7 ft (0.2...120 m)
0.7...656.1 ft (0.2...200 m)
sensing range

Highlights

- Interbus interface
- Removable optics
- Front access control panel
- Easy one-man set up and alignment
- Up to 500 kbit/s transfer rate
- Signal strength indicator

ISD 300 Interbus RS 422

Dimensional Drawing



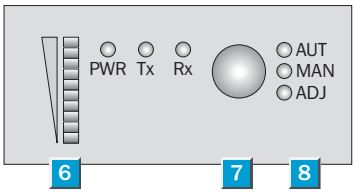
dimensions in inches (mm)

Notes

A pair of devices with numbers ending in 1 and 2 are required.A pair of devices with numbers ending in 1 and 2 are required.

Adjustments

All types



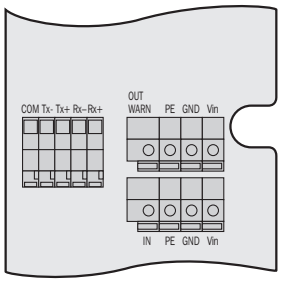
1. M16 cable gland
2. Control panel
3. Sender lens
4. Center of receiver optical axis
5. Receiver lens
6. Signal level display
7. Function button
8. LED indicator

Order Information

Type	Part no.
ISD 300-2211	6 024 842
ISD 300-2212	6 024 843
ISD 300-2221	6 024 846
ISD 300-2222	6 024 847
ISD 300-2111	6 024 844
ISD 300-2112	6 024 845
ISD 300-2121	6 024 848
ISD 300-2122	6 024 849

Technical Data		ISD-	300 -2211 -2212	300 -2221 -2222	300 -2111 -2112	300 -2121 -2122
Sensing range	0.7...393.7 ft (0.2 ... 120 m)				■	■
	0.7...656.1 ft (0.2 ... 200 m)		■	■		
Light source	Infrared light		■	■	■	■
Transmit/receive angle	± 0.5° for optical axis		■	■	■	■
Light spot diameter	3 ft at 16.4 ft (0.9 m at 50 m)/5.7 ft at 328 ft		■	■	■	■
	(1.75 m at 100 m)/11.4 ft at 656.1 ft (3.5 m at 200 m)		■	■	■	■
Data transfer rate	500 kbit/s Interbus RS 422		■	■	■	■
Signal delay (optical)	1.5 µs		■	■	■	■
LED indicators	Power, function mode,		■	■	■	■
	data transfer, signal level		■	■	■	■
Data interface	Interbus/RS 422		■	■	■	■
Switching inputs	Sender/receiver off, 0...2 V DC		■	■	■	■
	Sender/receiver on, 18...30 V DC		■	■	■	■
Switching outputs	Normal operation, 0...2 V DC		■	■	■	■
	Contamination alarm, V_{in}-2 V DC		■	■	■	■
Electrical connections	Terminals		■	■	■	■
Supply voltage V_S	18...30 V DC		■	■	■	■
Current consumption	200 mA at 24 V DC (without heating)		■		■	
	800 mA at 24 V DC (with heating)			■		■
Enclosure rating	IP 65		■	■	■	■
Protection class	1		■	■	■	■
EMC vibration test	EN 61326 (1998) + A1 (1999)		■	■	■	■
Ambient temperature	Operation 41...122°F (5…50°C)		■		■	
	(without heating)					
	-22...122°F (-30..50°C)			■		■
	(with heating)					
	Storage -22...158°F (-30…70°C)		■	■	■	■
Max. relative humidity	Max. 90%, non-condensing		■	■	■	■
Approximate weight per unit	42.3 oz (1200 g)		■	■	■	■
Housing material	Aluminum die cast, glass lenses		■	■	■	■

Connection Type and Data Interface



Terminals, general		Terminals, Interbus	
Vin	L+	DO1/DI2, Rx+	Receiver wire
GND	M	$\overline{DO1}$/$\overline{DI2}$, Rx–	Receiver wire
PE	Shield	DI1/DO2, Tx+	Send wire
OUT/WARN	Q	$\overline{DI1}$/$\overline{DO2}$, Tx–	Send wire
IN	Switch. input	COM	Common

SICK

ISD 300 Interbus Fiber Optic

Infrared Data Transmission Sensors

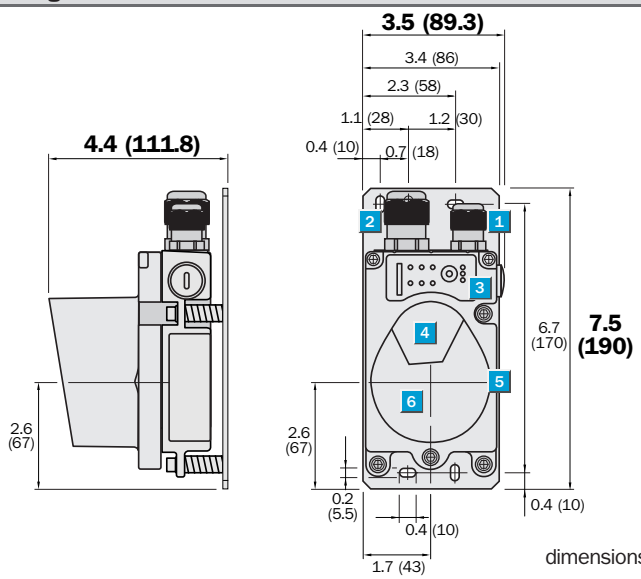
0.7...656.1 ft (0.2...200 m)
sensing range

Highlights

- Interbus interface
- Removable optics
- Front access control panel
- Easy one-man set up and alignment
- Up to 2 Mbit/s transfer rate
- Signal strength indicator

ISD 300 Interbus Fiber Optic

Dimensional Drawing



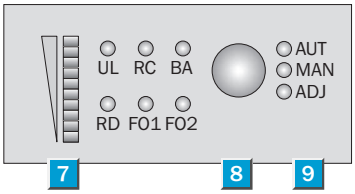
dimensions in inches (mm)

Notes

A pair of devices with numbers ending in 1 and 2 are required.

Adjustments

All types



1 M20 cable gland
2 M16 cable gland
3 Control panel
4 Sender lens
5 Center of receiver optical axis
6 Receiver lens
7 Signal level display
8 Function button
9 LED indicator

Order Information

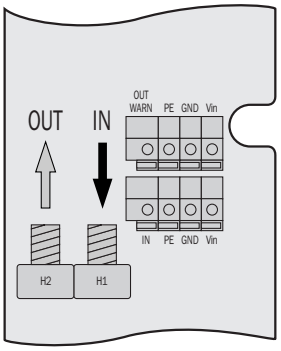
Type	Part no.
ISD 300-3211	6 024 850
ISD 300-3212	6 024 851
ISD 300-3221	6 024 852
ISD 300-3222	6 024 853

Accessories

	page
Mounting bracket	928

Technical Data		ISD-	300 -3211 -3212	300 -3221 -3222
Sensing range	0.7...656.1 ft (0.2 ... 200 m)			
Light source	Infrared light			
Transmit/receive angle	± 0.5° for optical axis			
Light spot diameter	3 ft at 16.4 ft (0.9 m at 50 m)/5.7 ft at 328 ft			
	(1.75 m at 100 m)/11.4 ft at 656.1 ft (3.5 m at 200 m)			
Data transfer rate	2 Mbit/s Interbus fiber optic			
Signal delay (optical)	2.5 µs			
LED indicators	Power, function mode,			
	data transfer, signal level			
Data interface	Interbus/fiber optic			
Switching inputs	Sender/receiver off, 0...2 V DC			
	Sender/receiver on, 18...30 V DC			
Switching outputs	Normal operation, 0...2 V DC			
	Contamination alarm, V_{in}-2 V DC			
Electrical connections	Terminals			
Supply voltage V_S	18 ... 30 V DC			
Current consumption	200 mA at 24 V DC (without heating)			
	800 mA at 24 V DC (with heating)			
Enclosure rating	IP 65			
Protection class	1			
EMC vibration test	EN 61326 (1998) + A1 (1999)			
Ambient temperature	Operation 41...122°F (5…50°C)			
	(without heating)			
	-22...122°F (-30..50°C)			
	(with heating)			
	Storage -22...158°F (-30…70°C)			
Max. relative humidity	Max. 90%, non-condensing			
Weight per unit	42.3 oz (1200 g)			
Housing material	Aluminum die cast, glass lenses			

Connection Type and Data Interface



Terminals, general		Fiber optic socket, Interbus	
Vin	L+	H1	Receiver
GND	M	H2	Sender
PE	Shield		
OUT/WARN	Q		
IN	Switch. input		

SICK

ISD 300 DH+/RIO

Infrared Data Transmission Sensors

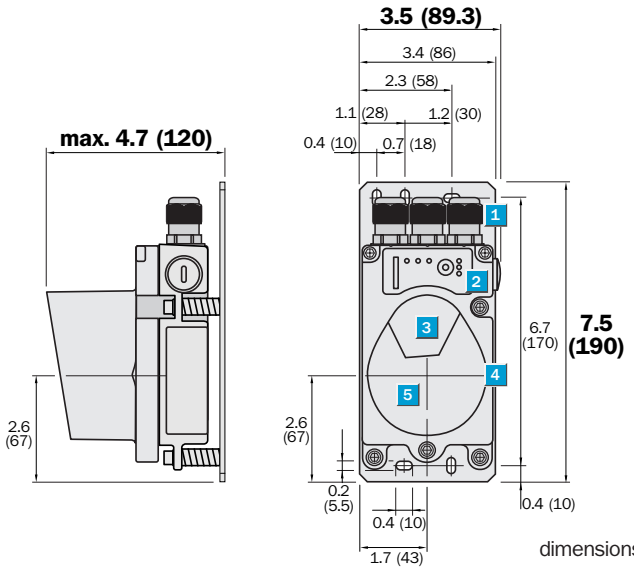
0.7...656.1 ft (0.2...200 m)
sensing range

Highlights

- DH+/RIO interface
- Removable optics
- Front access control panel
- Easy one-man set up and alignment
- Up to 230.4 kbit/s transfer rate
- Signal strength indicator

ISd 300 DH+/RIO

Dimensional Drawing



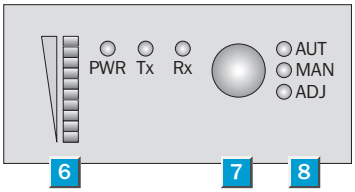
dimensions in inches (mm)

Notes

A pair of devices with numbers ending in 1 and 2 are required.

Adjustments

All types



1 M16 cable gland
2 Control panel
3 Sender lens
4 Center of receiver optical axis
5 Receiver lens
6 Signal level display
7 Function button
8 LED indicator

Order Information

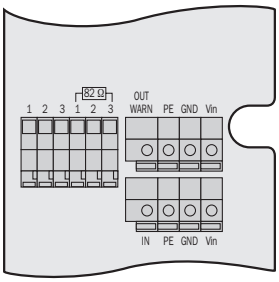
Type	Part no.
ISD 300-4211	6 024 854
ISD 300-4212	6 024 855
ISD 300-4221	6 024 856
ISD 300-4222	6 024 857

Accessories

	page
Mounting bracket	928

Technical Data		ISD-	300 -4211 -4212	300 -4221 -4222
Sensing range	0.7...656.1 ft (0.2 ... 200 m)			
Light source	Infrared light			
Transmit/receive angle	± 0.5° for optical axis			
Light spot diameter	3 ft at 16.4 ft (0.9 m at 50 m)/5.7 ft at 328 ft			
	(1.75 m at 100 m)/11.4 ft at 656.1 ft (3.5 m at 200 m)			
Data transfer rate	230.4 kbit/s DH+/RIO			
Signal delay (optical)	1.5 µs + 1.5 Tbit			
LED indicators	Power, function mode,			
	data transfer, signal level			
Data interface	DH+/RIO			
Switching inputs	Sender/receiver off, 0...2 V DC			
	Sender/receiver on, 18...30 V DC			
Switching outputs	Normal operation, 0...2 V DC			
	Contamination alarm, V_{in}-2 V DC			
Electrical connections	Terminals			
Supply voltage V_S	18...30 V DC			
Current consumption	200 mA at 24 V DC (without heating)			
	800 mA at 24 V DC (with heating)			
Enclosure rating	IP 65			
Protection class	1			
EMC vibration test	EN 61326 (1998) + A1 (1999)			
Ambient temperature	Operation 41...122°F (5…50°C)			
	(without heating)			
	-22...122°F (-30..50°C)			
	(with heating)			
	Storage -22...158°F (-30…70°C)			
Max. relative humidity	Max. 90%, non-condensing			
Weight per unit	42.3 oz (1200 g)			
Housing material	Aluminum die cast, glass lenses			

Connection Type and Data Interface



Terminals, general		Terminals, DH+/DH–	
Vin	L+	1	Clear/blue
GND	M	2	Shield
PE	Shield	3	Blue/clear
OUT/WARN	Q		
IN	Switch. input		

SICK

ISD 300 CANopen/DeviceNet

Infrared Data Transmission Sensors

0.7...656.1 ft (0.2...200 m)

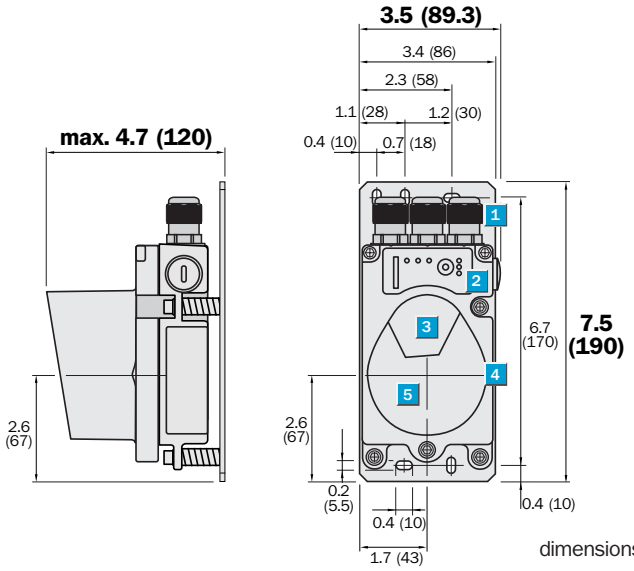
sensing range

Highlights

- CANopen/DeviceNet interface
- Removable optics
- Front access control panel
- Easy one-man set up and alignment
- Up to 1 MBbit/s transfer rate
- Signal strength indicator

ISd 300 DH+/RIO

Dimensional Drawing



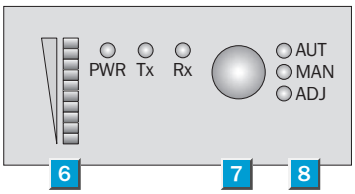
dimensions in inches (mm)

Notes

A pair of devices with numbers ending in 1 and 2 are required.

Adjustments

All types



1 M16 cable gland
2 Control panel
3 Sender lens
4 Center of receiver optical axis
5 Receiver lens
6 Signal level display
7 Function button
8 LED indicator

Order Information

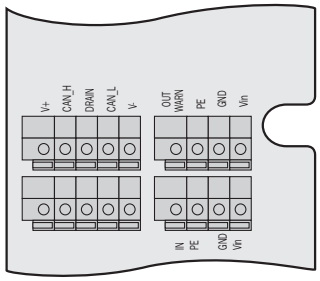
Type	Part no.
ISD 300-5211	6 027 231
ISD 300-5212	6 027 232

Accessories

	page
Mounting bracket	928

Technical Data	ISD-	5211	5212
Sensing range	0.7...656.1 ft (0.2...200 m)		
Light source	Infrared light		
Transmit/receive angle	± 0.5° for optical axis		
Light spot diameter	3 ft at 16.4 ft (0.9 m at 50 m)/5.7 ft at 328 ft		
	(1.75 m at 100 m)/11.4 ft at 656.1 ft (3.5 m at 200 m)		
Data transfer rate	Max. 500 kbit/s DeviceNet		
	Max. 1 MBit/s CANopen		
LED indicators	Power, function mode,		
	data transfer, signal level		
Data interface	CANopen/DeviceNet		
Switching inputs	Sender/receiver off, 0...2 V DC		
	Sender/receiver on, 18...30 V DC		
Switching outputs	Normal operation, 0...2 V DC		
	Contamination alarm, V_{in}-2 V DC		
Electrical connections	Terminals		
Supply voltage V_S	18...30 V DC		
Current consumption	200 mA at 24 V DC		
Enclosure rating	IP 65		
Protection class	1		
EMC vibration test	EN 61326 (1998) + A1 (1999)		
Ambient temperature	Operation 23...122°F (-5…50°C)		
	Storage -22...158°F (-30…70°C)		
Max. relative humidity	Max. 90%, non-condensing		
Weight per unit	42.3 oz (1200 g)		
Housing material	Aluminum die cast, glass lenses		

Connection Type and Data Interface



Terminals, general		Terminals, CANopen/DeviceNet	
Vin	L+	V-	Neg. supply (CAN ground reference)
GND	M	CAN_L	Bus signal (LOW)
PE	Shield	DRAIN	Shield
OUT/WARN	Q	CAN_H	Bus signal (HIGH)
IN	Switch.input	V+	Pos. supply

SICK

Theory of Operation...Inductive Proximity Sensors

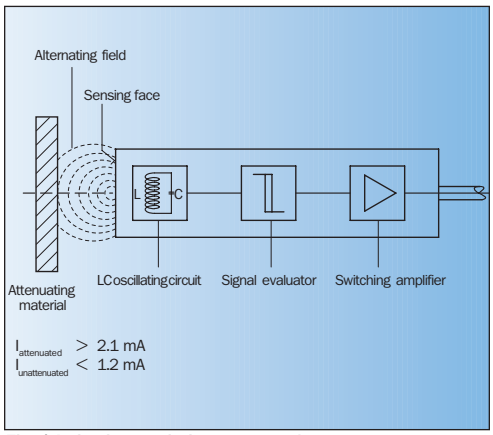


Fig. 1 Inductive proximity sensor makeup

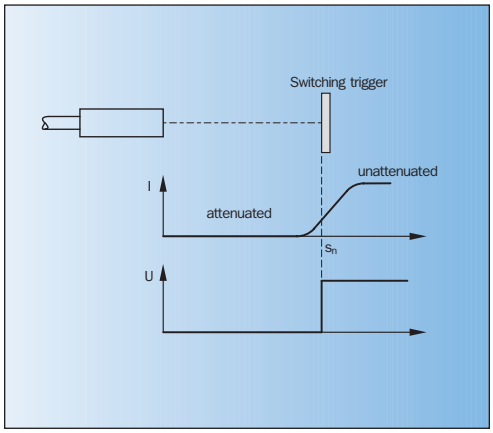


Fig. 2 Attenuated vs. unattenuated materials

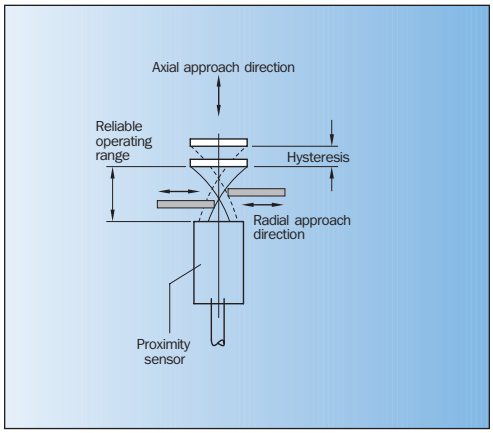


Fig. 3 Response curve for inductive sensors

About Inductive Sensors

Inductive sensors plan an especially important role owing to their non-contact mode of operation, their robust industry-compatible construction and the resulting high degree of reliability as well as for economic reasons. Their non-contact mode of operation means that no actuation forces are required and direct contact with the object is avoided. The completely electronic design (no moving parts or contacts) functions without wear. The electronics are encapsulated and provide a high degree of protection against vibration and shock stress as well as dirt, dust and humidity, and as a result, the majority of these sensors can also be used in extreme conditions.

About Inductive Proximity Sensors

An inductive proximity sensor comprises and LC oscillating circuit, a signal evaluator and a switching amplifier. (See Fig. 1)

The coil of this oscillating circuit generates a high-frequency electromagnetic alternating field. This field is emitted at the sensing face of the sensor.

If attenuating material nears the sensing face, eddy currents are generated in the case of non-ferrite metals. In the case of ferromagentic metals, hysteresis and eddy current loss also occurs. These losses draw energy from the oscillating circuit and reduce oscillation. The signal evaluator detects this reduction and converts it into a switching signal. (See Fig. 2)

The terms "attenuated" and "unattenuated" are used to describe the two switching states of the inductive proximity sensors.

Response curve for inductive proximity sensors

The specified sensing ranges are determined in the case of axial approach along the reference axis of the sensor. (See Fig. 3)

Radial approach results in a reduction of the sensing range. The edge of the switching trigger has only a small surface area. As a result, less eddy-current losses occur. The sensor therefore only reacts if the switching trigger laterally enters the alternating field relatively close to the sensing face. In the case of axial approach, the full surface of the switching trigger is exposed to the scattered electromagnetic field. Axial alignment therefore provides the maximum sensing range.

Inductive Proximity Sensors...Type Code

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Character
	I	**M**	**1**	**2**	**-**	**0**	**2**	**B**	**P**	**S**	**-**	**Z**	**U**	**0**	

1 **Sensor technology**
- I Inductive

2 **Design**
- H Barrel
- M Cylinder with thread
- Q Cuboid

3/4 **Housing shape**
- 03
- 04
- 05
- 06
- 08
- 10
- 12 Diameter
- 18 or
- 20 edge length of
- 30 sensing face
- 34
- 40
- 80

6/7/8 **Sensing range/ installation**
- B Flush
- N Non-flush
- 02B 2 mm; flush
- 04N 4 mm; non-flush
- 1B5 1.5 mm; flush
- 2N5 2.5 mm; non-flush

other codes 14
- K Short body housing

Connection 13
- W Cable, PVC
- U Cable, PUR-PVC
- P Cable with connector, M8x1
- T Connector, M8x1
- C Connector, M12x1
- K Terminals

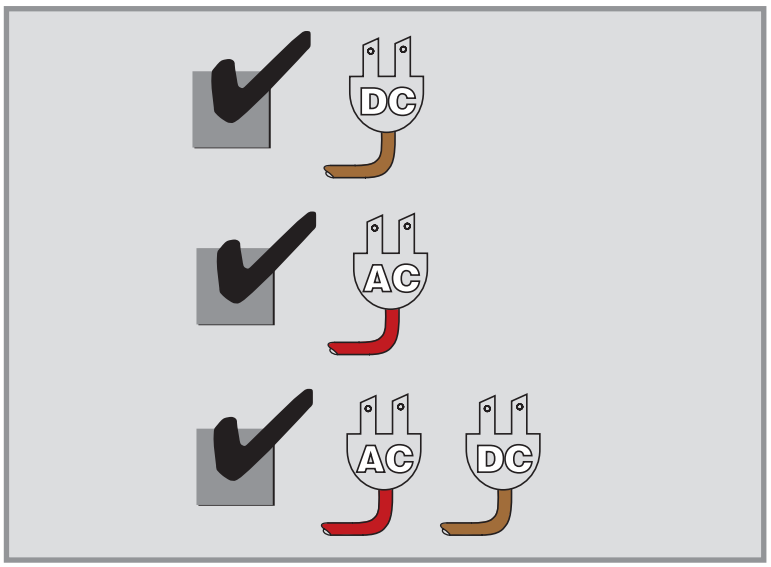
Housing material 12
- Z Ms, nickel-plated
- V Stainless steel
- K Plastic

Output 10
- S NO
- O NC
- P Programmable/complementary
- N NAMUR

Interface 9
- P DC (3/4-wire) PNP
- N DC (3/4-wire) NPN
- C DC (4-wire) PNP or NPN
- D DC (2-wire)
- A AC 2-wire
- U AC/DC 2-wire
- - NAMUR

Inductive Proximity Sensors

Inductive Proximity Sensors



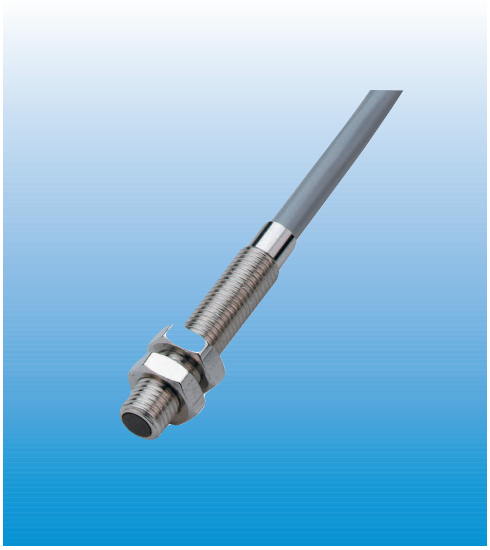
IM 04 Miniature

Inductive Proximity Sensors

Highlights

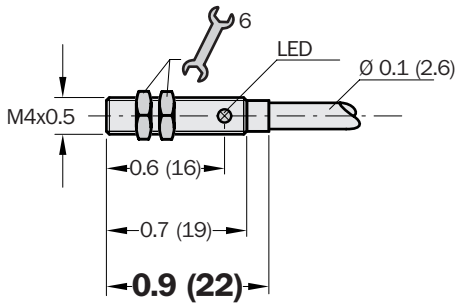
- Shielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M4 x 0.5 mm
- Cable
- Enclosure rating IP 67
- LED status indicator

IM 04 Miniature



Dimensional Drawing

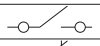
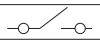
dimensions in inches (mm)



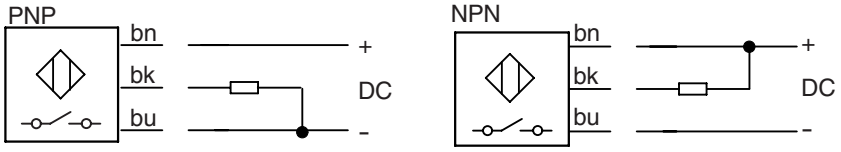
Electrical and Mechanical Data

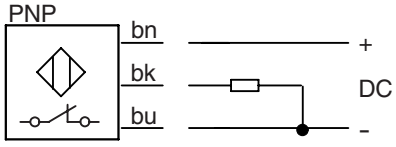
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 0.6 V max. at I_a = 50 mA
Power consumption (without load)	10 mA
Continuous current I_a	≤ 100 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H typ.	10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2%
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	0.8 Nm
Connection cable	PUR, 3 x 0.055 mm²

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.02 (0.6)		PNP		2000	Cable 2 m	IM04-0B6PS-ZU1	6 020 145
0.02 (0.6)		NPN		2000	Cable 2 m	IM04-0B6NS-ZU1	6 020 146
0.02 (0.6)		PNP		2000	Cable 2 m	IM04-0B6PO-ZU1	6 020 147
0.02 (0.6)		PNP		2000	Cable 5 m	IM04-0B6PS-ZU5	6 020 610

Connection Diagram





Wire color		Assignment
bn	brown	+ V DC
bk	black	NO/NC
bu	blue	- V DC

SICK

IM 05 Miniature

Inductive Proximity Sensors

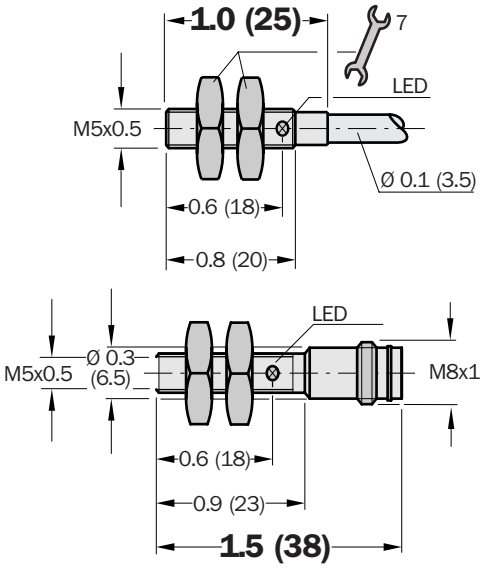
Highlights

- Shielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M5 x 0.5 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 05 Miniature

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908

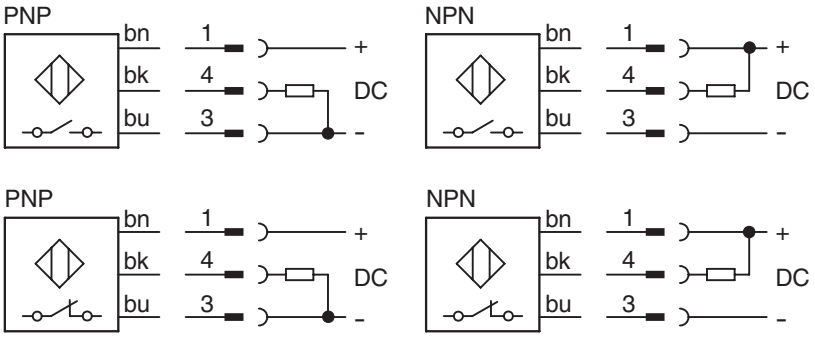
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 2.0 V max. at I_a = 200 mA
Power consumption (without load)	10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1.5%
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	1.5 Nm
Connection cable	PVC, 3 x 0.14 mm²

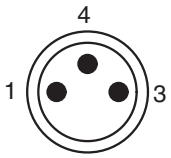
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.02 (0.8)	▭=	PNP	⏛	5000	Cable 2 m	IM05-0B8PS-ZW1	6 011 591
0.02 (0.8)	▭=	NPN	⏛	5000	Cable 2 m	IM05-0B8NS-ZW1	6 020 155
0.02 (0.8)	▭=	NPN	⏛	5000	Cable 2 m	IM05-0B8NO-ZW1	6 020 157
0.02 (0.8)	▭=	PNP	⏛	5000	Connector M8 x 1 mm	IM05-0B8PS-ZT1	6 020 110
0.02 (0.8)	▭=	NPN	⏛	5000	Connector M8 x 1 mm	IM05-0B8NS-ZT1	6 020 158
0.02 (0.8)	▭=	PNP	⏛	5000	Connector M8 x 1 mm	IM05-0B8PO-ZT1	6 020 159

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

IM 08 Standard

Inductive Proximity Sensors

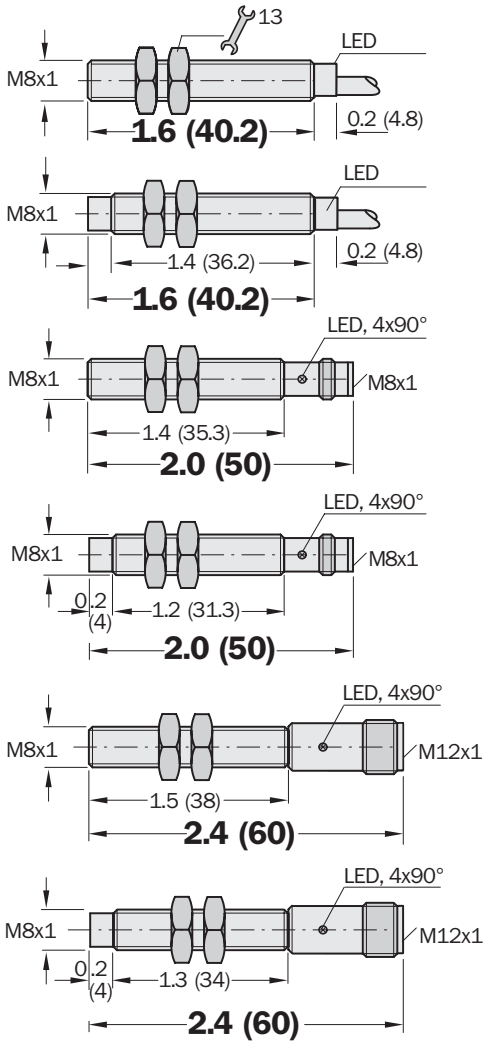
Highlights

- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- LED status indicator
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67

IM 08 Standard

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908, 909

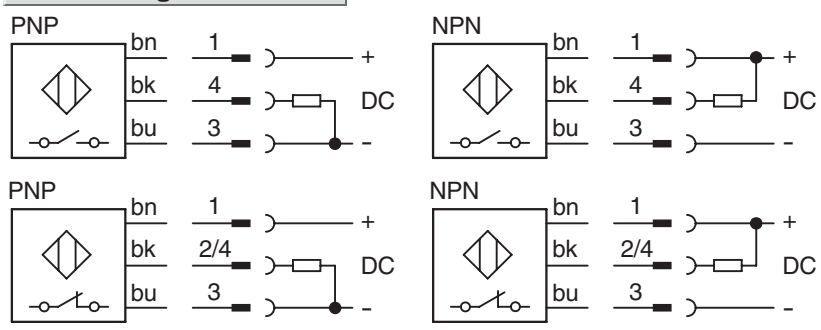
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	4 Nm
Connection cable	PVC, 3 x 0.14 mm²

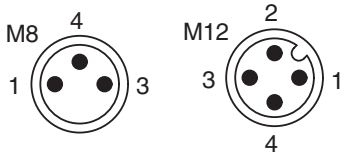
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.06 (1.5)	=	PNP		3000	Cable 2 m	IM08-01B5PS-ZW1	6 020 215
0.06 (1.5)	=	NPN		3000	Cable 2 m	IM08-01B5NS-ZW1	6 020 216
0.06 (1.5)	=	PNP		3000	Cable 2 m	IM08-01B5PO-ZW1	6 020 217
0.06 (1.5)	=	NPN		3000	Cable 2 m	IM08-01B5NO-ZW1	6 020 218
0.06 (1.5)	=	PNP		3000	Connector M8 x 1 mm	IM08-01B5PS-ZT1	6 020 219
0.06 (1.5)	=	NPN		3000	Connector M8 x 1 mm	IM08-01B5NS-ZT1	6 020 220
0.06 (1.5)	=	PNP		3000	Connector M8 x 1 mm	IM08-01B5PO-ZT1	6 020 221
0.06 (1.5)	=	PNP		3000	Connector M12 x 1 mm	IM08-01B5PS-ZC1	6 020 223
0.06 (1.5)	=	NPN		3000	Connector M12 x 1 mm	IM08-01B5NS-ZC1	6 020 224
0.1 (2.5)	=	PNP		2500	Cable 2 m	IM08-02N5PS-ZW1	6 020 227
0.1 (2.5)	=	NPN		2500	Cable 2 m	IM08-02N5NS-ZW1	6 020 228
0.1 (2.5)	=	PNP		2500	Connector M8 x 1 mm	IM08-02N5PS-ZT1	6 020 231
0.1 (2.5)	=	NPN		2500	Connector M8 x 1 mm	IM08-02N5NS-ZT1	6 020 232
0.1 (2.5)	=	PNP		2500	Connector M12 x 1 mm	IM08-02N5PS-ZC1	6 020 235
0.1 (2.5)	=	NPN		2500	Connector M12 x 1 mm	IM08-02N5NS-ZC1	6 020 236

Connection Diagram



Wire color		Contact M8	Contact M12	Assignment
bn	brown	1	1	+ V DC
bk	black	4	2/4	NO/NC
bu	blue	3	3	- V DC



SICK

IM 08 Short

Inductive Proximity Sensors

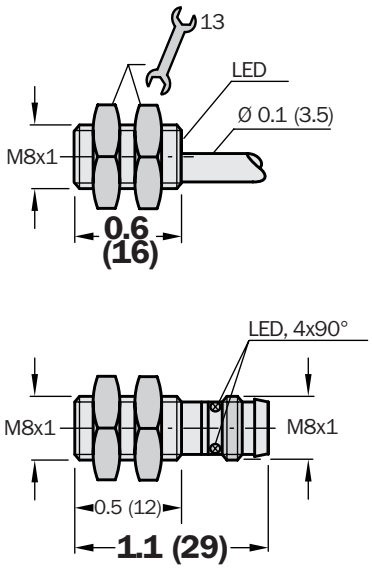
Highlights

- Shielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 08 Short

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908

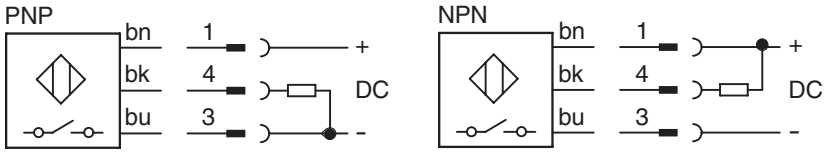
Electrical and Mechanical Data

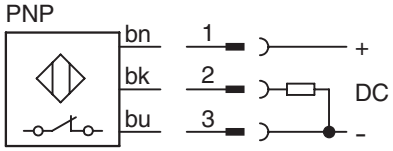
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 2.0 V max. at I_a = 200 mA
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	10% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	4 Nm
Connection cable	PVC, 3 x 0.14 mm²

Selection Table

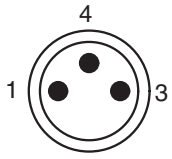
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.06 (1.5)		PNP		5000	Cable 2 m	IM08-1B5PS-ZWK	6 020 111
0.06 (1.5)		NPN		5000	Cable 2 m	IM08-1B5NS-ZWK	6 020 173
0.06 (1.5)		PNP		5000	Connector M8 x 1 mm	IM08-1B5PS-ZTK	6 020 112
0.06 (1.5)		NPN		5000	Connector M8 x 1 mm	IM08-1B5NS-ZTK	6 020 176
0.06 (1.5)		PNP		5000	Connector M8 x 1 mm	IM08-1B5PO-ZTK	6 020 177

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

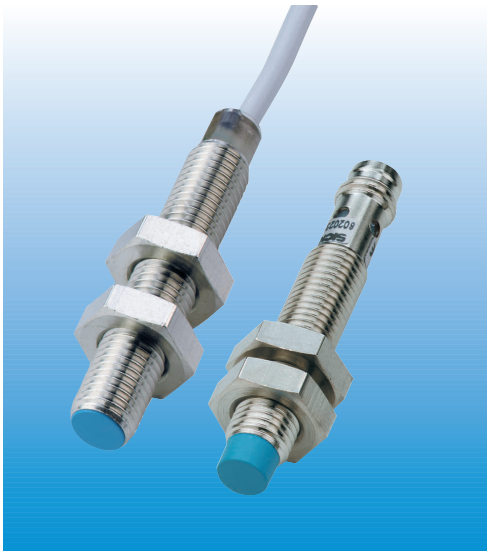
IM 08 Advanced

Inductive Proximity Sensors

Highlights

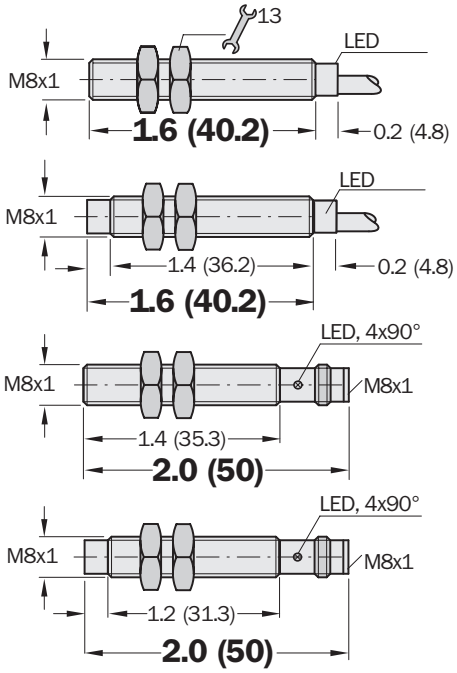
- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 08 Advanced



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908

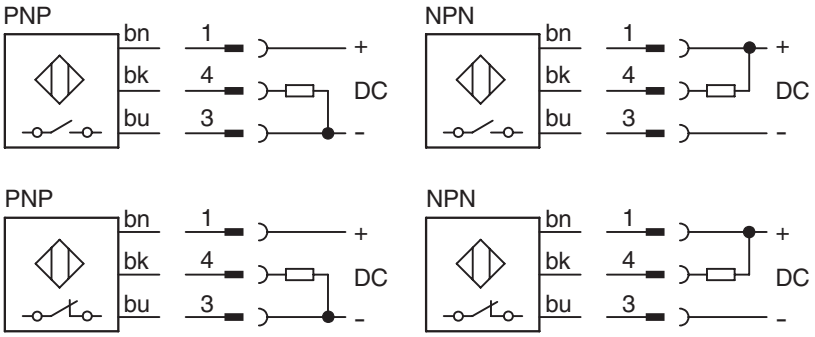
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	4 Nm
Connection cable	PVC, 3 x 0.14 mm²

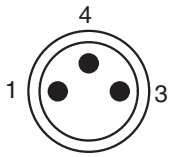
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP		3000	Cable 2 m	IM08-02BPS-ZW1	7 900 001
0.08 (2)		NPN		3000	Cable 2 m	IM08-02BNS-ZW1	7 900 002
0.08 (2)		PNP		3000	Cable 2 m	IM08-02BPO-ZW1	7 900 003
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IM08-02BPS-ZT1	7 900 005
0.08 (2)		NPN		3000	Connector M8 x 1 mm	IM08-02BNS-ZT1	7 900 006
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IM08-02BPO-ZT1	7 900 007
0.08 (2)		NPN		3000	Connector M8 x 1 mm	IM08-02BNO-ZT1	7 900 008
0.2 (4)		PNP		3000	Cable 2 m	IM08-04NPS-ZW1	7 900 009
0.2 (4)		NPN		3000	Cable 2 m	IM08-04NNS-ZW1	7 900 010
0.2 (4)		PNP		3000	Cable 2 m	IM08-04NPO-ZW1	7 900 011
0.2 (4)		PNP		3000	Connector M8 x 1 mm	IM08-04NPS-ZT1	7 900 013
0.2 (4)		NPN		3000	Connector M8 x 1 mm	IM08-04NNS-ZT1	7 900 014
0.2 (4)		PNP		3000	Connector M8 x 1 mm	IM08-04NPO-ZT1	7 900 015
0.2 (4)		NPN		3000	Connector M8 x 1 mm	IM08-04NNO-ZT1	7 900 016

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

IM 08 Advanced Short

Inductive Proximity Sensors

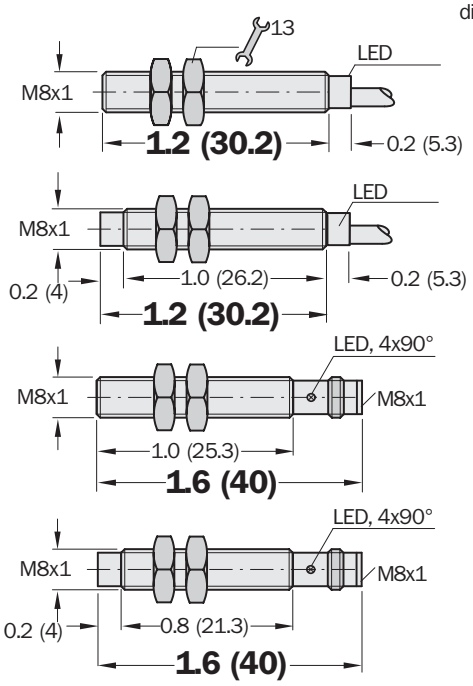
Highlights

- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 08 Advanced Short

Dimensional Drawing

dimensions in inches (mm)



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Cables and connectors	908

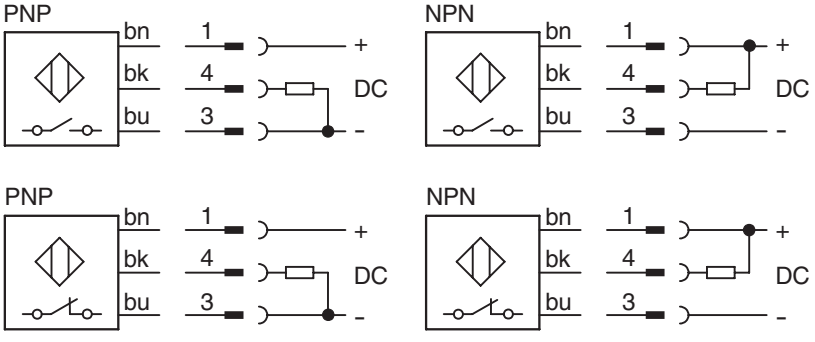
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 5 ms
Hysteresis H	1% - 20% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	4 Nm
Connection cable	PVC, 3 x 0.14 mm²

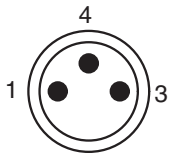
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP		3000	Cable 2 m	IM08-02BPS-ZWK	6 025 861
0.08 (2)		NPN		3000	Cable 2 m	IM08-02BNS-ZWK	6 025 862
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IM08-02BPS-ZTK	6 025 863
0.08 (2)		NPN		3000	Connector M8 x 1 mm	IM08-02BNS-ZTK	6 025 864
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IM08-02BPO-ZTK	6 025 865
0.08 (2)		NPN		3000	Connector M8 x 1 mm	IM08-02BNO-ZTK	6 025 866
0.2 (4)		PNP		2500	Cable 2 m	IM08-04NPS-ZWK	6 025 867
0.2 (4)		NPN		2500	Cable 2 m	IM08-04NNS-ZWK	6 025 868
0.2 (4)		PNP		2500	Connector M8 x 1 mm	IM08-04NPS-ZTK	6 025 869
0.2 (4)		NPN		2500	Connector M8 x 1 mm	IM08-04NNS-ZTK	6 025 870
0.2 (4)		PNP		2500	Connector M8 x 1 mm	IM08-04NPO-ZTK	6 025 871
0.2 (4)		NPN		2500	Connector M8 x 1 mm	IM08-04NNO-ZTK	6 025 872

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

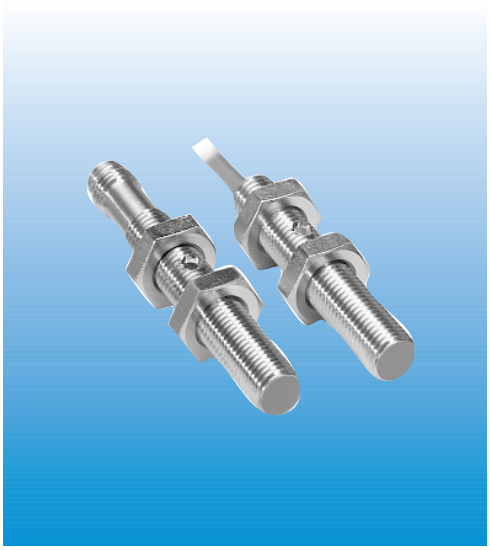
IM 08 Triple Sensing Range

Inductive Proximity Sensors

Highlights

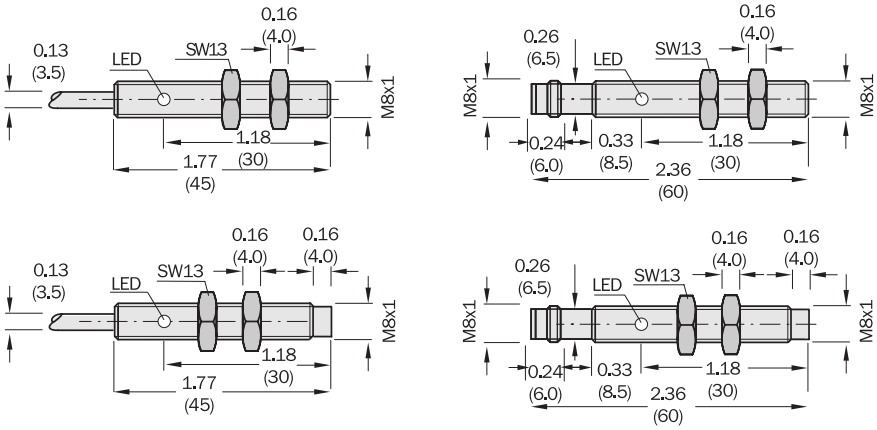
- Triple sensing range
- Installation quasi flush or non-flush in metal
- Normally open function
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 08 Triple Sensing Range



Dimensional Drawing

dimensions in inches (mm)



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Cables and connectors	908

Electrical and Mechanical Data

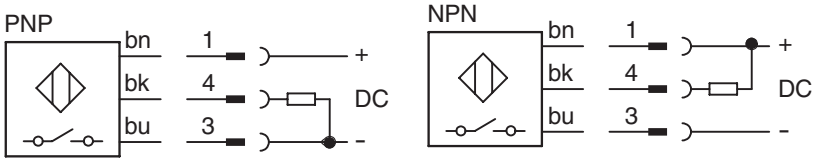
Operating voltage U_b	10...30 V DC
Ripple U_{ss}	≤ 20% of U_b
Voltage drop U_d (at I_a max.)	≤ 2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability T_v	≤ 100 ms
Hysteresis H	1% - 5% of s_r (5% typ.)
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, chrome-plated, plastic
Tightening torque	4 Nm
Connection cable	PVC, 3 x 0.14 mm²

Selection Table

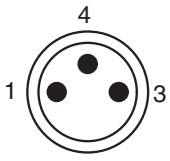
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.12 (3)	*	PNP		1000	Cable 2 m	IM 08-03BPS-ZW1	6 027 505
0.12 (3)	*	PNP		1000	Connector M8 x 1 mm	IM08-03BPS-ZTI	6 025 574
0.24 (6)		PNP		500	Cable 2 m	IM08-06NPS-ZW1	6 027 506
0.24 (6)		NPN		500	Cable 2 m	IM08-06NNS-ZW1	6 027 507
0.24 (6)		PNP		500	Connector M8 x 1 mm	IM08-06NPS-ZT1	6 027 508

* Installation notes "quasi flush"
When mounting in conductible materials the sensors have to be installed with a distance A to the surface.
A Steel, metal = 1 mm / **A** Stainless steel = 0 mm

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

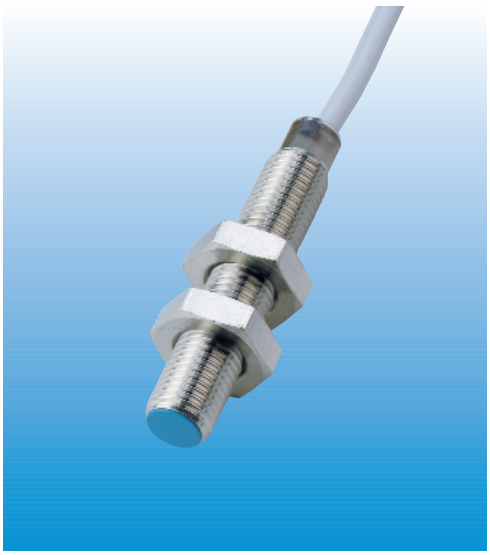
IM 08 NAMUR

Inductive Proximity Sensors

Highlights

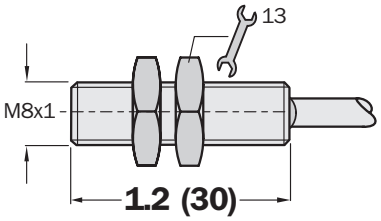
- NAMUR to DIN 19 234
- High switching frequency
- Robust brass housing with nickel-plated fine thread M8 x 1
- Enclosure rating IP 67
- LED status indicator

IM 08 NAMUR



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Power supply	966

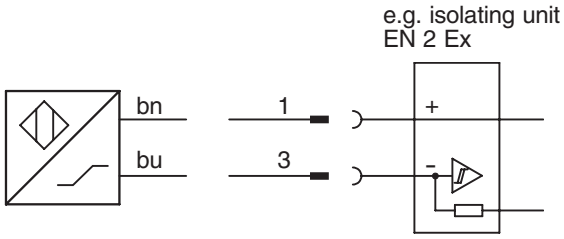
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Nominal voltage U_n	8.2 V DC
Power consumption, attenuated	≤ 1.0 mA
Power consumption, unattenuated	≥ 2.2 mA
Internal capacitance	≤ 80 nF
Internal inductance	≤ 110 µH
Cable resistance	≤ 50 Ω
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	2.5 Nm
Connection cable	PVC, 2 x 0.14 mm², blue
Max. data for connecting isolating unit EN 2	
EX or other approved isolating amplifier:	
Short circuit current I_K max	50 mA
No load voltage U_O	15 V
Power loss Pmax	180 mW

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.04 (1)	=	NAMUR	⌐	2000	Cable 2 m	IM08-01B-N-ZW0	6 021 123

Connection Diagram



Wire color			Assignment
bn	braun	brown	+ V DC
bu	blau	blue	- V DC

SICK

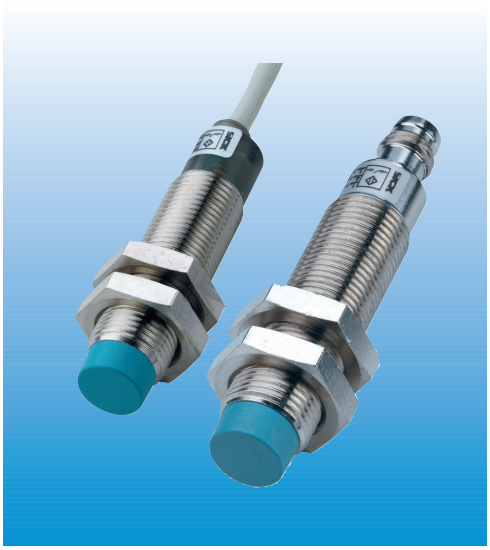
IM 12 Standard

Inductive Proximity Sensors

Highlights

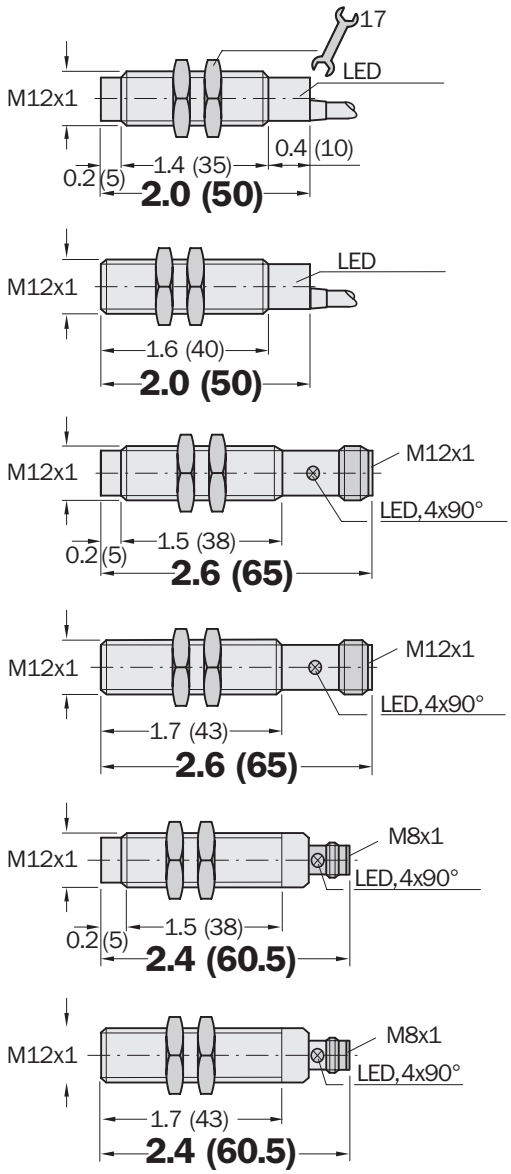
- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 12 Standard



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908, 909
Mounting brackets	925

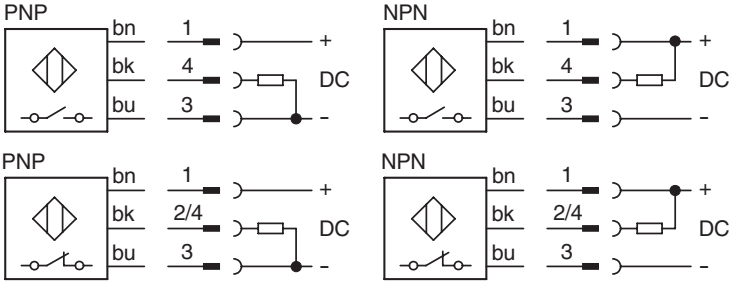
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	10 Nm
Connection cable	PVC, 3 x 0.22 mm²

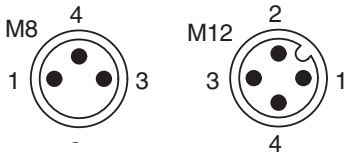
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP		2000	Cable 2 m	IM12-02BPS-ZW1	6 011 963
0.08 (2)		NPN		2000	Cable 2 m	IM12-02BNS-ZW1	6 011 964
0.08 (2)		PNP		2000	Cable 2 m	IM12-02BPO-ZW1	6 011 965
0.08 (2)		NPN		2000	Cable 2 m	IM12-02BNO-ZW1	6 011 966
0.08 (2)		PNP		2000	Connector M8 x 1 mm	IM12-02BPS-ZT1	6 011 967
0.08 (2)		NPN		2000	Connector M8 x 1 mm	IM12-02BNS-ZT1	6 011 968
0.08 (2)		PNP		2000	Connector M12 x 1 mm	IM12-02BPS-ZC1	6 011 971
0.08 (2)		NPN		2000	Connector M12 x 1 mm	IM12-02BNS-ZC1	6 011 972
0.08 (2)		PNP		2000	Connector M12 x 1 mm	IM12-02BPO-ZC1	6 011 973
0.08 (2)		NPN		2000	Connector M12 x 1 mm	IM12-02BNO-ZC1	6 011 974
0.2 (4)		PNP		2000	Cable 2 m	IM12-04NPS-ZW1	6 011 975
0.2 (4)		NPN		2000	Cable 2 m	IM12-04NNS-ZW1	6 011 976
0.2 (4)		PNP		2000	Cable 2 m	IM12-04NPO-ZW1	6 011 977
0.2 (4)		PNP		2000	Connector M8 x 1 mm	IM12-04NPS-ZT1	6 011 979
0.2 (4)		NPN		2000	Connector M8 x 1 mm	IM12-04NNS-ZT1	6 011 980
0.2 (4)		PNP		2000	Connector M12 x 1 mm	IM12-04NPS-ZC1	6 011 983
0.2 (4)		NPN		2000	Connector M12 x 1 mm	IM12-04NNS-ZC1	6 011 984
0.2 (4)		PNP		2000	Connector M12 x 1 mm	IM12-04NPO-ZC1	6 011 985

Connection Diagram



Wire color		Contact M8	Contact M12	Assignment
bn	brown	1	1	+ V DC
bk	black	4	2/4	NO/NC
bu	blue	3	3	- V DC



IM 12 Short

Inductive Proximity Sensors

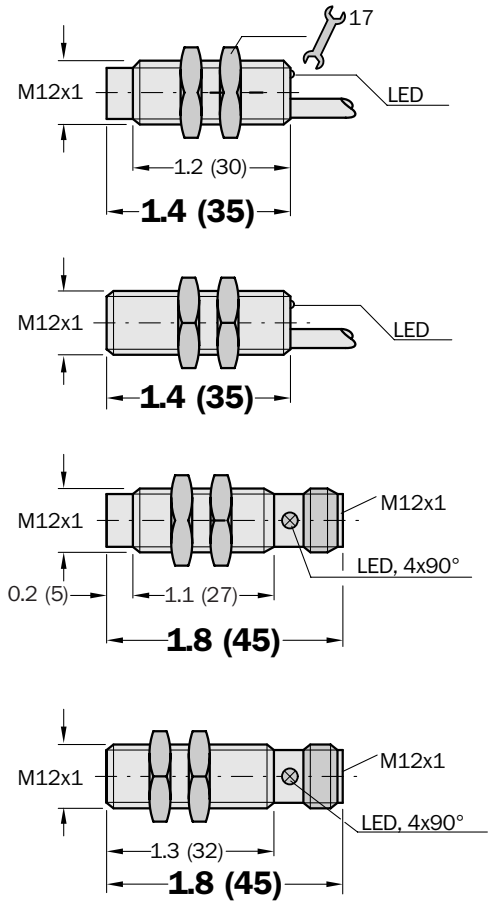
Highlights

- Shielded or unshielded
- PNP or NPN output
- Normally open function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing,nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 12 Short

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

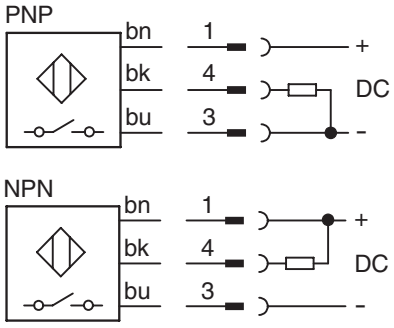
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7.0 Nm
Connection cable	PUR-PVC, 3 x 0.25 mm²

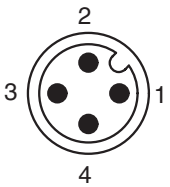
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP		3000	Cable 2 m	IM12-02BPS-ZUK	1 017 426
0.08 (2)		NPN		3000	Cable 2 m	IM12-02BNS-ZUK	1 017 438
0.08 (2)		PNP		3000	Connector M12 x 1 mm	IM12-02BPS-ZCK	1 017 428
0.08 (2)		NPN		3000	Connector M12 x 1 mm	IM12-02BNS-ZCK	1 017 440
0.2 (4)		PNP		3000	Cable 2 m	IM12-02NPS-ZUK	1 017 427
0.2 (4)		NPN		3000	Cable 2 m	IM12-02NNS-ZUK	1 017 439
0.2 (4)		PNP		3000	Connector M12 x 1 mm	IM12-02NPS-ZCK	1 017 429
0.2 (4)		NPN		3000	Connector M12 x 1 mm	IM12-02NNS-ZCK	1 017 441

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

IM 12 2-wire

Inductive Proximity Sensors

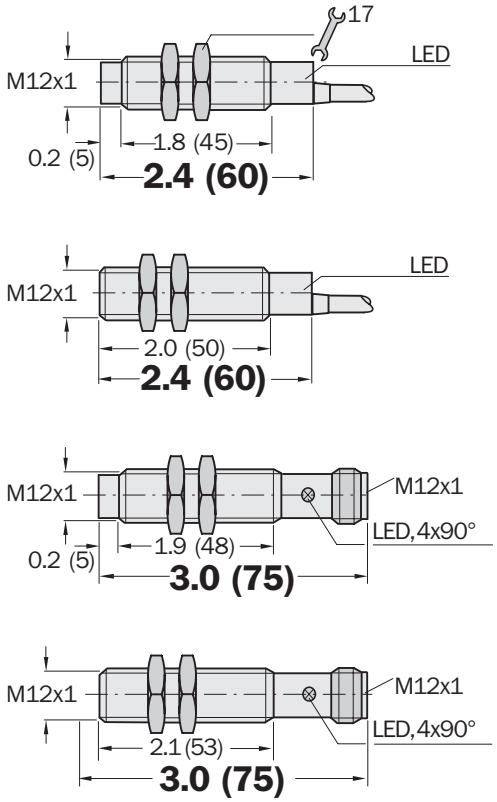
Highlights

- Shielded or unshielded
- Normally open function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 12 2-wire

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

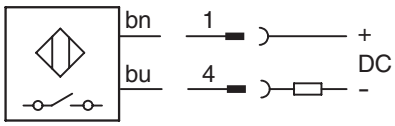
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 2.8 V at I_a max.
Power consumption (without load)	≥ 3 mA
Continuous current I_a	≤ 100 mA
Time delay before availability t_v	≤ 0.8 mA
Hysteresis H	≤ 50 ms
Repeatability R (U_b and T_a constant)	2% - 10% of s_r
Temperature drift	≤ 5% of s_r
EMC	±10% of s_r
Short circuit protection (pulsed)	to EN 60 947-5-2
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	10 Nm
Connection cable	PVC, 2 x 0.22 mm²

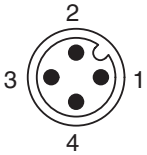
Selection Table

Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)			1500	Cable 2 m	IM12-02BDS-ZW1	6 020 310
0.08 (2)			1500	Connector M12 x 1 mm	IM12-02BDS-ZC1	6 020 312
0.2 (4)			1500	Cable 2 m	IM12-04NDS-ZW1	6 020 314
0.2 (4)			1500	Connector M12 x 1 mm	IM12-04NDS-ZC1	6 020 316

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	4	- V DC



SICK

IM 12 Advanced

Inductive Proximity Sensors

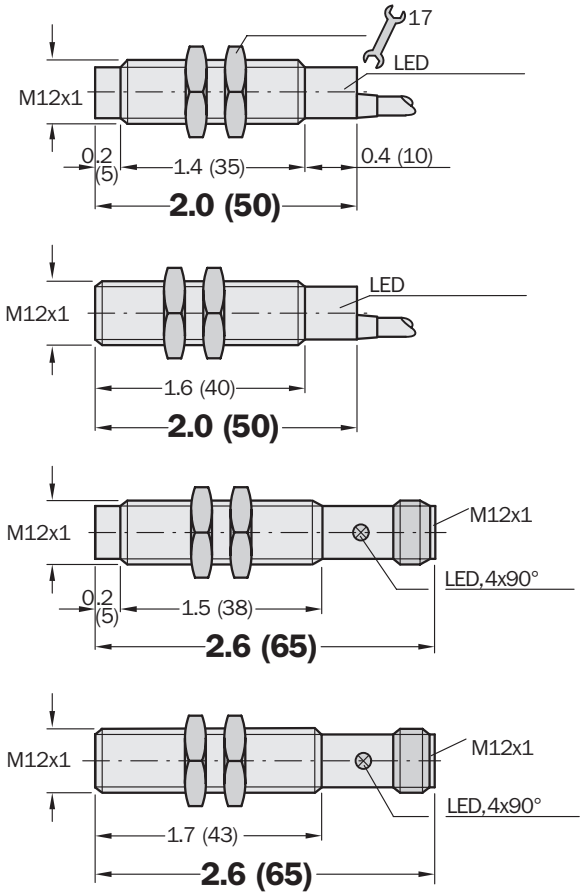
Highlights

- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 12 Advanced

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

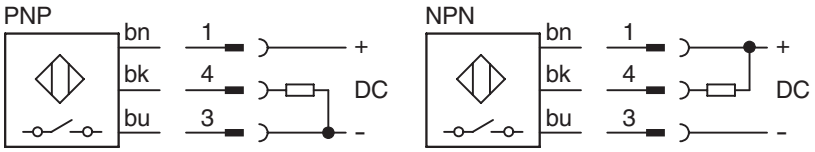
Electrical and Mechanical Data

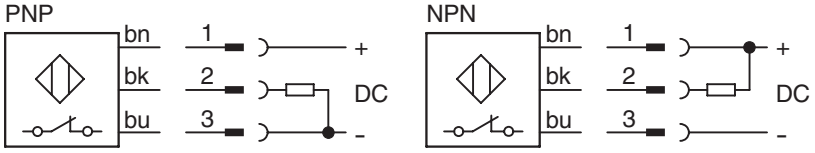
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	10 Nm
Connection cable	PVC, 3 x 0.22 mm²

Selection Table

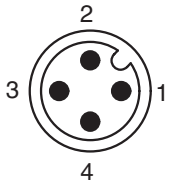
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (4)	=	PNP		1000	Cable 2 m	IM12-04BPS-ZW1	7 900 033
0.2 (4)	=	NPN		1000	Cable 2 m	IM12-04BNS-ZW1	7 900 034
0.2 (4)	=	PNP		1000	Cable 2 m	IM12-04BPO-ZW1	7 900 035
0.2 (4)	=	PNP		1000	Connector M12 x 1 mm	IM12-04BPS-ZC1	7 900 037
0.2 (4)	=	NPN		1000	Connector M12 x 1 mm	IM12-04BNS-ZC1	7 900 038
0.2 (4)	=	PNP		1000	Connector M12 x 1 mm	IM12-04BPO-ZC1	7 900 039
0.3 (8)	=	PNP		1000	Cable 2 m	IM12-08NPS-ZW1	7 900 041
0.3 (8)	=	NPN		1000	Cable 2 m	IM12-08NNS-ZW1	7 900 042
0.3 (8)	=	PNP		1000	Cable 2 m	IM12-08NPO-ZW1	7 900 043
0.3 (8)	=	NPN		1000	Cable 2 m	IM12-08NNO-ZW1	7 900 044
0.3 (8)	=	PNP		1000	Connector M12 x 1 mm	IM12-08NPS-ZC1	7 900 045
0.3 (8)	=	NPN		1000	Connector M12 x 1 mm	IM12-08NNS-ZC1	7 900 046
0.3 (8)	=	PNP		1000	Connector M12 x 1 mm	IM12-08NPO-ZC1	7 900 047

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NO/NC
bu	blue	3	- V DC



SICK

IM 12 Advanced Short

Inductive Proximity Sensors

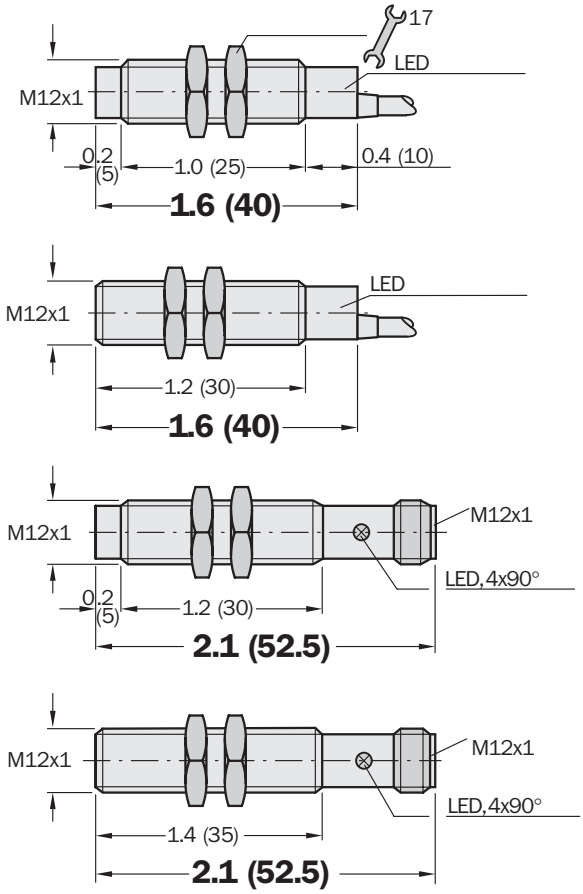
Highlights

- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 08 Advanced Short

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

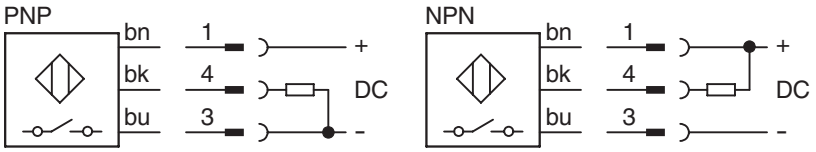
Electrical and Mechanical Data

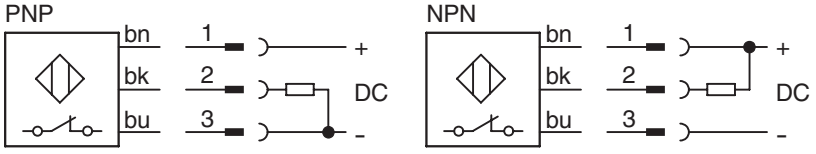
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...168°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7 Nm
Connection cable	PVC, 3 x 0.22 mm²

Selection Table

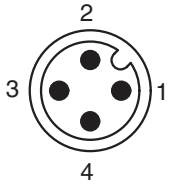
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (4)	=	PNP		2000	Cable 2 m	IM12-04BPS-ZWK	6 025 682
0.2 (4)	=	NPN		2000	Cable 2 m	IM12-04BNS-ZWK	6 025 683
0.2 (4)	=	PNP		2000	Connector M12 x 1 mm	IM12-04BPS-ZCK	6 025 679
0.2 (4)	=	NPN		2000	Connector M12 x 1 mm	IM12-04BNS-ZCK	6 025 681
0.2 (4)	=	PNP		2000	Connector M12 x 1 mm	IM12-04BPO-ZCK	6 025 680
0.2 (4)	=	NPN		2000	Connector M12 x 1 mm	IM12-04BNO-ZCK	6 025 859
0.3 (8)	=	PNP		2000	Cable 2 m	IM12-08NPS-ZWK	6 025 684
0.3 (8)	=	NPN		2000	Cable 2 m	IM12-08NNS-ZWK	6 025 685
0.3 (8)	=	PNP		2000	Connector M12 x 1 mm	IM12-08NPS-ZCK	6 025 686
0.3 (8)	=	NPN		2000	Connector M12 x 1 mm	IM12-08NNS-ZCK	6 025 687
0.3 (8)	=	PNP		2000	Connector M12 x 1 mm	IM12-08NPO-ZCK	6 025 688
0.3 (8)	=	NPN		2000	Connector M12 x 1 mm	IM12-08NNO-ZCK	6 025 860

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NO/NC
bu	blue	3	- V DC



SICK

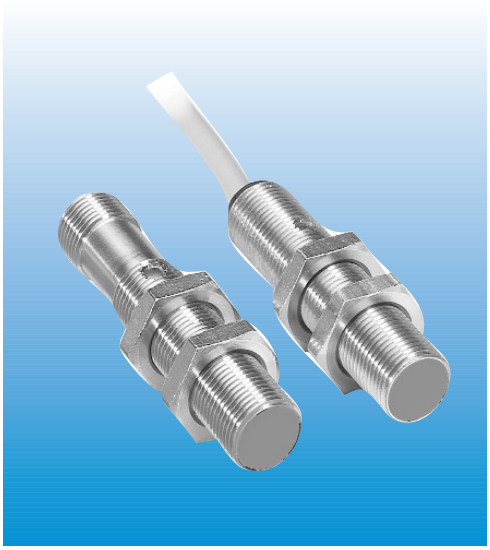
IM 12 Triple Sensing Range

Inductive Proximity Sensors

Highlights

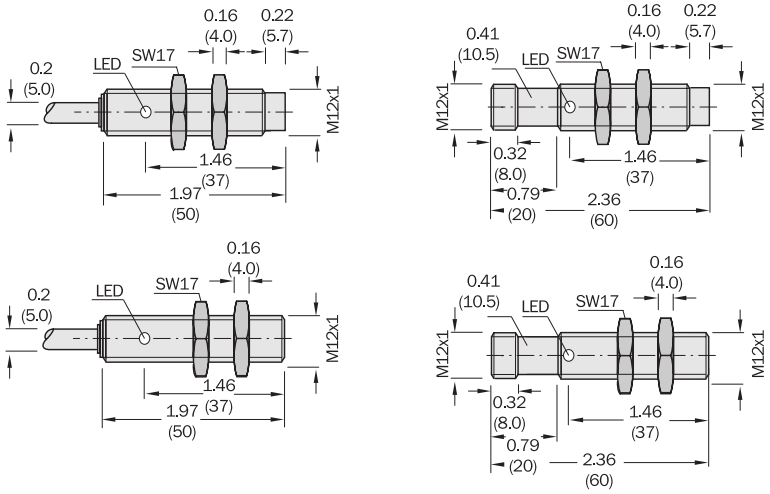
- Triple sensing range
- Installation quasi or non-flush in metal
- Normally open function/normally closed function
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 12 Triple Sensing Range



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

Electrical and Mechanical Data

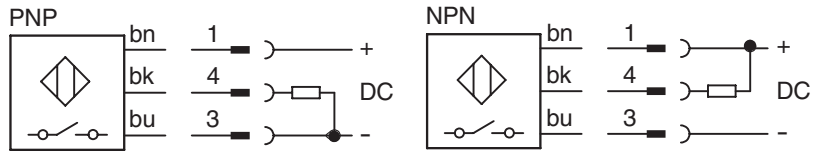
Operating voltage U_b	10...30 V DC
Ripple U_{ss}	≤ 20% of U_b
Voltage drop U_d (at I_a max.)	≤ 2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability T_v	≤ 100 ms
Hysteresis H	1% - 5% of s_r (5% typ.)
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, chrome-plated, plastic
Tightening torque	10 Nm
Connection cable	PVC, 3 x 0.34 mm²

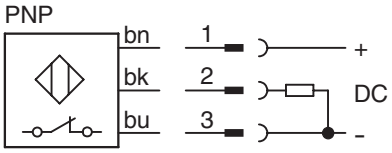
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.24 (6)	*	PNP		800	Cable 2 m	IM 12-06BPS-ZW1	6 027 509
0.24 (6)	*	PNP		800	Cable 2 m	IM12-06BPO-ZWI	6 027 510
0.24 (6)	*	PNP		800	Connector M12 x 1 mm	IM12-06BPS-ZC1	6 027 511
0.4 (10)		PNP		400	Cable 2 m	IM12-10NPS-ZW1	6 027 512
0.4 (10)		NPN		400	Cable 2 m	IM12-10NNS-ZW1	6 027 513
0.4 (10)		PNP		400	Connector M12 x 1 mm	IM12-10NPS-ZC1	6 027 514

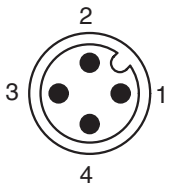
* Installation notes "quasi flush"
When mounting in conductible materials the sensors have to be installed with a distance A to the surface.
A Steel, metal = 2 mm / **A** Stainless steel = 1 mm

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NC/NO
bu	blue	3	- V DC



IM 12 Harsh Environment

Inductive Proximity Sensors

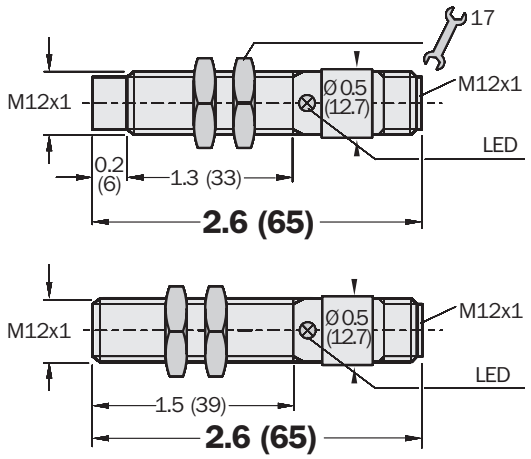
Highlights

- For harsh environment, resistant to most cutting oils
- Enclosure rating IP 68
- Shielded or unshielded
- PNP or NPN output
- Complementary output function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Internal enclosure housing in technopolymer
- LED status indicator (NO function)

IM 12 Harsh environment

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

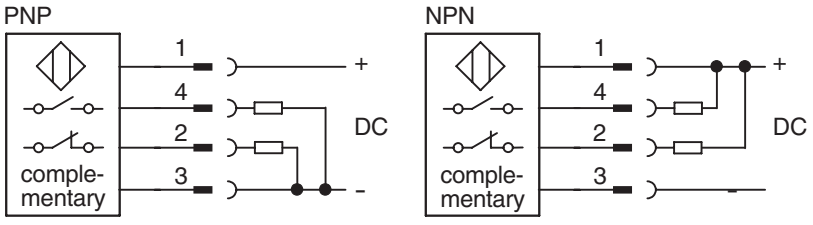
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 100 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating	IP 68
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	10 Nm

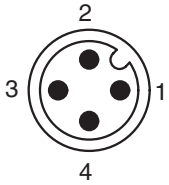
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP	 complementary	2000	Connector M12 x 1 mm	IM12-02BPP-ZC1	7 902 923
0.08 (2)		NPN	 complementary	2000	Connector M12 x 1 mm	IM12-02BNP-ZC1	7 902 924
0.2 (4)		PNP	 complementary	2000	Connector M12 x 1 mm	IM12-04NPP-ZC1	7 902 925
0.2 (4)		NPN	 complementary	2000	Connector M12 x 1 mm	IM12-04NNP-ZC1	7 902 926

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
wh	white	2	NC
bu	blue	3	- V DC
bk	black	4	NO



SICK

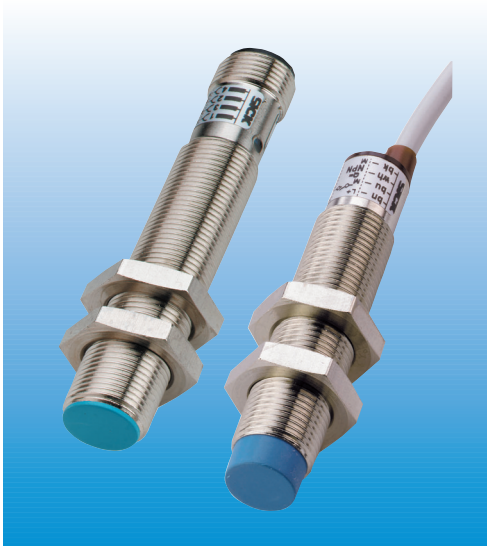
IM 12 QuadProx

Inductive Proximity Sensors

Highlights

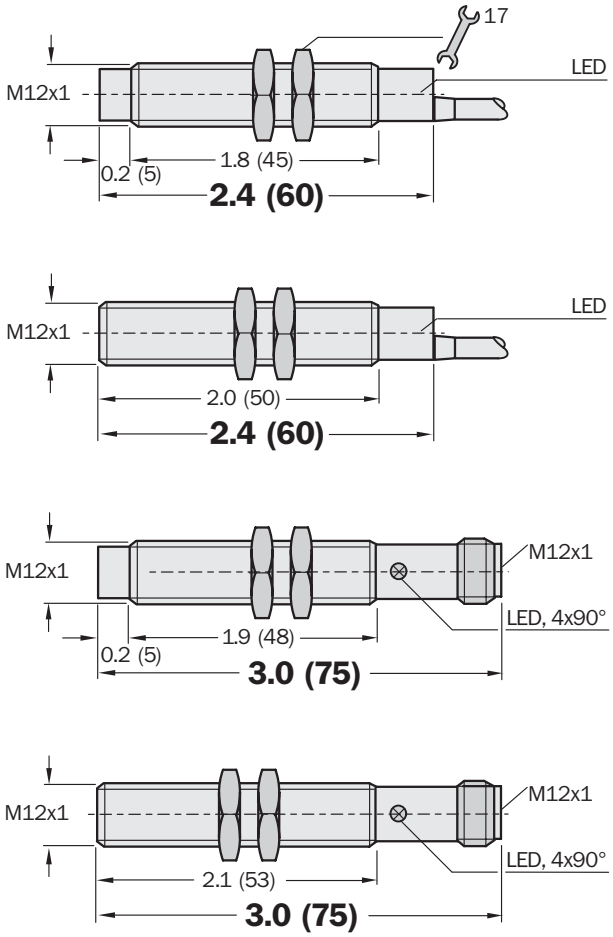
- Programmable output functions in one sensor: PNP/NO, PNP/NC, NPN/NO, NPN/NC
- Shielded or unshielded
- Short circuit protection
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator (NO function)

IM 12 QuadProx



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925

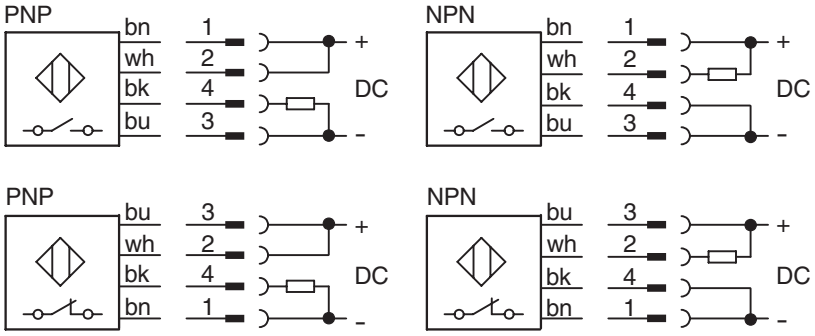
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 30 mA
Continuous current I_a	≤ 100 mA
Time delay before availability t_v	≤ 250 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	15 Nm
Connection cable	PVC, 4 x 0.22 mm²

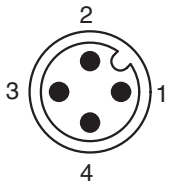
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP/NPN config.	 config.	1000	Cable 2 m	IM12-02BCP-ZW1	7 902 927
0.08 (2)		PNP/NPN config.	 config..	1000	Connector M12 x 1 mm	IM12-02BCP-ZC1	7 902 928
0.2 (4)		PNP/NPN config.	 config..	1000	Cable 2 m	IM12-04NCP-ZW1	7 902 929
0.2 (4)		PNP/NPN config.	 config.	1000	Connector M12 x 1 mm	IM12-04NCP-ZC1	7 902 930

Connection Diagram



Wire color		Contact	Configurable output function PNP		NPN	
bn	brown	1	+V DC	-V DC	+V DC	-V DC
wh	white	2	+V DC	+V DC	NO	NC
bu	blue	3	- V DC	+V DC	-V DC	+V DC
bk	black	4	NO	NC	-V DC	-V DC



SICK

IM 12 Universal

Inductive Proximity Sensors

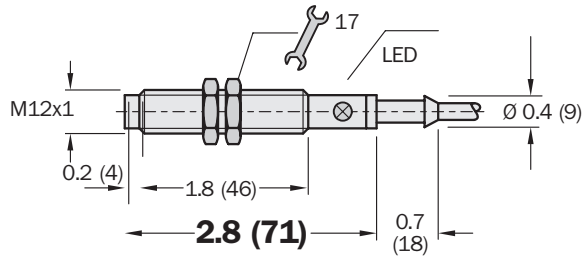
Highlights

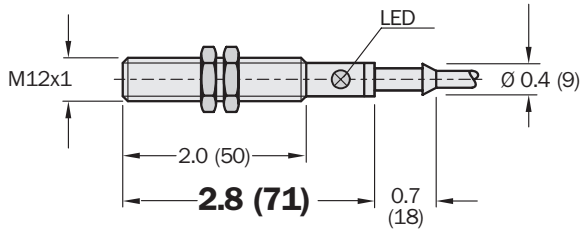
- Shielded or unshielded
- Normally open/normally closed function
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Enclosure rating IP 67
- LED status indicator

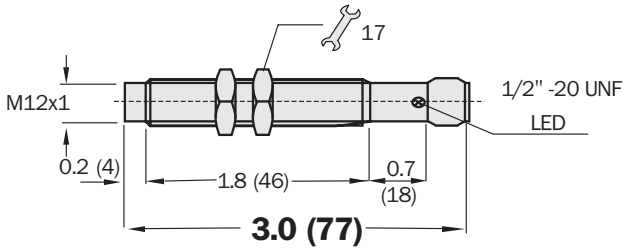
IM 12

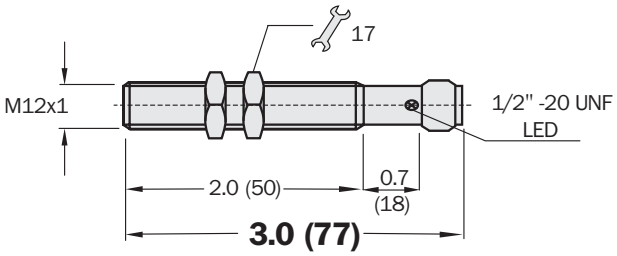
Dimensional Drawing

dimensions in inches (mm)









Accessories	page
Cables and connectors	909
Mounting brackets	925

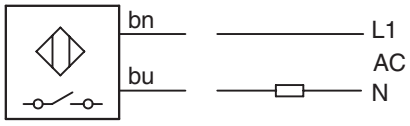
Electrical and Mechanical Data

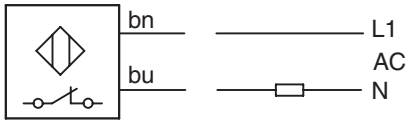
Operating voltage U_b	90...250 V AC
Voltage drop U_b	≤ 8.5 V AC at I_a max.
Continuous current I_a	≤ 250 mA AC (... + 50 °C), ≤ 200 mA AC (... + 80 °C)
Peak current I_k	0.9 A (20 ms/0.5 Hz)
Min. load current	8 mA
Residual current	≤ 3 mA (250 V AC), ≤ 1.5 mA (120 V AC)
Time delay before availability t_v	approx.10 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Protection class	□
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7 Nm
Connection cable	PUR-PVC, 2 x 0.5 mm²

Selection Table

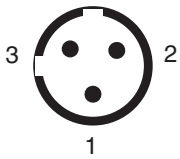
Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)	=		25	Cable 2 m	IM12-02BAS-ZU0	7 902 118
0.08 (2)	=		25	Cable 2 m	IM12-02BAO-ZU0	7 902 119
0.08 (2)	=		25	Connector Micro AC	IM12-02BAS-ZZ0	6 020 627
0.2 (4)	=		25	Cable 2 m	IM12-04NAS-ZU0	7 902 120
0.2 (4)	=		25	Cable 2 m	IM12-04NAO-ZU0	7 902 121
0.2 (4)	=		25	Connector Micro AC	IM12-04NAS-ZZ0	6 020 628

Connection Diagram





Cable version	Connector versions	Contact	Assignment
bn	red/white	3	L1
bu	red/blk	2	N
	grn	1	NC



SICK

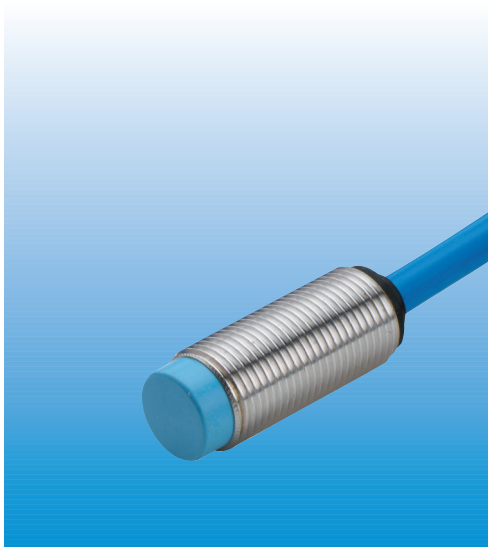
IM 12 NAMUR

Inductive Proximity Sensors

Highlights

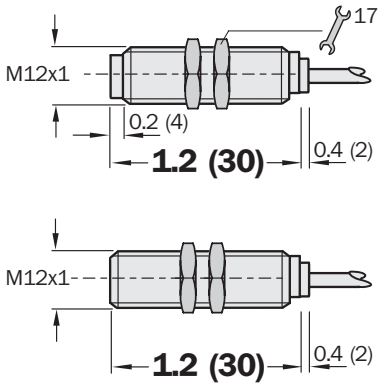
- Shielded or unshielded
- NAMUR to DIN 19 234
- High switching frequency
- Robust brass housing with nickel=plated fine thread M8 x 1
- Enclosure rating IP 67
- LED status indicator

IM 12 NAMUR



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Mounting brackets	925
Power supply	966

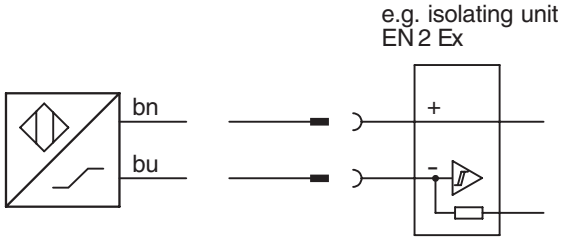
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Nominal voltage U_n	8.2 V DC
Power consumption, attenuated	≤ 1.0 mA
Power consumption, unattenuated	≥ 2.2 mA
Internal capacitance	≤ 230 nF
Internal inductance	≤ 380 µH
Cable resistance	≤ 50 Ω
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Short-circuit protected	Yes
Reverse polarity protected	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7.0 Nm
Connection cable	PVC, 2 x 0.34 mm², blue
Max. data for connecting isolating unit EN 2	
EX or other approved isolating amplifier:	
Short circuit current I_K max	50 mA
No load voltage U_O	15 V
Power loss Pmax	180 mW

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)	⊟	NAMUR	⌐	1200	Cable 2 m	IM12-02B-N-ZW0	6 021 124
0.2 (4)	⊟	NAMUR	⌐	1500	Cable 2 m	IM12-04N-N-ZW0	6 021 125

Connection Diagram



Wire color			Assignment
bn	braun	brown	+ V DC
bu	blau	blue	- V DC

SICK

IM 18 Standard

Inductive Proximity Sensors

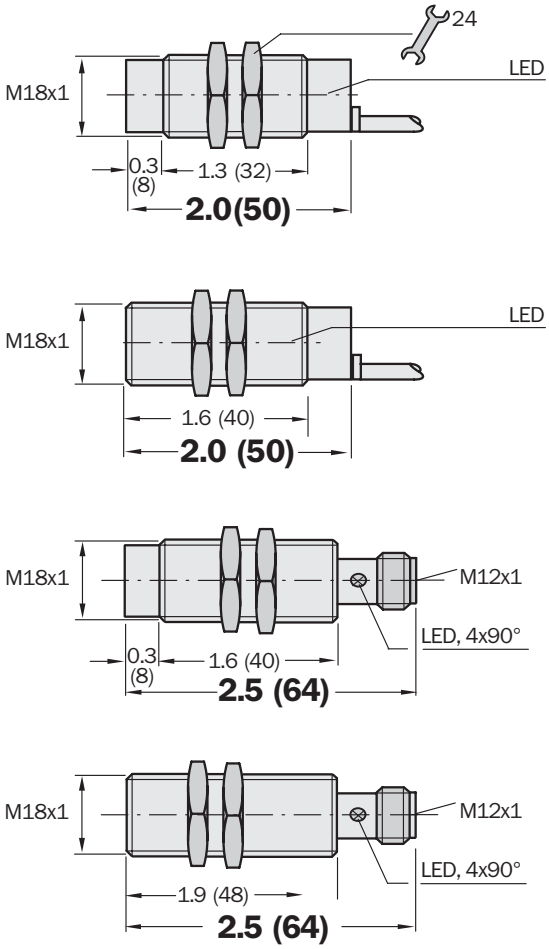
Highlights

- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 18 Standard

Dimensional Drawing

dimensions in inches (mm)

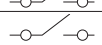
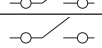
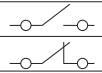
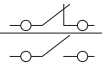
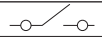


Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

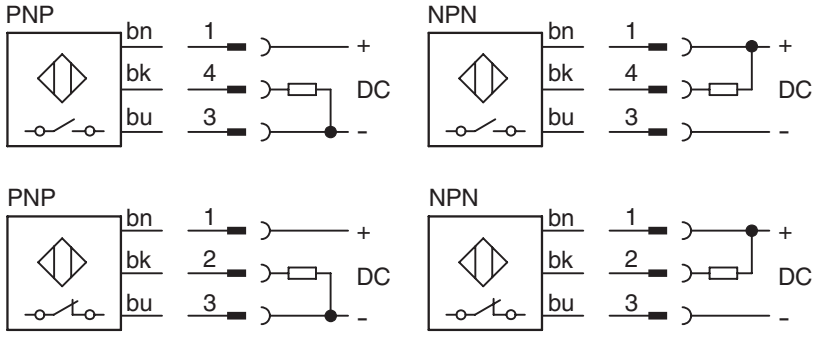
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 400 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	30 Nm
Connection cable	PVC, 3 x 0.34 mm²

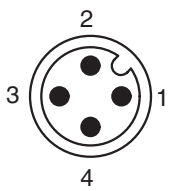
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)		PNP		600	Cable 2 m	IM18-05BPS-ZW1	6 011 987
0.2 (5)		NPN		600	Cable 2 m	IM18-05BNS-ZW1	6 011 988
0.2 (5)		PNP		600	Connector M12 x 1 mm	IM18-05BPS-ZC1	6 011 991
0.2 (5)		NPN		600	Connector M12 x 1 mm	IM18-05BNS-ZC1	6 011 992
0.2 (5)		PNP		600	Connector M12 x 1 mm	IM18-05BPO-ZC1	6 011 993
0.3 (8)		PNP		600	Cable 2 m	IM18-08NPS-ZW1	6 011 995
0.3 (8)		NPN		600	Cable 2 m	IM18-08NNS-ZW1	6 011 996
0.3 (8)		NPN		600	Cable 2 m	IM18-08NNO-ZW1	6 011 998
0.3 (8)		PNP		600	Connector M12 x 1 mm	IM18-08NPS-ZC1	6 011 999
0.3 (8)		NPN		600	Connector M12 x 1 mm	IM18-08NNS-ZC1	6 012 000
0.3 (8)		PNP		600	Connector M12 x 1 mm	IM18-08NPO-ZC1	6 012 001

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NO/NC
bu	blue	3	- V DC



SICK

IM 18 Short

Inductive Proximity Sensors

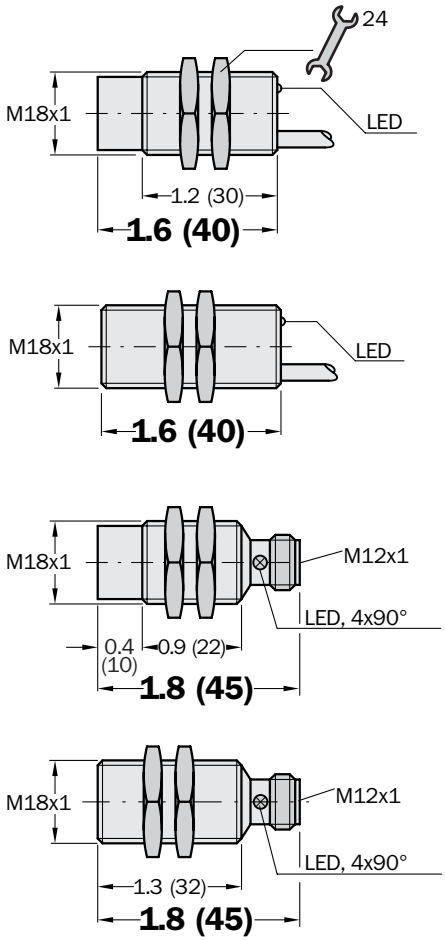
Highlights

- Shielded or unshielded
- PNP or NPN output
- Normally open function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 18 Short

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

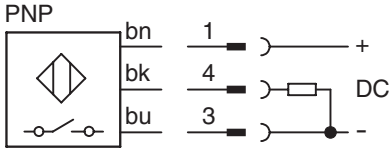
Electrical and Mechanical Data

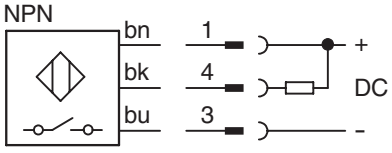
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	25 Nm
Connection cable	PUR-PVC, 3 x 0.25 mm²

Selection Table

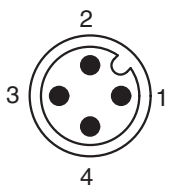
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)		PNP		2000	Cable 2 m	IM18-05BPS-ZUK	1 017 430
0.2 (5)		NPN		2000	Cable 2 m	IM18-05BNS-ZUK	1 017 442
0.2 (5)		PNP		2000	Connector M12 x 1 mm	IM18-05BPS-ZCK	1 017 432
0.2 (5)		NPN		2000	Connector M12 x 1 mm	IM18-05BNS-ZCK	1 017 444
0.3 (8)		PNP		2000	Cable 2 m	IM18-08NPS-ZUK	1 017 431
0.3 (8)		NPN		2000	Cable 2 m	IM18-08NNS-ZUK	1 017 443
0.3 (8)		PNP		2000	Connector M12 x 1 mm	IM18-08NPS-ZCK	1 017 433
0.3 (8)		NPN		2000	Connector M12 x 1 mm	IM18-08NNS-ZCK	1 017 445

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

IM 18 2-wire

Inductive Proximity Sensors

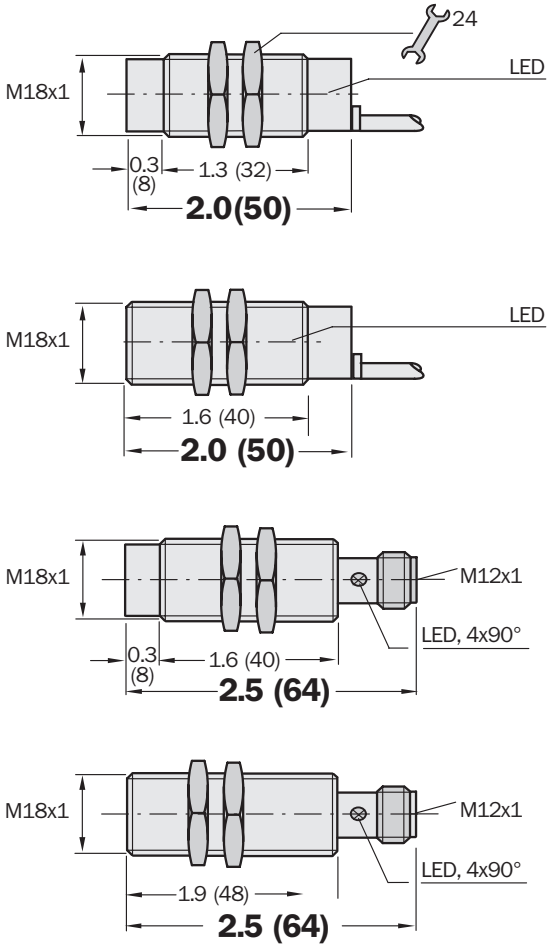
Highlights

- Shielded or unshielded
- Normally open function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 18

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

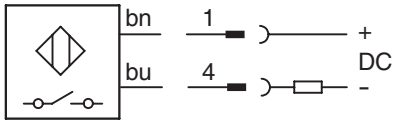
Electrical and Mechanical Data

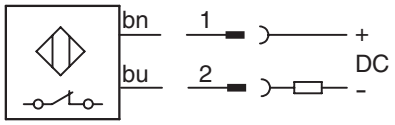
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 2.8 V at I_a max.
Load current	≥ 3 mA
Continuous current I_a	≤ 100 mA
Off-state current	≤ 0.8 mA
Time delay before availability t_v	≤ 50 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	30 Nm
Connection cable	PVC, 2 x 0.34 mm²

Selection Table

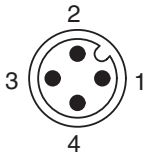
Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)			300	Cable 2 m	IM18-05BDS-ZW1	6 020 318
0.2 (5)			300	Connector M12 x 1 mm	IM18-05BDS-ZC1	6 020 320
0.3 (8)			300	Cable 2 m	IM18-08NDS-ZW1	6 020 322
0.3 (8)			300	Connector M12 x 1 mm	IM18-08NDS-ZC1	6 020 324

Connection Diagram





Wire color	Contact	Assignment
bn brown	1	+ V DC
bu blue	2/4	- V DC



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IM 18 Advanced

Inductive Proximity Sensors

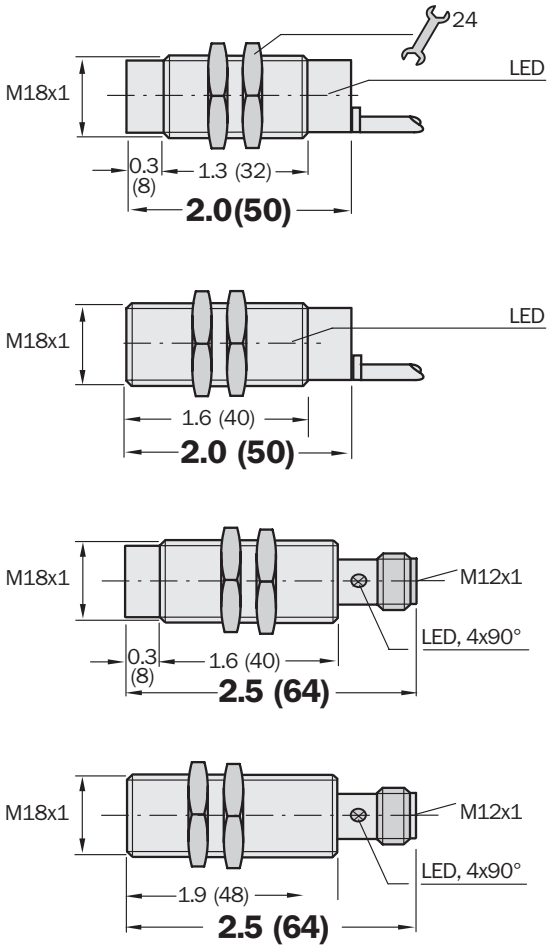
Highlights

- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- High switching frequency
- Normally open/normally closed function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Cable and connector
- LED status indicator

IM 18 Advanced

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

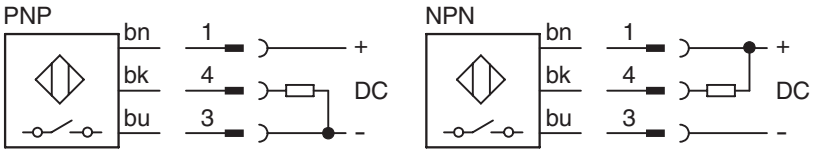
Electrical and Mechanical Data

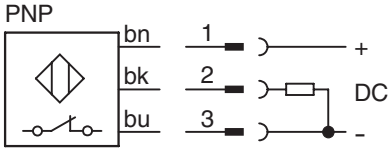
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 400 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	30 Nm
Connection cable	PVC, 3 x 0.25 mm²

Selection Table

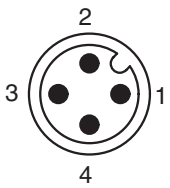
Sensing range S_n in mm	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
8		PNP		300	Cable 2 m	IM18-08BPS-ZW1	7 900 081
8		NPN		300	Cable 2 m	IM18-08BNS-ZW1	7 900 082
8		PNP		300	Cable 2 m	IM18-08BPO-ZW1	7 900 083
8		PNP		300	Connector M12 x 1 mm	IM18-08BPS-ZC1	7 900 085
8		NPN		300	Connector M12 x 1 mm	IM18-08BNS-ZC1	7 900 086
8		PNP		300	Connector M12 x 1 mm	IM18-08BPO-ZC1	7 900 087
12		PNP		300	Cable 2 m	IM18-12NPS-ZW1	7 900 093
12		NPN		300	Cable 2 m	IM18-12NNS-ZW1	7 900 094
12		PNP		300	Cable 2 m	IM18-12NPO-ZW1	7 900 095
12		PNP		300	Connector M12 x 1 mm	IM18-12NPS-ZC1	7 900 097
12		NPN		300	Connector M12 x 1 mm	IM18-12NNS-ZC1	7 900 098
12		PNP		300	Connector M12 x 1 mm	IM18-12NPO-ZC1	7 900 099

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NO/NC
bu	blue	3	- V DC



SICK

IM 18 Triple Sensing Range

Inductive Proximity Sensors

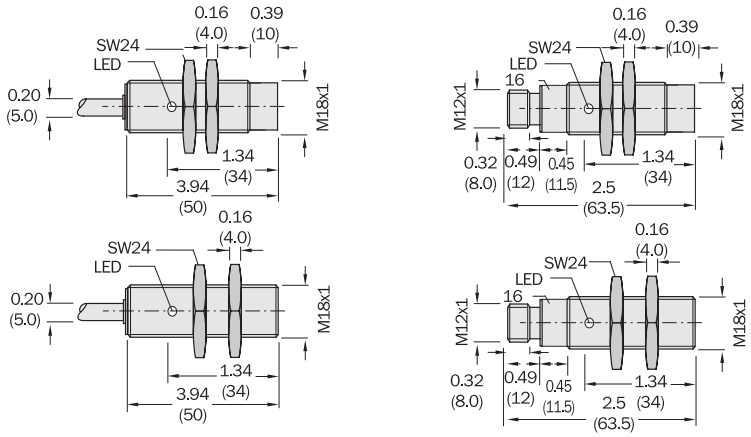
Highlights

- Triple sensing range
- Installation quasi flush or non-flush in metal
- Normally open function
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 18 Triple Sensing Range

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

Electrical and Mechanical Data

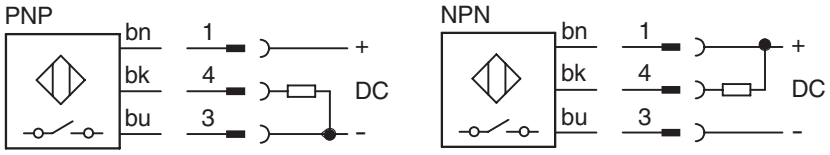
Operating voltage U_b	10...30 V DC
Ripple U_{ss}	≤ 20% of U_b
Voltage drop U_d (at I_a max.)	≤ 2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability T_v	≤ 100 ms
Hysteresis H	1% - 5% of s_r (5% typ.)
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, chrome-plated, plastic
Tightening torque	30 Nm
Connection cable	PVC, 3 x 0.34 mm²

Selection Table

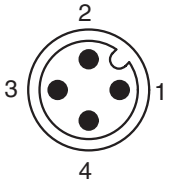
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.5 (12)	*	PNP		500	Cable 2 m	IM 18-12BPS-ZW1	6 027 515
0.5 (12)		NPN		500	Cable 2 m	IM18-12BNS-ZW1	6 027 516
0.5 (12)	*	PNP		500	Connector M12 x 1 mm	IM18-12BPS-ZC1	6 027 517
0.8 (20)		PNP		200	Cable 2 m	IM18-20NPS-ZW1	6 027 518
0.8 (20)		PNP		200	Connector M12 x 1 mm	IM18-20NPS-ZC1	6 027 519

* Installation notes "quasi flush"
When mounting in conductible materials the sensors have to be installed with a distance A to the surface.
A Steel, metal = 4 mm / **A** Stainless steel = 1.5 mm

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



IM 18 Harsh Environment

Inductive Proximity Sensors

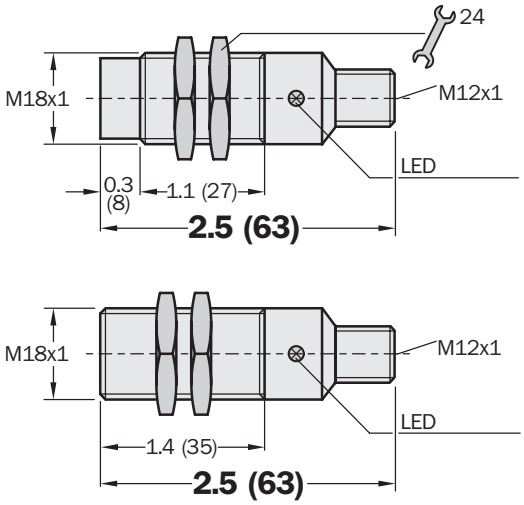
Highlights

- For harsh environment, resistant to most cutting oils
- Enclosure rating IP 68
- Shielded or unshielded
- PNP or NPN output
- Complementary output function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Internal enclosure housing in technopolymer
- LED status indicator (NO function)

IM 18 Harsh environment

Dimensional Drawing

dimensions in inches (mm)



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Cables and connectors	909
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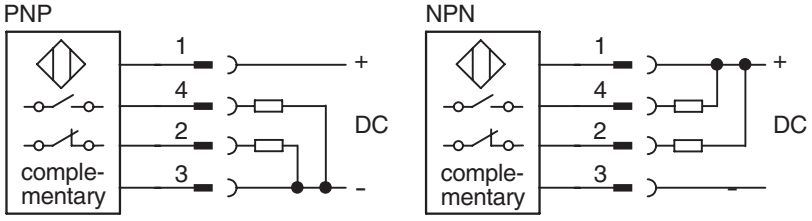
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 0.8 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 400 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating	IP 68
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	40 Nm

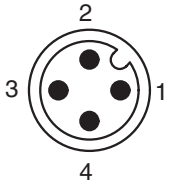
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)		PNP	 complementary	1000	Connector M12 x 1 mm	IM18-05BPP-ZC1	7 902 931
0.2 (5)		NPN	 complementary	1000	Connector M12 x 1 mm	IM18-05BNP-ZC1	7 902 932
0.3 (8)		PNP	 complementary	1000	Connector M12 x 1 mm	IM18-08NPP-ZC1	7 902 933
0.3 (8)		NPN	 complementary	1000	Connector M12 x 1 mm	IM18-08NNP-ZC1	7 902 934

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
wh	white	2	NC
bu	blue	3	- V DC
bk	black	4	NO



SICK

IM 18 QuadProx

Inductive Proximity Sensors

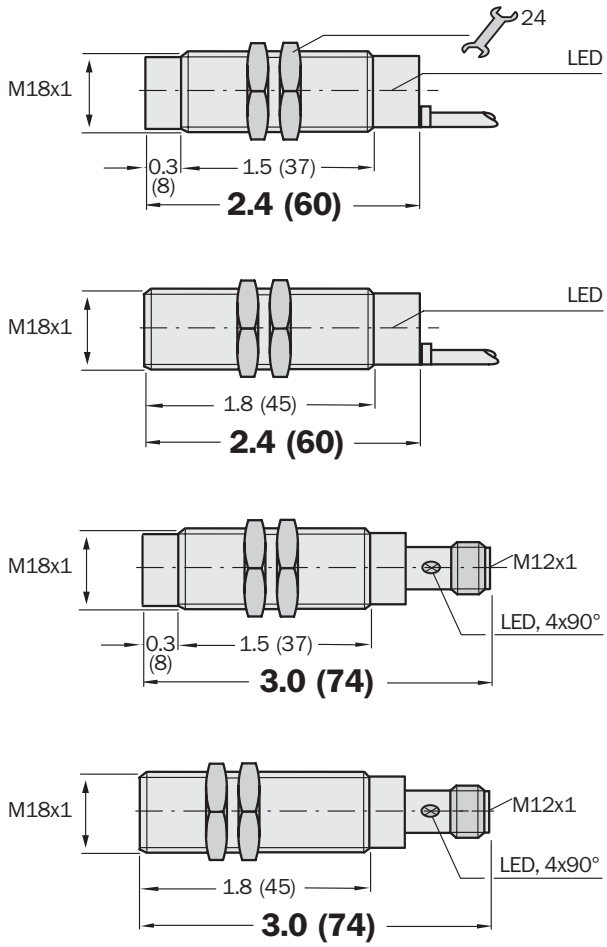
Highlights

- Programmable output functions in one sensor: PNP/NO, PNP/NC, NPN/NO, NPN/NC
- Shielded or unshielded
- Short circuit protection
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator (NO function)

IM 18 QuadProx

Dimensional Drawing

dimensions in inches (mm)



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Cables and connectors	909
Mounting brackets	925, 926

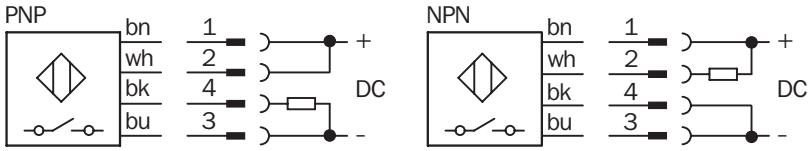
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 30 mA
Continuous current I_a	≤ 100 mA
Time delay before availability t_v	≤ 200 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	40 Nm
Connection cable	PVC, 4 x 0.34 mm²

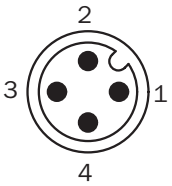
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)		PNP/NPN config.	 config.	300	Cable 2 m	IM18-05BCP-ZW1	7 902 935
0.2 (5)		PNP/NPN config.	 config.	300	Connector M12 x 1 mm	IM18-05BCP-ZC1	7 902 936
0.3 (8)		PNP/NPN config.	 config.	300	Cable 2 m	IM18-08NCP-ZW1	7 902 937
0.3 (8)		PNP/NPN config.	 config.	300	Connector M12 x 1 mm	IM18-08NCP-ZC1	7 902 938

Connection Diagram



Wire color		Contact	Configurable output function PNP		NPN	
bn	brown	1	+V DC	-V DC	+V DC	-V DC
wh	white	2	+V DC	+V DC	NO	NC
bu	blue	3	- V DC	+V DC	-V DC	+V DC
bk	black	4	NO	NC	-V DC	-V DC



SICK

IM 18 Universal

Inductive Proximity Sensors

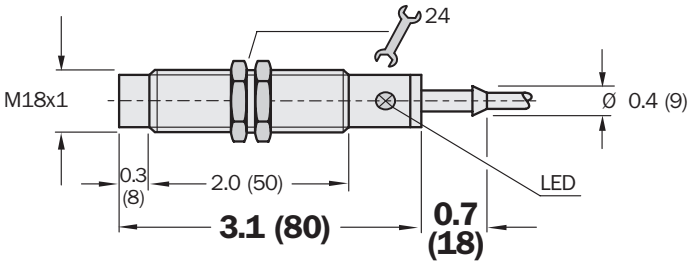
Highlights

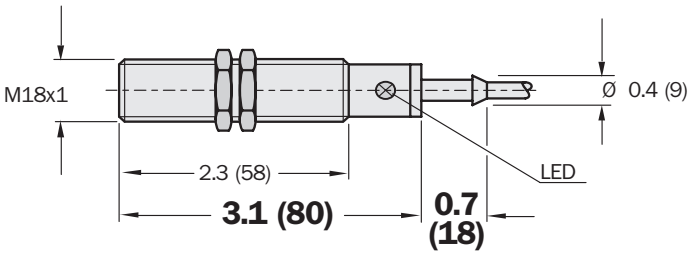
- Shielded or unshielded
- Broad operating voltage range in AC and DC
- Normally open/normally closed function
- High switching frequency
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Enclosure rating IP 67
- LED status indicator

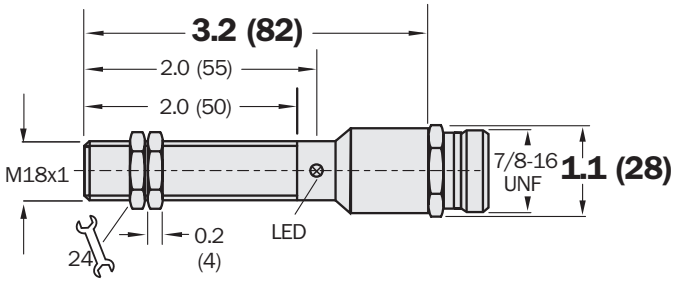
IM 18 Universal

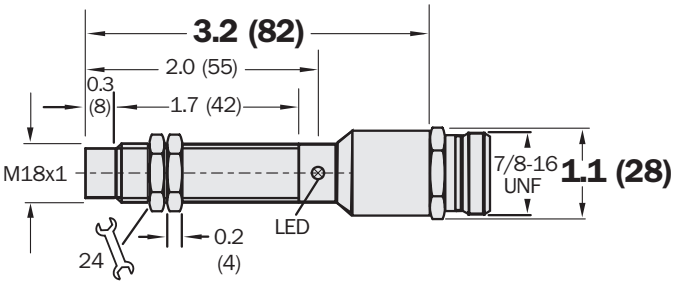
Dimensional Drawing

dimensions in inches (mm)









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Cables and connectors	911
Mounting brackets	925, 926

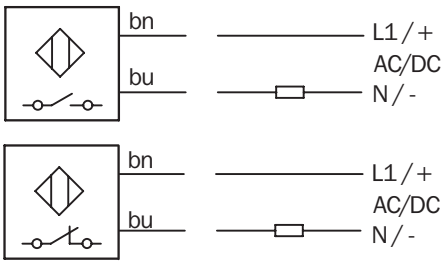
Electrical and Mechanical Data

Operating voltage U_b	20...250 V AC / DC
Voltage drop U_b	≤ 6.5 V AC / ≤ 6 V DC at I_a max.
Continuous current I_a	≤ 350 mA AC (...+50°C), ≤ 250 mA AC (...+80°C), ≤ 100 mA DC
Peak current I_k	2.2 A (20ms/0.5 Hz)
Min. load current	5 mA
Residual current	≤ 2.5 mA (250 V AC), ≤ 1.3 mA (110 V AC), ≤ 0.8 mA (24 V DC)
Time delay before availability t_v	approx. 8 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Protection class	⧈
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	35 Nm
Connection cable	PUR-PVC, 2 x 0.5 mm²

Selection Table

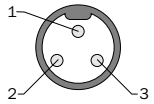
Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)	⊟	–○⁄○–	25 (AC) / 100 (DC)	Cable 2 m	IM18-05BUS-ZU0	7 902 122
0.2 (5)	⊟	–○⁄○–	25 (AC) / 100 (DC)	Cable 2 m	IM18-05BUO-ZU0	7 902 123
0.2 (5)	⊟	–○⁄○–	25 (AC) / 100 (DC)	Connector 3-pin Mini	IM18-05BUS-ZMO	6 021 223
0.3 (8)	⊟	–○⁄○–	25 (AC) / 100 (DC)	Cable 2 m	IM18-08NUS-ZU0	7 902 124
0.3 (8)	⊟	–○⁄○–	25 (AC) / 100 (DC)	Cable 2 m	IM18-08NUO-ZU0	7 902 125
0.3 (8)	⊟	–○⁄○–	25 (AC) / 100 (DC)	Connector 3-pin Mini	IM18-08NUS-ZMO	6 021 224

Connection Diagram



Wire color		Assignment
bn	brown	L1 / +
bu	blue	N / -

3-Pin Mini Connector



SICK

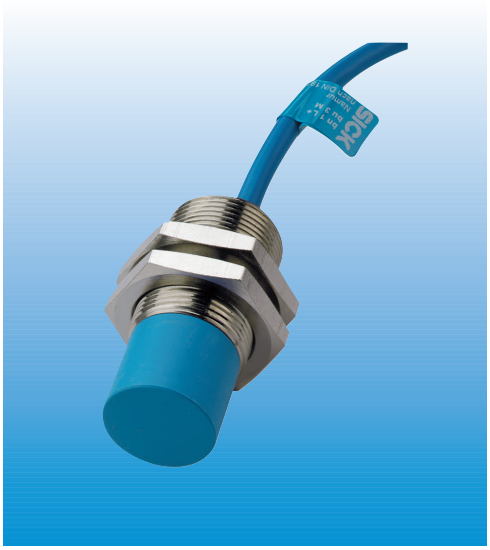
IM 18 NAMUR

Inductive Proximity Sensors

Highlights

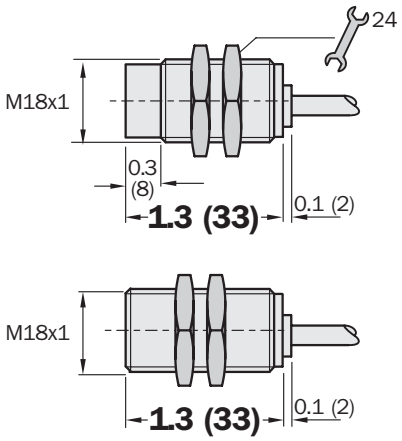
- NAMUR to DIN 19 234
- Shielded or unshielded
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- High switching frequency
- Enclosure rating IP 67
- LED status indicator (NO function)

IM 18 NAMUR



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Mounting brackets	925, 926
Power supply	966

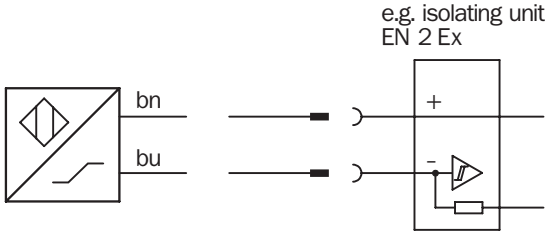
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Nominal voltage U_n	8.2 V DC
Power consumption, attenuated	≤ 1.0 mA
Power consumption, unattenuated	≥ 2.2 mA
Internal capacitance	≤ 230 nF (flush) ≤ 240 nF (non-flush)
Internal inductance	≤ 60 µH
Cable resistance	≤ 50 Ω
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Short-circuit protected	Yes
Reverse polarity protected	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	35 Nm
Connection cable	PVC, 2 x 0.34 mm^2, blue
Max. data for connecting isolating unit EN 2	
EX or other approved isolating amplifier:	
Short circuit current I_K max	50 mA
No load voltage U_O	15 V
Power loss Pmax	180 mW

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.2 (5)	=	NAMUR		720	Cable 2 m	IM18-05B-N-ZW0	6 021 126
0.3 (8)	=	NAMUR		300	Cable 2 m	IM18-08N-N-ZW0	6 021 127

Connection Diagram



Wire color			Assignment
bn	braun	brown	+ V DC
bu	blau	blue	- V DC

SICK

IM 30 Standard

Inductive Proximity Sensors

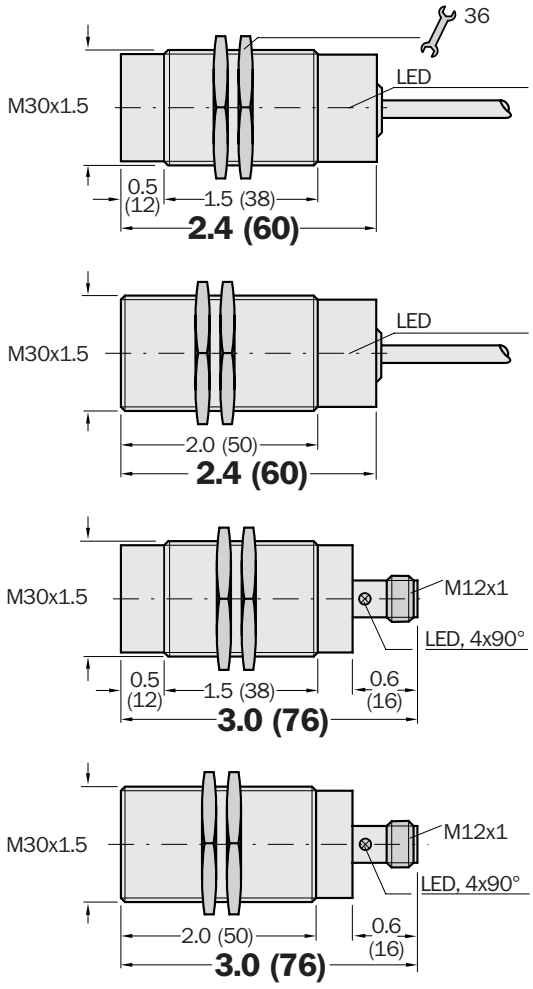
Highlights

- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M30 x 1.5 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 30 Standard

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	927

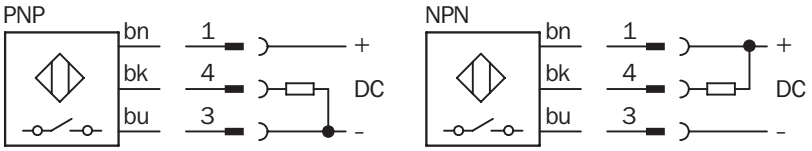
Electrical and Mechanical Data

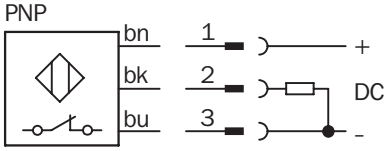
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 1 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 400 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H typ.	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	60 Nm
Connection cable	PUR-PVC, 3 x 0.5 mm²

Selection Table

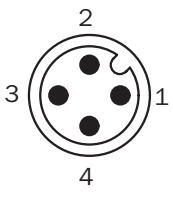
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.4 (10)	=	PNP		200	Cable 2 m	IM30-10BPS-ZW1	6 020 274
0.4 (10)	=	NPN		200	Cable 2 m	IM30-10BNS-ZW1	6 020 275
0.4 (10)	=	PNP		200	Connector M12 x 1 mm	IM30-10BPS-ZC1	6 020 278
0.4 (10)	=	NPN		200	Connector M12 x 1 mm	IM30-10BNS-ZC1	6 020 279
0.4 (10)	=	PNP		200	Connector M12 x 1 mm	IM30-10BPO-ZC1	6 020 280
0.6 (15)	=	PNP		200	Cable 2 m	IM30-15NPS-ZW1	6 020 282
0.6 (15)	=	NPN		200	Cable 2 m	IM30-15NNS-ZW1	6 020 283
0.6 (15)	=	PNP		200	Cable 2 m	IM30-15NPO-ZW1	6 020 284
0.6 (15)	=	PNP		200	Connector M12 x 1 mm	IM30-15NPS-ZC1	6 020 286
0.6 (15)	=	NPN		200	Connector M12 x 1 mm	IM30-15NNS-ZC1	6 020 287

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NO/NC
bu	blue	3	- V DC



SICK

IM 30 Short

Inductive Proximity Sensors

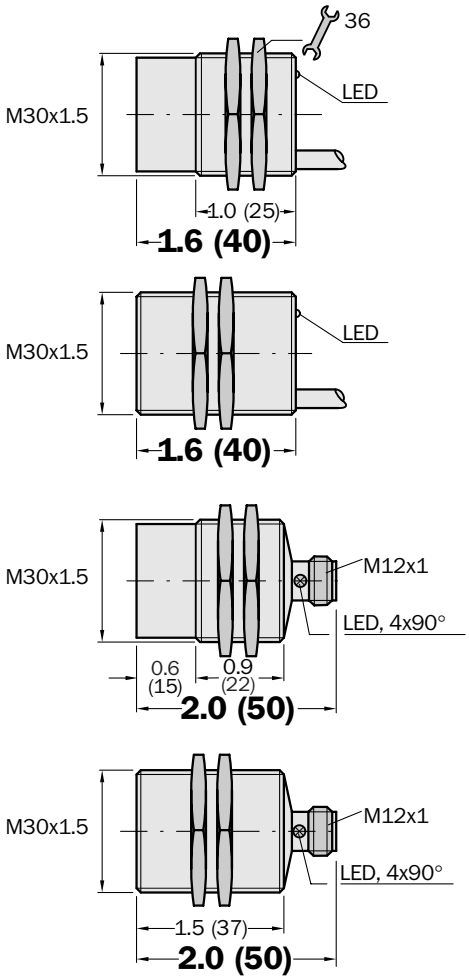
Highlights

- Shielded or unshielded
- PNP or NPN output
- Normally open function
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M30 x 1.5 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 30 Short

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	927

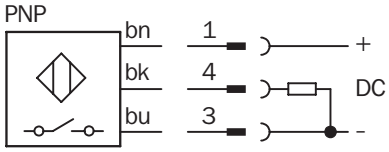
Electrical and Mechanical Data

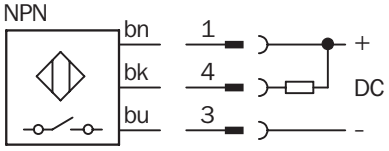
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	50 Nm
Connection cable	PUR-PVC, 3 x 0.5 mm²

Selection Table

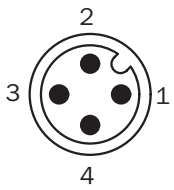
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.4 (10)	=	PNP		500	Cable 2 m	IM30-10BPS-ZUK	1 017434
0.4 (10)	=	NPN		500	Cable 2 m	IM30-10BNS-ZUK	1 017 446
0.4 (10)	=	PNP		500	Connector M12 x 1 mm	IM30-10BPS-ZCK	1 017 436
0.6 (15)	=	PNP		500	Cable 2 m	IM30-15NPS-ZUK	1 017 435
0.6 (15)	=	NPN		500	Cable 2 m	IM30-15NNS-ZUK	1 017 447
0.6 (15)	=	PNP		500	Connector M12 x 1 mm	IM30-15NPS-ZCK	1 017 437

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

IM 30 2-wire

Inductive Proximity Sensors

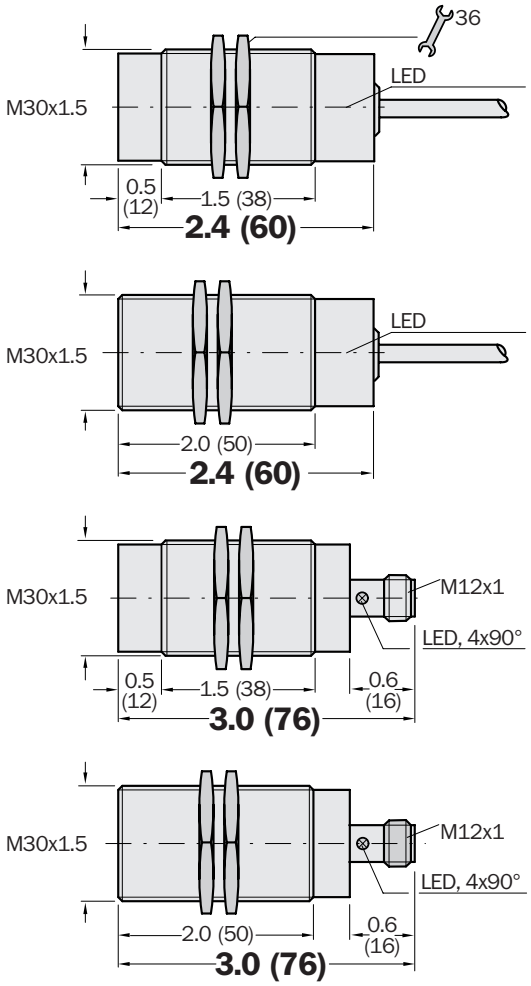
Highlights

- Shielded or unshielded
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plating with fine thread M30 x 1.5 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 30 2-wire

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	927

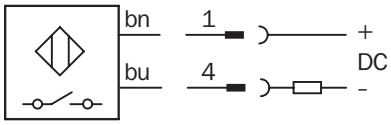
Electrical and Mechanical Data

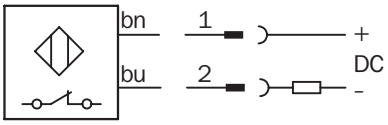
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10%
Voltage drop U_b	≤ 2.8 V at I_a max.
Load current	≥ 3 mA
Continuous current I_a	≤ 100 mA
OFF state current	≤ 0.8 mA
Time delay before availability t_v	≤ 50 ms
Hysteresis H	2% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 bis 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass nickel-plated, plastic
Tightening torque	30 Nm
Connection cable	PVC, 2 x 0.5 mm²

Selection Table

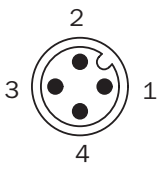
Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection	Type	Part no.
0.4 (10)			200	Cable 2 m	IM30-10BDS-ZW1	6 020 326
0.4 (10)			200	Connector M12 x 1 mm	IM30-10BDS-ZC1	6 020 328
0.6 (15)			200	Cable 2 m	IM30-15NDS-ZW1	6 020 330
0.6 (15)			200	Connector M12 x 1 mm	IM30-15NDS-ZC1	6 020 332

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	2/4	– V DC



SICK

IM 30 Advanced

Inductive Proximity Sensors

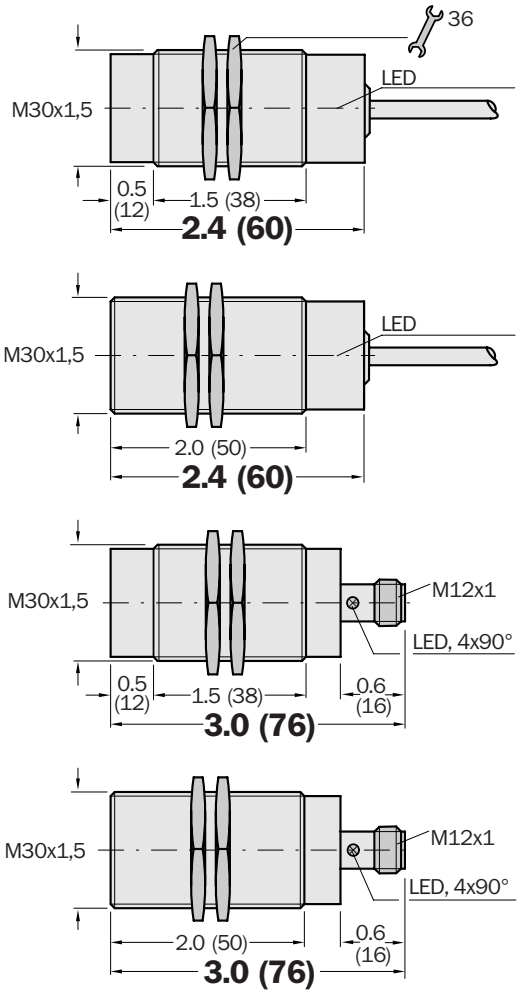
Highlights

- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- Normally open/normally closed function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M30 x 1.5 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 30 Advanced

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	927

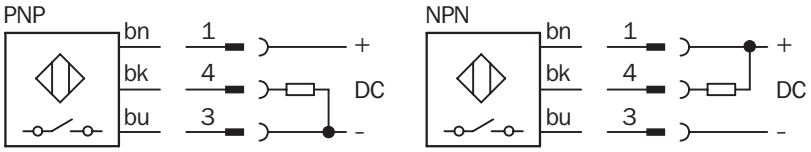
Electrical and Mechanical Data

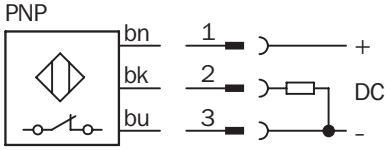
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 400 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	60 Nm
Connection cable	PVC, 3 x 0.5 mm²

Selection Table

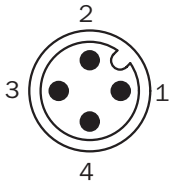
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.6 (15)		PNP		150	Cable 2 m	IM30-15BPS-ZW1	7 900 141
0.6 (15)		NPN		150	Cable 2 m	IM30-15BNS-ZW1	7 900 142
0.6 (15)		PNP		150	Cable 2 m	IM30-15BPO-ZW1	7 900 143
0.6 (15)		PNP		150	Connector M12 x 1 mm	IM30-15BPS-ZC1	7 900 145
0.6 (15)		NPN		150	Connector M12 x 1 mm	IM30-15BNS-ZC1	7 900 146
0.6 (15)		PNP		150	Connector M12 x 1 mm	IM30-15BPO-ZC1	7 900 147
0.8 (20)		PNP		150	Cable 2 m	IM30-20NPS-ZW1	7 900 153
0.8 (20)		NPN		150	Cable 2 m	IM30-20NNS-ZW1	7 900 154
0.8 (20)		PNP		150	Cable 2 m	IM30-20NPO-ZW1	7 900 155
0.8 (20)		PNP		150	Connector M12 x 1 mm	IM30-20NPS-ZC1	7 900 157
0.8 (20)		NPN		150	Connector M12 x 1 mm	IM30-20NNS-ZC1	7 900158
0.8 (20)		PNP		150	Connector M12 x 1 mm	IM30-20NPO-ZC1	7 900 159

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	2/4	NO/NC
bu	blue	3	- V DC



SICK

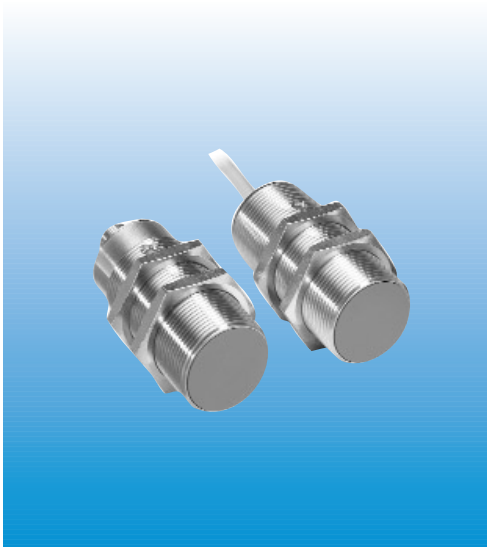
IM 30 Triple Sensing Range

Inductive Proximity Sensors

Highlights

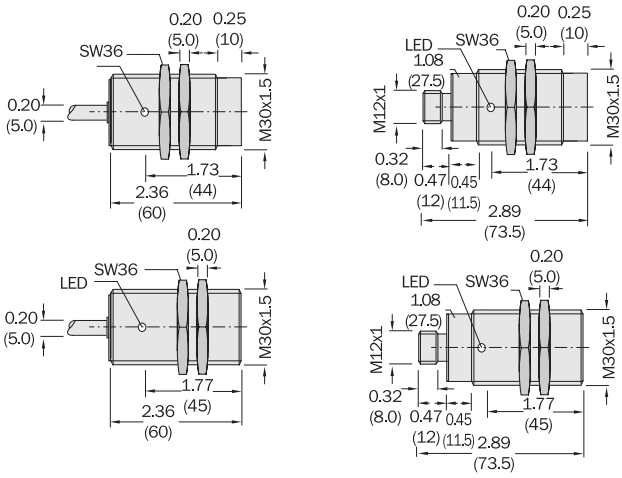
- Triple sensing range
- Installation quasi flush or non-flush in metal
- Normally open function
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M8 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IM 30 Triple Sensing Range



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	927

Electrical and Mechanical Data

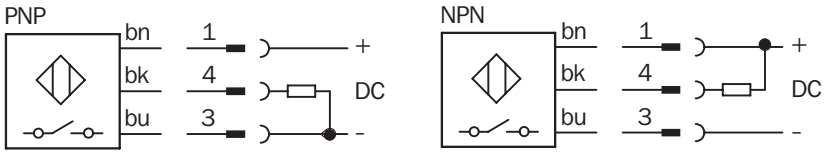
Operating voltage U_b	10...30 V DC
Ripple U_{ss}	≤ 20% of U_b
Voltage drop U_d (at I_a max.)	≤ 2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability T_v	≤ 100 ms
Hysteresis H	1% - 5% of s_r (5% typ.)
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, chrome-plated, plastic
Tightening torque	60 Nm
Connection cable	PVC, 3 x 0.34 mm²

Selection Table

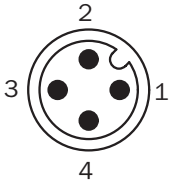
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.9 (22)	*	NPN		200	Cable 2 m	IM 30-22BNS-ZW1	6 027 520
0.9 (22)	*	PNP		200	Connector M12 x 1 mm	IM30-22BPS-ZC1	6 027 521
1.6 (40)		PNP		100	Connector M12 x 1 mm	IM30-40NPS-ZC1	6 027 522

* Installation notes "quasi flush"
When mounting in conductible materials the sensors have to be installed with a distance A to the surface.
A Steel, metal = 6 mm / **A** Stainless steel = 2 mm

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



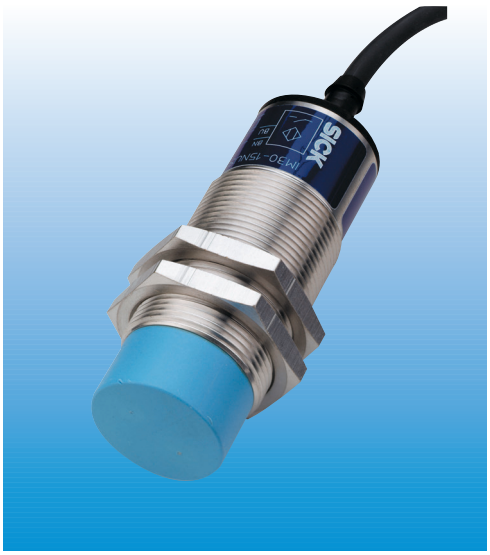
IM 30 Universal

Inductive Proximity Sensors

Highlights

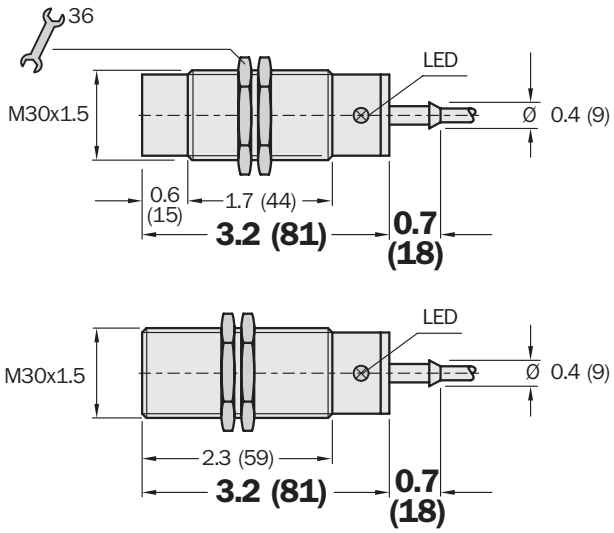
- Shielded or unshielded
- Broad operating voltage range in AC and DC
- Normally open/normally closed function
- Robust brass housing, nickel-plated with fine thread M30 x 1.5 mm
- Enclosure rating IP 67
- LED status indicator

IM 30 Universal



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Mounting brackets	927

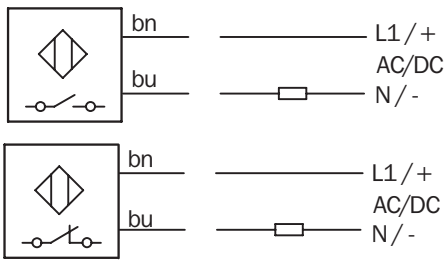
Electrical and Mechanical Data

Operating voltage U_b	2...250 V AC / DC
Voltage drop U_b	≤ 6.5 V AC / ≤ 6 V DC at I_a max.
Continuous current I_a	≤ 350 mA AC (...+50°C), ≤ 250 mA AC (...+80°C), ≤ 100 mA DC
Peak current I_k	2.2 A (20ms/0.5 Hz)
Min. load current	5 mA
Residual current	≤ 2.5 mA (250 V AC), ≤ 1.3 mA (110 V AC), ≤ 0.8 mA (24 V DC)
Time delay before availability t_v	approx. 8 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Protection class	⧈
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	50 Nm
Connection cable	PUR-PVC, 2 x 0.5 mm²

Selection Table

Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection	Type	Part no.
0.4 (10)			25 (AC) / 30 (DC)	Cable 2 m	IM30-10BUS-ZU0	7 902 126
0.4 (10)			25 (AC) / 30 (DC)	Cable 2 m	IM30-10BU0-ZU0	7 902 127
0.6 (15)			25 (AC) / 30 (DC)	Cable 2 m	IM30-15NUS-ZU0	7 902 128

Connection Diagram



Wire color		Assignment
bn	brown	L1 / +
bu	blue	N / -

IM 30 NAMUR

Inductive Proximity Sensors

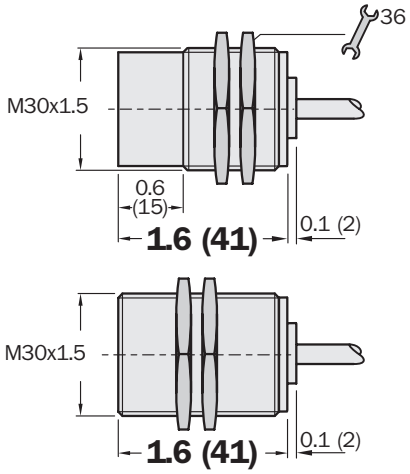
Highlights

- Shielded
- High switching frequency
- Short circuit protection (pulsed)
- Solid stainless steel housing
- Cable
- Enclosure rating IP 67
- LED status indicator

IM 30 NAMUR

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Mounting brackets	927
Power supply	966

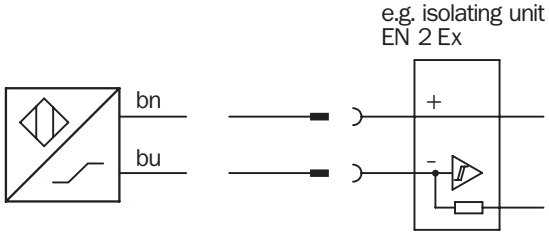
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Power consumption, attenuated	≤ 1.0 mA
Power Consumption, unattenuated	≥ 2.2 mA
Internal capacitance	≤ 230 nF (flush) ≤ 240 nF (non-flush)
Internal inductance	≤ 130 µH (flush) ≤ 100 µH (non-flush)
Cable resistance	≤ 50 Ω
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	10% of s_r
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Short circuit protected	Yes
Reverse polarity protected	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	50 Nm
Connection cable	PUR-PVC, 3 x 0.055 mm², blue
Max. data for connecting isolating unit EN 2	
EX or other approved isolating amplifier:	
Short circuit current I_K max	50 mA
No load voltage U_O	15 V
Power loss Pmax	180 mW

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.4 (10)		NAMUR		450	Cable 2 m	IM30-10B-N-ZW0	6 021 128
0.6 (15)		NAMUR		200	Cable 2 m	IM30-15N-N-ZW0	6 021 129

Connection Diagram



Wire color			Assignment
bn	braun	brown	+ V DC
bu	blau	blue	- V DC

SICK

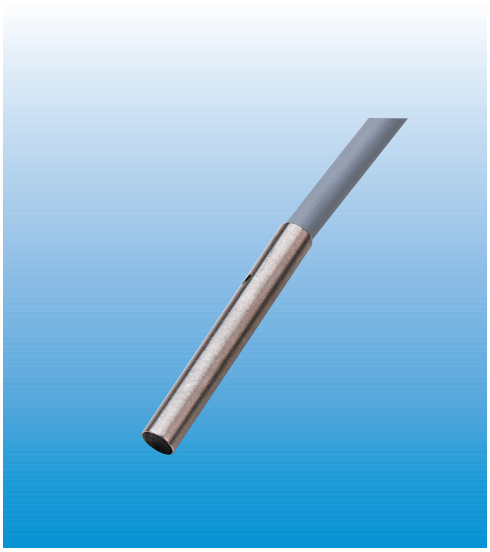
IH 03 Miniature

Inductive Proximity Sensors

Highlights

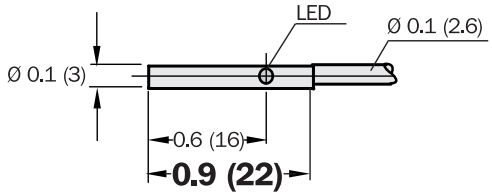
- Shielded
- PNP or NPN output
- Normally open function
- High switching frequency
- Short circuit protection (pulsed)
- Solid stainless steel housing
- Cable
- Enclosure rating IP 67
- LED status indicator

IH 03 Miniature



Dimensional Drawing

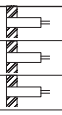
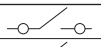
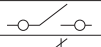
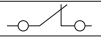
dimensions in inches (mm)



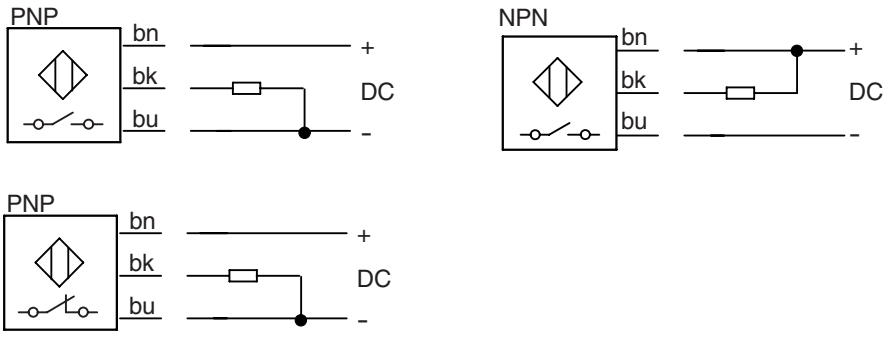
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 0.6 V max. at I_a max.
Power consumption (without load)	10 mA
Continuous current I_a	≤ 100 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	10% of s_r
Repeatability R (U_b and T_a constant)	≤ 2%
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Stainless steel, plastic
Connection cable	PUR-PVC, 3 x 0.055 mm²

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.02 (0.6)		PNP		2000	Cable 2 m	IH03-0B6PS-VU1	6 020 141
0.02 (0.6)		NPN		2000	Cable 2 m	IH03-0B6NS-VU1	6 020 142
0.02 (0.6)		PNP		2000	Cable 2 m	IH03-0B6PO-VU1	6 020 143

Connection Diagram



Wire color		Assignment
bn	brown	+ V DC
bk	black	NO/NC
bu	blue	- V DC

SICK

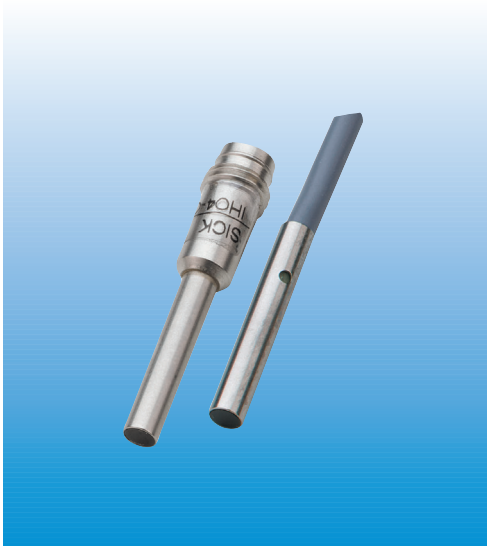
IH 04 Miniature

Inductive Proximity Sensors

Highlights

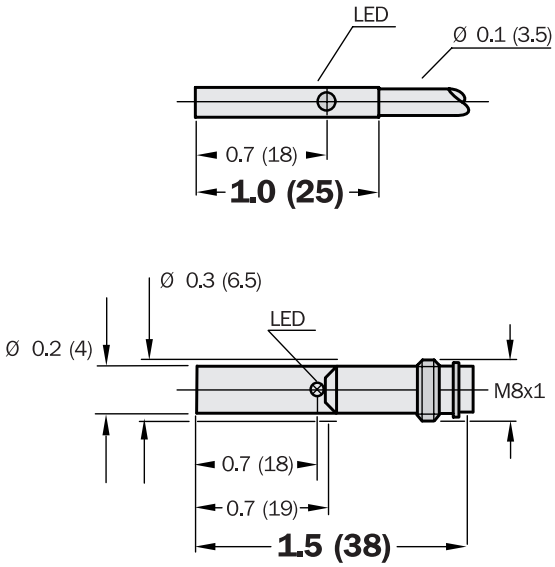
- Shielded
- PNP or NPN output
- Normally open function
- High switching frequency
- Short circuit protection (pulsed)
- Solid stainless steel housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IH 04 Miniature



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908

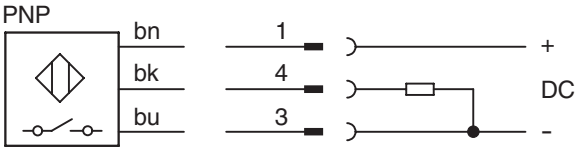
Electrical and Mechanical Data

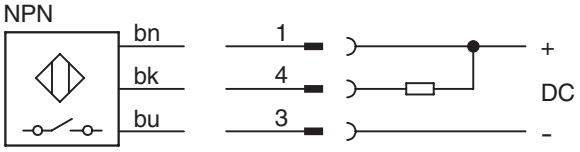
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 2.0 V max. at I_a max.
Power consumption (without load)	10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1.5%
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Stainless steel, plastic
Connection cable	PUR-PVC, 3 x 0.14 mm²

Selection Table

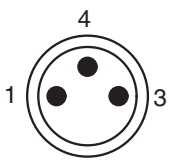
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.03 (0.8)	≠	PNP		5000	Cable 2 m	IH04-0B8PS-VW1	6 020 113
0.03 (0.8)	≠	NPN		5000	Cable 2 m	IH04-0B8NS-VW1	6 020 149
0.03 (0.8)	≠	PNP		5000	Connector M8 x 1 mm	IH04-0B8PS-VT1	6 020 114
0.03 (0.8)	≠	NPN		5000	Connector M8 x 1 mm	IH04-0B8NS-VT1	6 020 152

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

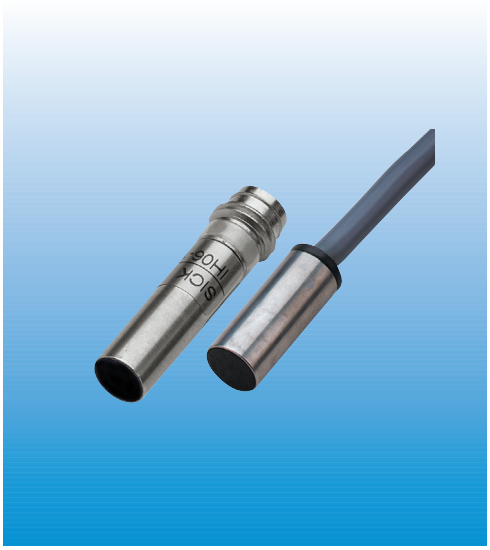
IH 06 Short

Inductive Proximity Sensors

Highlights

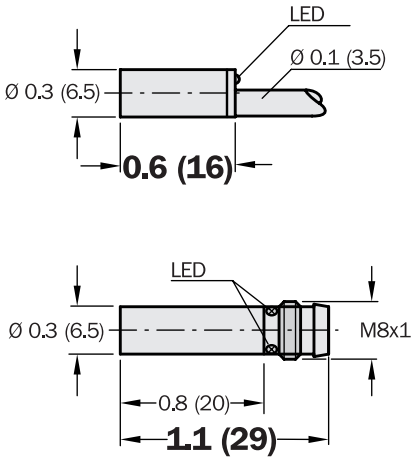
- Shielded
- PNP or NPN output
- Normally open function
- High switching frequency
- Short circuit protection (pulsed)
- Solid stainless steel housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IH 06 Short



Dimensional Drawing

dimensions in inches (mm)



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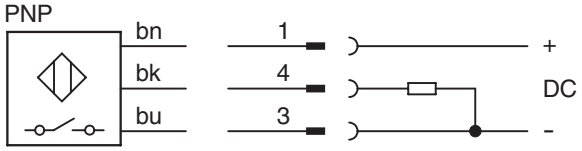
Electrical and Mechanical Data

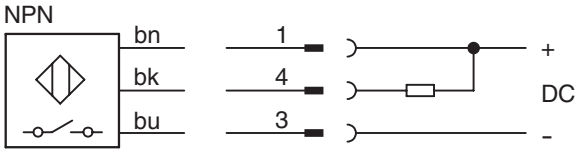
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 2.0 V max. at I_a max.
Power consumption (without load)	10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	10% of s_r
Repeatability R (U_b and T_a constant)	≤ 5%
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Stainless steel, plastic
Connection cable	PVC, 3 x 0.14 mm²

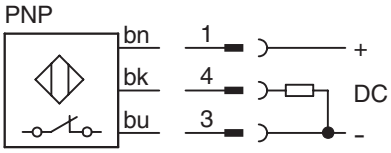
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.6 (1.5)	=	PNP		5000	Cable 2 m	IH06-1B5PS-VWK	6 020 165
0.6 (1.5)	=	NPN		5000	Cable 2 m	IH06-1B5NS-VWK	6 020 166
0.6 (1.5)	=	PNP		5000	Cable 2 m	IH06-1B5PO-VWK	6 020 167
0.6 (1.5)	=	PNP		5000	Connector M8 x 1 mm	IH06-1B5PS-VTK	6 020 169
0.6 (1.5)	=	NPN		5000	Connector M8 x 1 mm	IH06-1B5NS-VTK	6 020 170
0.6 (1.5)	=	PNP		5000	Connector M8 x 1 mm	IH06-1B5PO-VTK	6 020 171

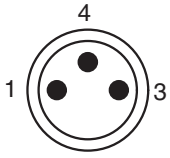
Connection Diagram







Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

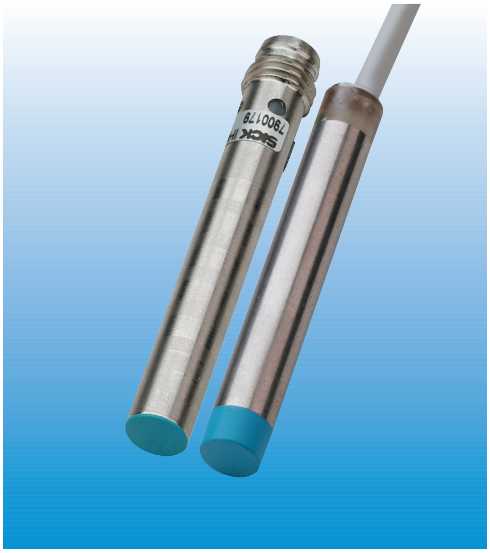
IH 06 Advanced

Inductive Proximity Sensors

Highlights

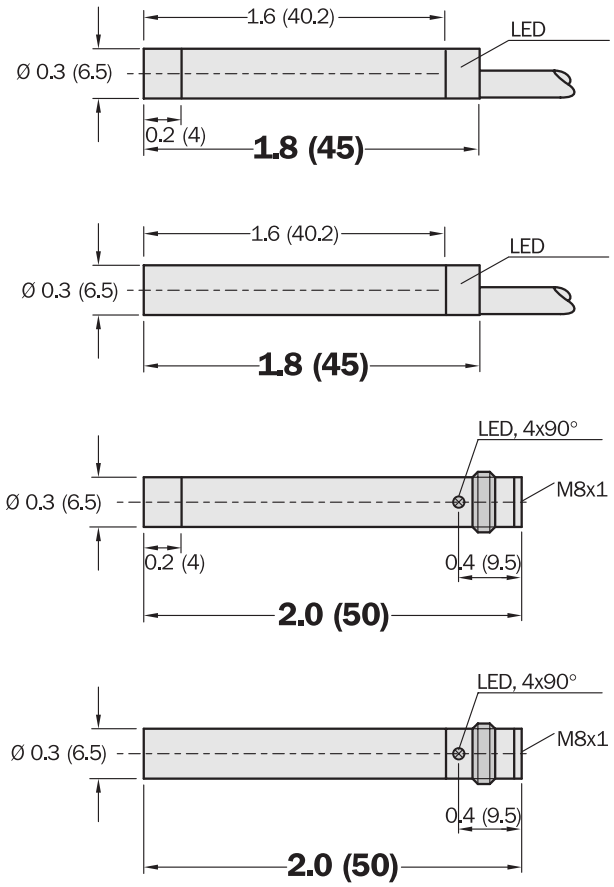
- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Solid stainless steel housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IH 06 Advanced



Dimensional Drawing

dimensions in inches (mm)



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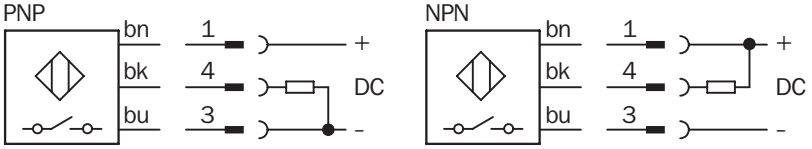
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 20 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	2% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Stainless steel, plastic
Connection cable	PVC, 3 x 0.14 mm²

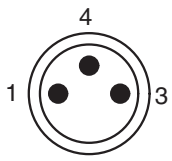
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP		3000	Cable 2 m	IH06-02BPS-VW1	7 900 177
0.08 (2)		NPN		3000	Cable 2 m	IH06-02BNS-VW1	7 900 178
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IH06-02BPS-VT1	7 900 179
0.08 (2)		NPN		3000	Connector M8 x 1 mm	IH06-02BNS-VT1	7 900 180
0.2 (4)		PNP		3000	Cable 2 m	IH06-04NPS-VW1	7 900181
0.2 (4)		NPN		3000	Cable 2 m	IH06-04NNS-VW1	7 900 182
0.2 (4)		PNP		3000	Connector M8 x 1 mm	IH06-04NPS-VT1	7 900 183

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

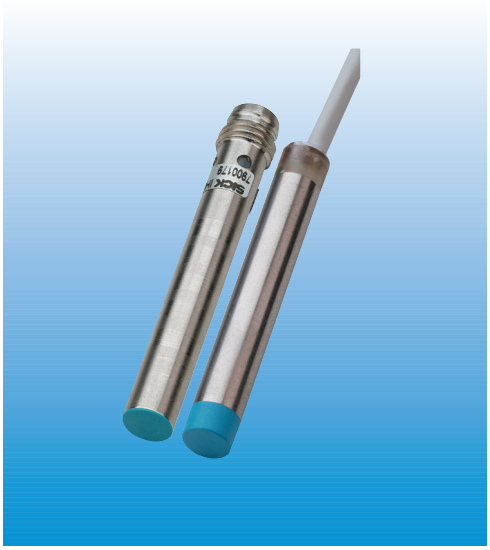
IH 06 Advanced Short

Inductive Proximity Sensors

Highlights

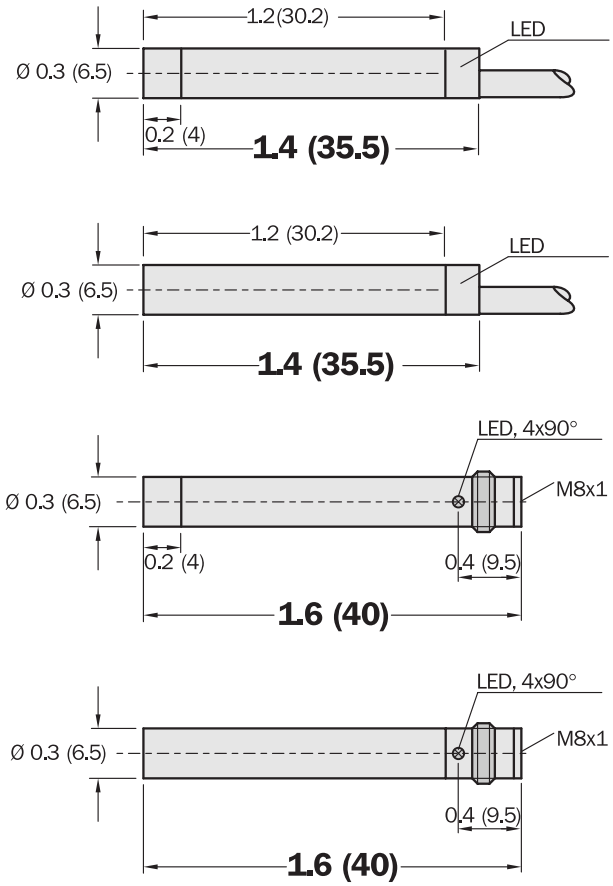
- Enhanced sensing range
- Shielded or unshielded
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Solid stainless steel housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IH 06 Advanced Short



Dimensional Drawing

dimensions in inches (mm)



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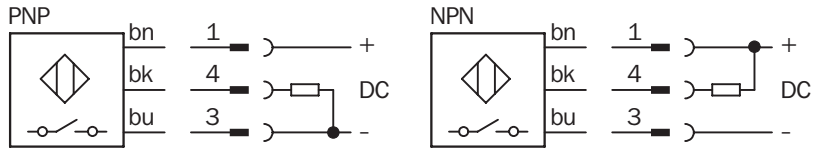
Electrical and Mechanical Data

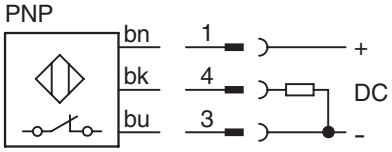
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 5 ms
Hysteresis H	1% - 20% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...160°F (-25...70°C)
Housing material	Stainless steel, plastic
Connection cable	PVC, 3 x 0.14 mm²

Selection Table

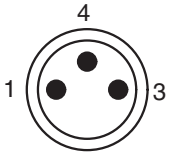
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)		PNP		3000	Cable 2 m	IH06-02BPS-VWK	6 025 874
0.08 (2)		NPN		3000	Cable 2 m	IH06-02BNS-VWK	6 025 874
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IH06-02BPS-VTK	6 025 874
0.08 (2)		NPN		3000	Connector M8 x 1 mm	IH06-02BNS-VTK	6 025 874
0.08 (2)		PNP		3000	Connector M8 x 1 mm	IH06-02BPO-VTK	6 025 874
0.2 (4)		PNP		2500	Cable 2 m	IH06-04NPS-VWK	6 025 874
0.2 (4)		NPN		2500	Cable 2 m	IH06-04NNS-VWK	6 025 874
0.2 (4)		PNP		2500	Connector M8 x 1 mm	IH06-04NPS-VTK	6 025 874
0.2 (4)		NPN		2500	Connector M8 x 1 mm	IH06-04NNS-VTK	6 025 874
0.2 (4)		PNP		2500	Connector M8 x 1 mm	IH06-04NPO-VTK	6 025 874

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO/NC
bu	blue	3	- V DC



SICK

IH 20 Universal

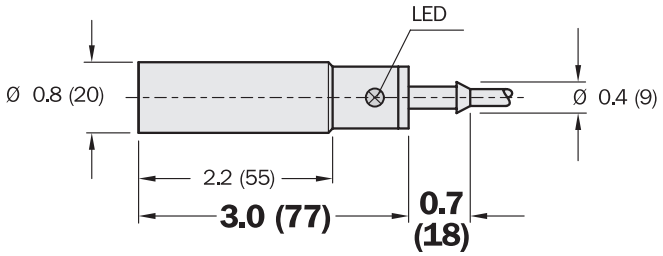
Inductive Proximity Sensors

Highlights

- Unshielded
- Broad operating voltage range in AC and DC
- Short circuit protection (pulsed)
- Plastic housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

Dimensional Drawing

dimensions in inches (mm)



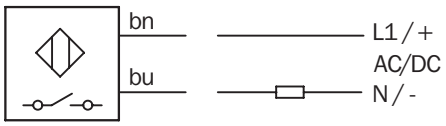
Electrical and Mechanical Data

Operating voltage U_b	20...250 V AC / DC
Voltage drop U_d (at I_a max.)	≤ 6.5 V AC / ≤ 6 V DC
Continuous current I_a	≤ 350 mA AC (... 50°C), ≤ 250 mA AC (...80°C), ≤ 100 mA DC
Peak current I_k	2.2 A (20 ms / 0.5 Hz)
Min. load current	5 mA
Residual current	≤ 2.5 mA (250 V AC), ≤ 1.3 mA (110 V AC), ≤ 0.8 mA (24 V DC)
Time delay before availability t_v	approx. 45 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Protection class	□
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...176°F (-25...80°C)
Housing material	Plastic
Connection cable	PUR-PVC, 2 x 0.5 mm²

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.4 (10)		PNP		25 (AC) / 70 (DC)	Cable 2 m	IH20-10NUS-KU0	7 902 130

Connection Diagram



Wire color		Assignment
bn	brown	L1 / +
bu	blue	N / -

SICK

IH 34 Universal

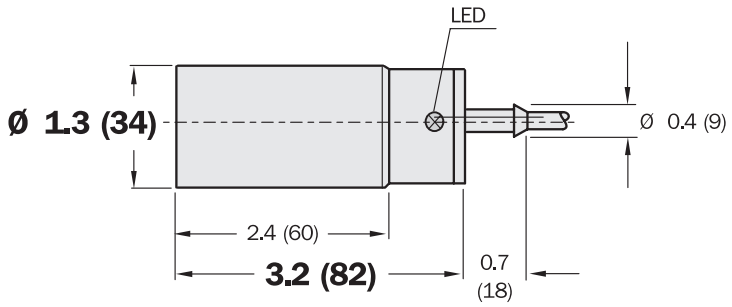
Inductive Proximity Sensors

Highlights

- Enhanced sensing range
- Unshielded
- Broad operating voltage range in AC or DC
- Plastic housing
- Enclosure rating IP 67
- LED status indicator

Dimensional Drawing

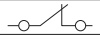
dimensions in inches (mm)



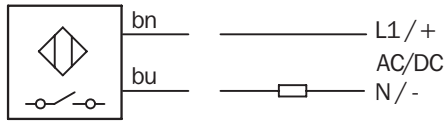
Electrical and Mechanical Data

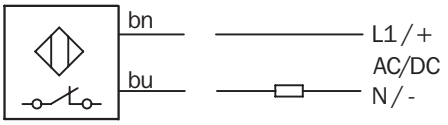
Operating voltage U_b	20...250 V AC / DC
Voltage drop U_d (at I_a max.)	≤ 6.5 V AC / ≤ 6 V DC
Continuous current I_a	≤ 350 mA AC (... 50°C), ≤ 250 mA AC (...80°C), ≤ 100 mA DC
Peak current I_k	2.2 A (20 ms / 0.5 Hz)
Min. load current	5 mA
Residual current	≤ 2.5 mA (250 V AC), ≤ 1.3 mA (110 V AC), ≤ 0.8 mA (24 V DC)
Time delay before availability t_v	approx. 8 / 50 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Protection class	□
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...176°F (-25...80°C)
Housing material	Plastic
Connection cable	PUR-PVC, 2 x 0.5 mm²

Selection Table

Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
1.2 (30)			7	Cable 2 m	IH34-30NUS-KU0	7 902 134
1.2 (30)			7	Cable 2 m	IH34-30NU0-KU0	7 902 135

Connection Diagram





Wire color		Assignment
bn	brown	L1 / +
bu	blue	N / -

SICK

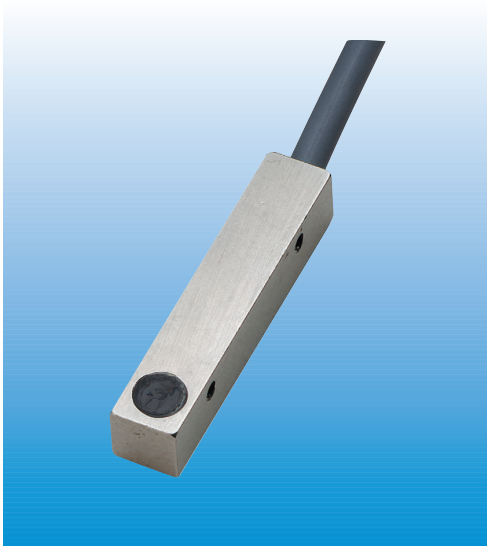
IQ 05 Miniature

Inductive Proximity Sensors

Highlights

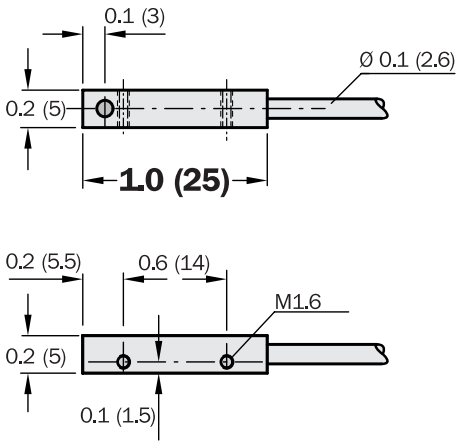
- Shielded
- PNP or NPN output
- Normally open function
- High switching frequency
- Short circuit protection (pulsed)
- Robust brass housing,nickel-plated
- Cable
- Enclosure rating IP 67
- LED status indicator

IQ 05 Miniature



Dimensional Drawing

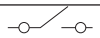
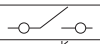
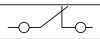
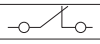
dimensions in inches (mm)



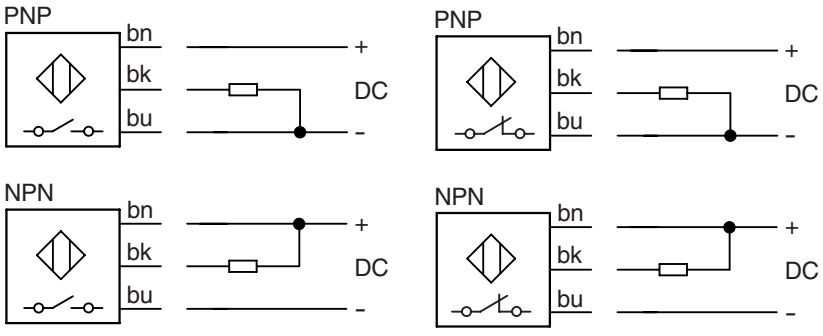
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 20% of U_b
Voltage drop U_b	≤ 2.0 V max. at I_a = 200 mA
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	10% of sr
Repeatability R (U_b and T_a constant)	≤ 1.5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated,plastic
Connection cable	PUR, 3 x 0.055 mm²

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.03 (0.8)		PNP		5000	Cable 2 m	IQ05-0B8PS-ZU1	6 020 161
0.03 (0.8)		NPN		5000	Cable 2 m	IQ05-0B8NS-ZU1	6 020 162
0.03 (0.8)		PNP		5000	Cable 2 m	IQ05-0B8PO-ZU1	6 020 163
0.03 (0.8)		NPN		5000	Cable 2 m	IQ05-0B8NO-ZU1	6 020 164

Connection Diagram



Wire color		Assignment
bn	brown	+ V DC
bk	black	NO
bu	blue	- V DC

SICK

IQ 08 Standard

Inductive Proximity Sensors

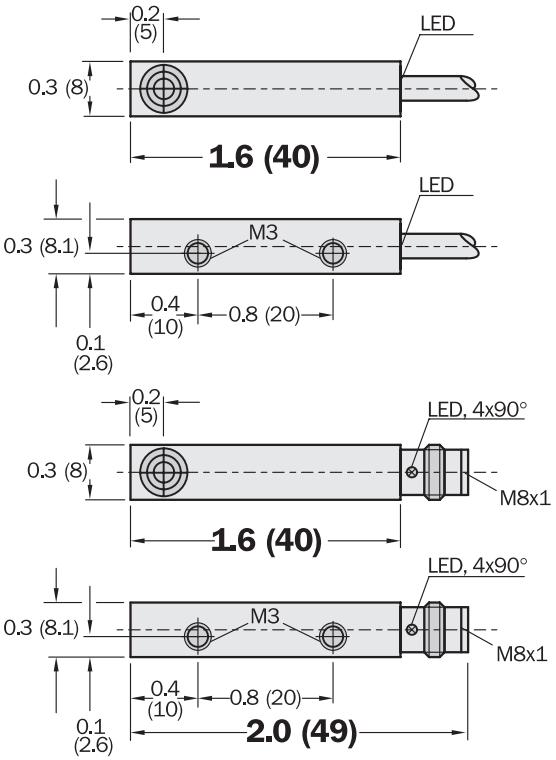
Highlights

- Shielded or unshielded
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Small plastic housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IQ 08 Advanced

Dimensional Drawing

dimensions in inches (mm)



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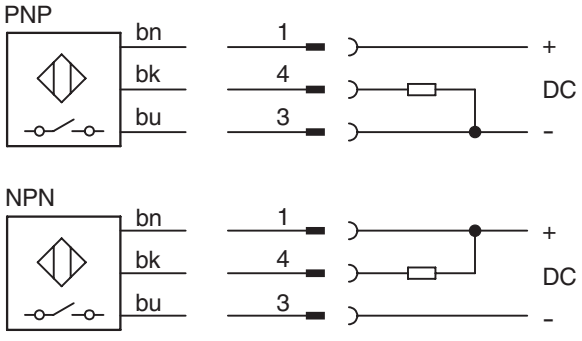
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable	PVC, 3 x 0.25 mm²

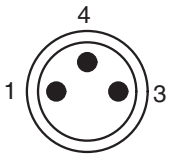
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.08 (2)	≠	PNP		5000	Cable 2 m	IQ08-02BPS-KU0	7 900 195
0.08 (2)	≠	NPN		5000	Cable 2 m	IQ08-02BNS-KU0	7 900 196
0.08 (2)	≠	PNP		5000	Connector M8 x 1 mm	IQ08-02BPS-KT0	7 900 197
0.08 (2)	≠	NPN		5000	Connector M8 x 1 mm	IQ08-02BNS-KT0	7 900 198
0.2 (4)	≠	PNP		5000	Cable 2 m	IQ08-04NPS-KU0	7 900 199
0.2 (4)	≠	PNP		5000	Connector M8 x 1 mm	IQ08-04NPS-KT0	7 900 201

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

IQ 10 Standard

Inductive Proximity Sensors

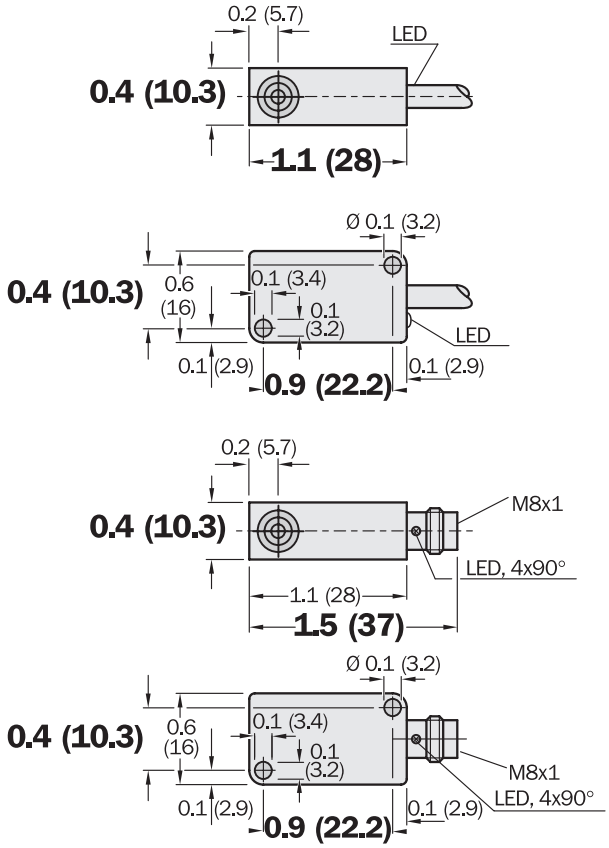
Highlights

- Shielded or unshielded
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Plastic housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IQ 10 Advanced

Dimensional Drawing

dimensions in inches (mm)



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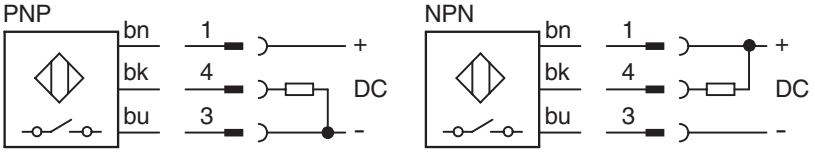
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable	PVC, 3 x 0.25 mm²

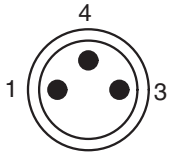
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.1 (3)		PNP		3000	Cable 2 m	IQ10-03BPS-KU0	7 900 203
0.1 (3)		NPN		3000	Cable 2 m	IQ10-03BNS-KU0	7 900 204
0.1 (3)		PNP		3000	Connector M8 x 1 mm	IQ10-03BPS-KT0	7 900 205
0.1 (3)		NPN		3000	Connector M8 x 1 mm	IQ10-03BNS-KT0	7 900 206
0.2 (6)		PNP		3000	Cable 2 m	IQ10-06NPS-KU0	7 900 207
0.2 (6)		NPN		3000	Cable 2 m	IQ10-06NNS-KU0	7 900 208
0.2 (6)		PNP		3000	Connector M8 x 1 mm	IQ10-06NPS-KT0	7 900 209
0.2 (6)		NPN		3000	Connector M8 x 1 mm	IQ10-06NNS-KT0	7 900 210

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

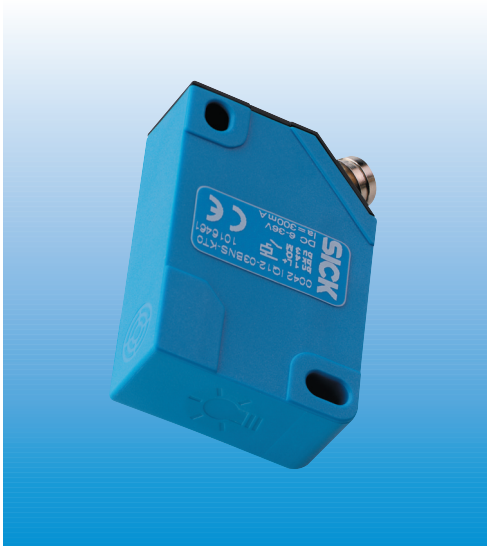
IQ 12 Standard

Inductive Proximity Sensors

Highlights

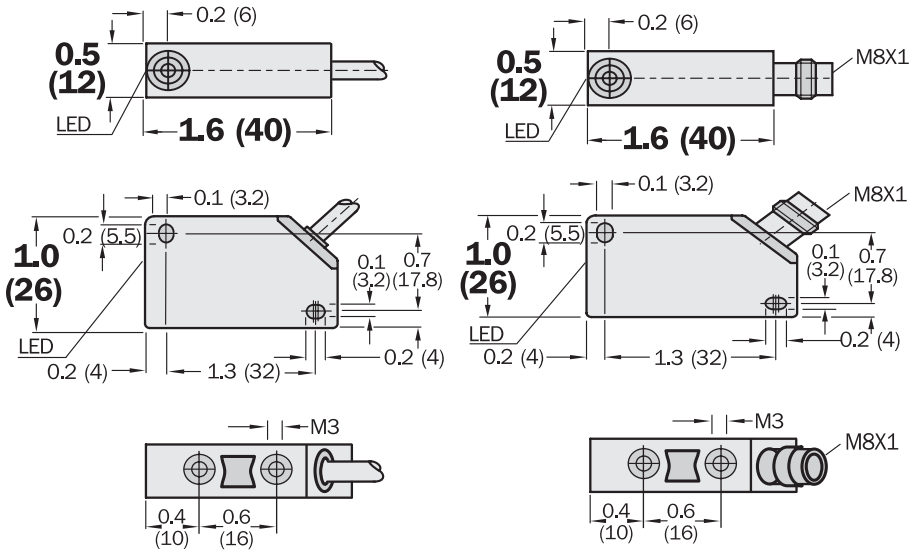
- Shielded or unshielded
- PNP or NPN output
- High switching frequency
- Short circuit protection (pulsed)
- Plastic housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

IQ 12 Advanced



Dimensional Drawing

dimensions in inches (mm)



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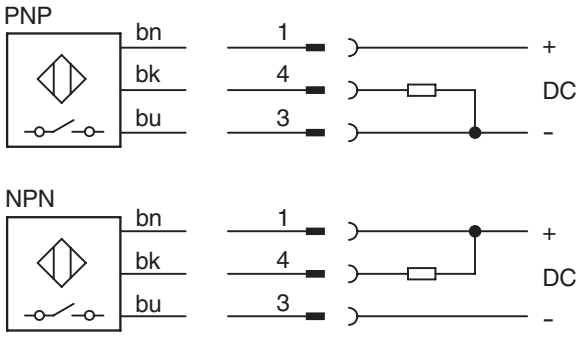
Electrical and Mechanical Data

Operating voltage U_b	6...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 5 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 10 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable	PVC, 3 x 0.25 mm²

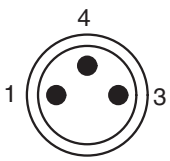
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.1 (3)		PNP		3000	Cable 2 m	IQ12-03BPS-KW1	1 016 275
0.1 (3)		NPN		3000	Cable 2 m	IQ12-03BNS-KW1	1 016 299
0.1 (3)		PNP		3000	Connector M8 x 1 mm	IQ12-03BPS-KT1	1 016 276
0.1 (3)		NPN		3000	Connector M8 x 1 mm	IQ12-03BNS-KT1	1 016 461
0.2 (6)		PNP		1000	Cable 2 m	IQ12-06NPS-KW1	1 016 463
0.2 (6)		PNP		1000	Connector M8 x 1 mm	IQ12-06NPS-KT1	1 016 467

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

IQ 40 Short

Inductive Proximity Sensors

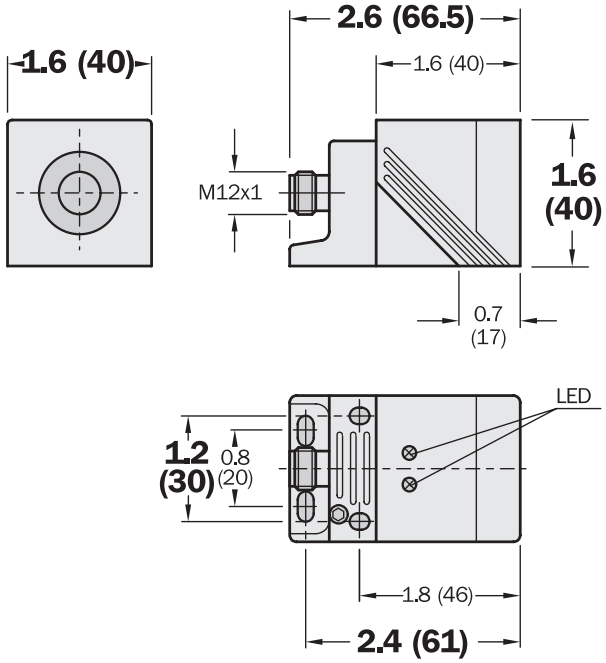
Highlights

- Shielded or unshielded
- User-selectable sensing position, adjusts to any of 5 sensing directions
- PNP output
- NO and complementary output function
- Short circuit protection (pulsed)
- Plastic housing
- Connector
- Enclosure rating IP 67
- LED status indicator and LED function indicator

IQ 40 Short

Dimensional Drawing

dimensions in inches (mm)



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Electrical and Mechanical Data

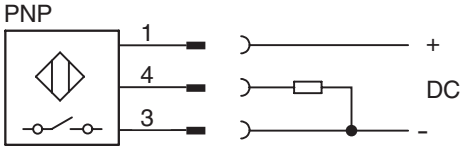
Operating voltage U_b	10...36 V DC
Voltage drop U_b	≤ 2.5 V at I_a max. and U_b 24 V
Power consumption (without load)	≤ 15 mA
Continuous current I_a	≤ 250 mA
Time delay before availability t_v	approx. 4 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Protection class	□
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Plastic

Selection Table

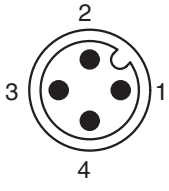
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.6 (15)		PNP		200	Connector M12 x 1 mm	IQ40-15BPS-KC0	7 900 223
0.8 (20)		PNP	programmable	300	Connector M12 x 1 mm	IQ40-20BPP-KCK	6 012 014
1.4 (35)		PNP		100	Connector M12 x 1 mm	IQ40-35NPS-KC0	7 900 224
1.4 (35)		PNP	programmable	100	Connector M12 x 1 mm	IQ40-35NPP-KCK	6 012 015

Connection Diagram

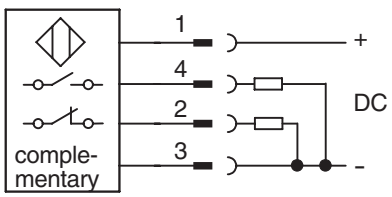
PNP



Contact	Assignment
1	+ V DC
4	NO
3	- V DC
2	free



PNP



Contact	Assignment
1	+ V DC
2	NC
3	- V DC
4	NO

SICK

IQ 40 Standard

Inductive Proximity Sensors

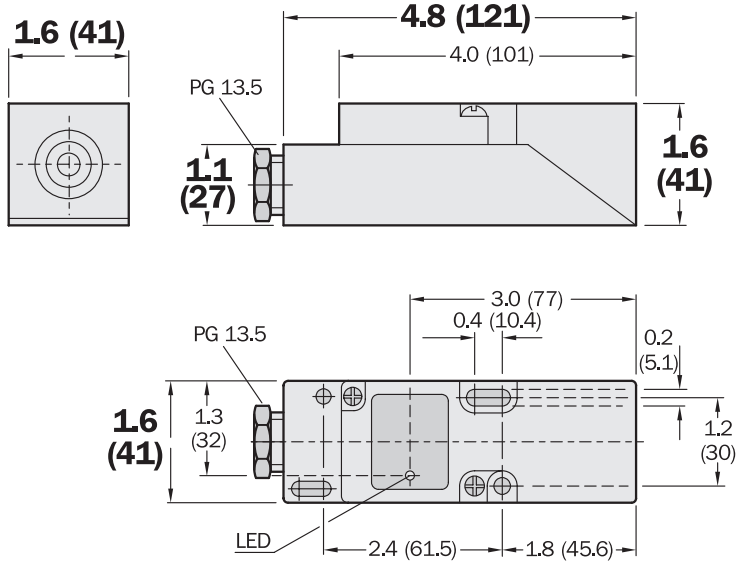
Highlights

- Shielded or unshielded
- User-selectable sensing position, adjusts to any of 5 sensing directions
- PNP output
- Programmable NO/NC function
- Short circuit protection (pulsed)
- Plastic housing
- Terminal connection
- Enclosure rating IP 65
- LED status indicator

IQ 40 Advanced

Dimensional Drawing

dimensions in inches (mm)



Electrical and Mechanical Data

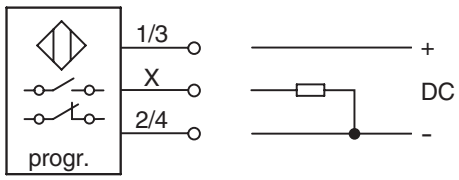
Operating voltage U_b	10...36 V DC
Voltage drop U_b	≤ 2.5 V at I_a max. and U_b 24 V
Power consumption (without load)	≤ 15 mA
Continuous current I_a	≤ 250 mA
Time delay before availability t_v	approx. 4 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 65
Protection class	□
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Plastic

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.6 (15)		PNP	programmable	300	Terminal up to 2.5 mm²	IQ40-15BPP-KK0	7 900 219
0.8 (20)		PNP	programmable	300	Terminal up to 2.5 mm²	IQ40-20NPP-KK0	7 900 221

Connection Diagram

PNP



Programming with wirelinks
Link closed: NO
Link open: NC

Terminal	Assignment
1/3	+ V DC
X	NO/NC
2/4	- V DC

SICK

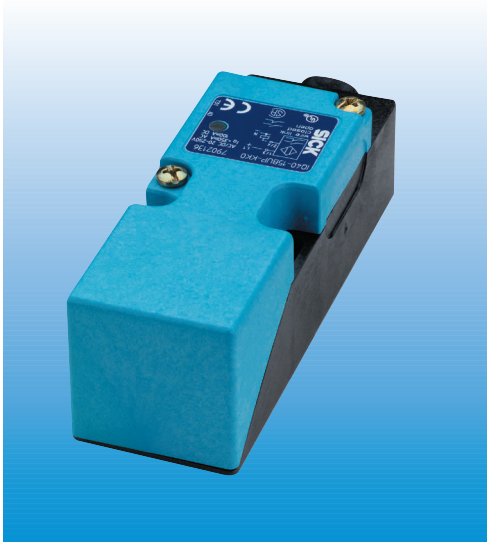
IQ 40 Universal

Inductive Proximity Sensors

Highlights

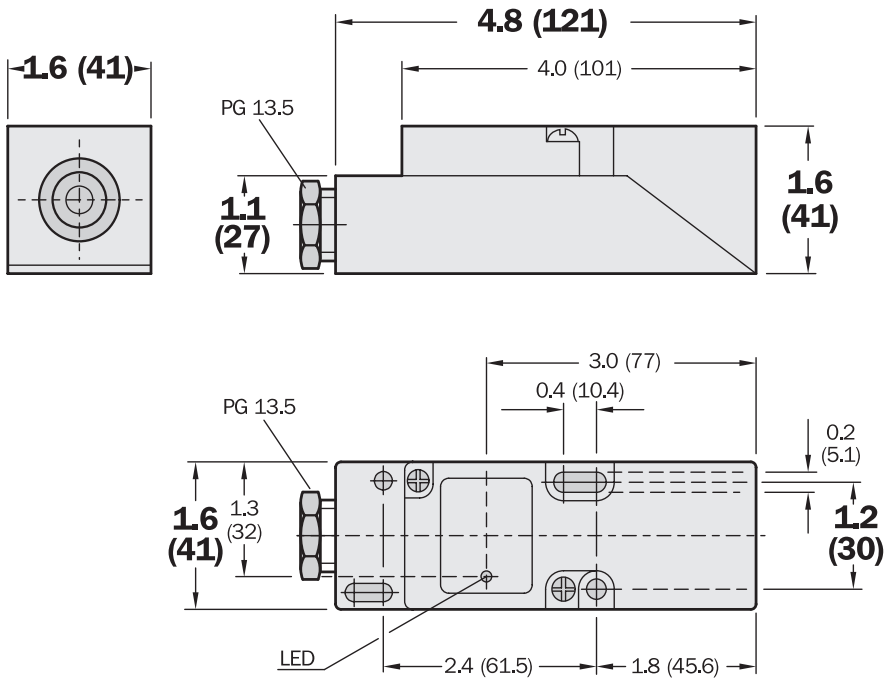
- Shielded or unshielded
- User-selectable sensing position, adjusts to any of 5 sensing directions
- Broad operating voltage range in AC and DC
- Programmable switching output: NO or NC
- Plastic housing
- Enclosure rating IP 65
- Terminal connection
- LED status indicator

IQ 40 Universal



Dimensional Drawing

dimensions in inches (mm)



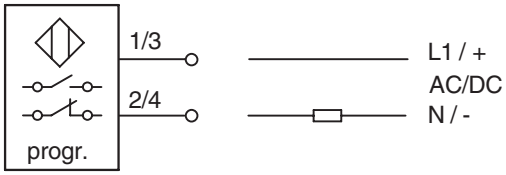
Electrical and Mechanical Data

Operating voltage U_b	20...250 V AC / DC
Voltage drop U_b	≤ 6.5 V AC / ≤ 6 V DC with I_a max.
Continuous current I_a	≤ 350 mA AC (...+50°C), ≤ 250 mA AC (...+80°C), ≤ 100 mA DC
Peak current I_k	2.2 A (20 ms / 0.5 Hz)
Min. load current	5 mA
Residual current	≤ 2.5 mA (250 V AC), ≤ 1.3 mA (110 V AC), ≤ 0.8 mA (24 V DC)
Time delay before availability t_v	approx. 8 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 65
Protection class	□
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Plastic

Selection Table

Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection	Type	Part no.
0.6 (15)		 programmable	20 (AC) / 55 (DC)	Terminal up to 2.5mm²	IQ40-15BUP-KK0	7 902 136
0.8 (20)		 programmable	20 (AC) / 55 (DC)	Terminal up to 2.5mm²	IQ40-20NUP-KK0	7 902 137

Connection Diagram



Programming with wire links
Link closed: NO
Link open: NC

Terminal	Assignment
1/3	L1 / +
2/4	N / -

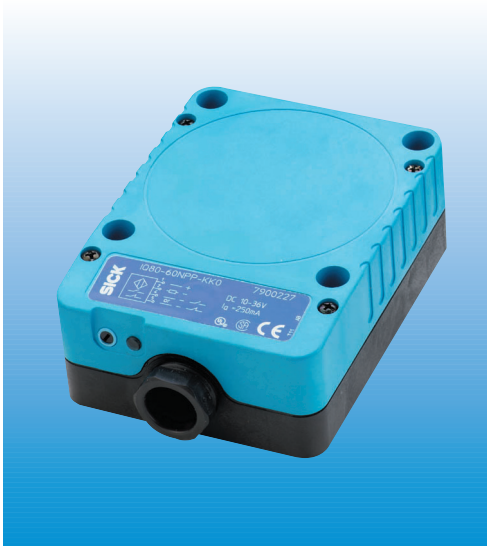
IQ 80 Standard

Inductive Proximity Sensors

Highlights

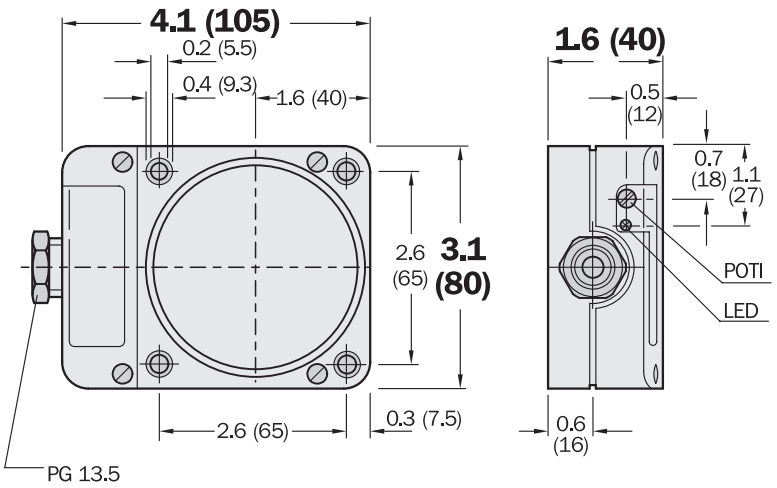
- Unshielded
- Adjustable sensing distance from 20 to 60 mm
- PNP output
- Programmable NO/NC function
- Short circuit protection (pulsed)
- Robust plastic housing
- Terminal connection
- Enclosure rating IP 65
- LED status indicator

IQ 80 Advanced



Dimensional Drawing

dimensions in inches (mm)



Electrical and Mechanical Data

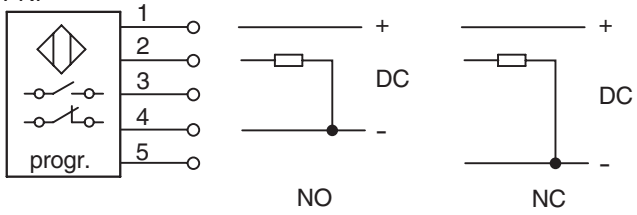
Operating voltage U_b	10...36 V DC
Voltage drop U_b	≤ 2.5 V at I_a max. and U_b 24 V
Power consumption (without load)	≤ 15 mA
Continuous current I_a	≤ 250 mA
Time delay before availability t_v	approx. 250 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 65
Protection class	□
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Plastic

Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.4 (60)	⫢	PNP	programmable	4	Terminal up to 2.5 mm²	IQ80-60NPP-KK0	7 900 227

Connection Diagram

PNP



Terminal	Assignment
1	+ V DC
2	Output
3	free
4	- V DC/ NO
5	- V DC/ NC

SICK

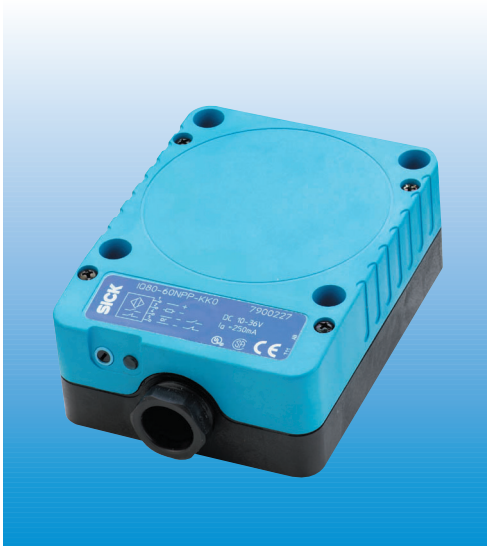
IQ 80 Universal

Inductive Proximity Sensors

Highlights

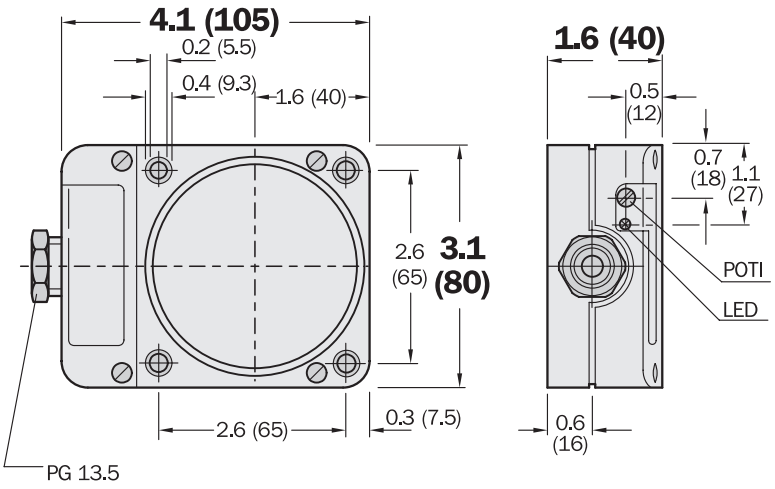
- Unshielded
- Adjustable sensing distance from 20 to 60 mm
- Broad operating voltage range in AC and DC
- Robust plastic housing
- Programmable switching output: NO or NC
- Enclosure rating IP 65
- Terminal connection
- LED status indicator

IQ 80 Universal



Dimensional Drawing

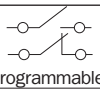
dimensions in inches (mm)



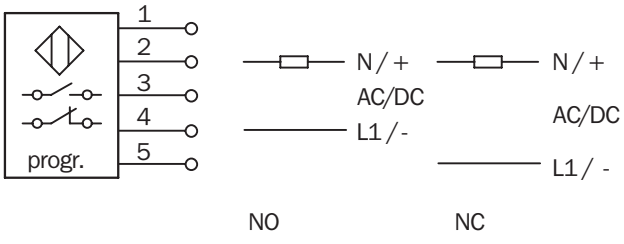
Electrical and Mechanical Data

Operating voltage U_b	20...250 V AC / DC
Voltage drop U_b	≤ 6.5 V AC / ≤ 6 V DC with I_a max.
Continuous current I_a	≤ 350 mA AC (...+50°C), ≤ 250 mA AC (...+80°C), ≤ 100 mA DC
Peak current I_k	2.2 A (20 ms / 0.5 Hz)
Min. load current	5 mA
Residual current	≤ 2.5 mA (250 V AC), ≤ 1 mA (24 V DC)
Time delay before availability t_v	approx. 8 ms
Hysteresis H	1% - 15% of s_r
Repeatability R (U_b and T_a constant)	≤ 10% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	-
Short circuit protection (pulsed)	-
Reverse polarity protection	-
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 65
Protection class	⧈
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Plastic

Selection Table

Sensing range S_n in (mm)	Installation in metal	Output function	Switching frequency f in Hz	Connection	Type	Part no.
2.4 (60)		 programmable	4	Terminal up to 2.5 mm²	IQ80-60NUP-KK0	7 902 138

Connection Diagram



Terminal	Assignment
1	free
2	N/+
3	free
4	L1/- (NO)
5	L1/- (NC)

SICK

Theory of Operation...Capacitive Proximity Sensors

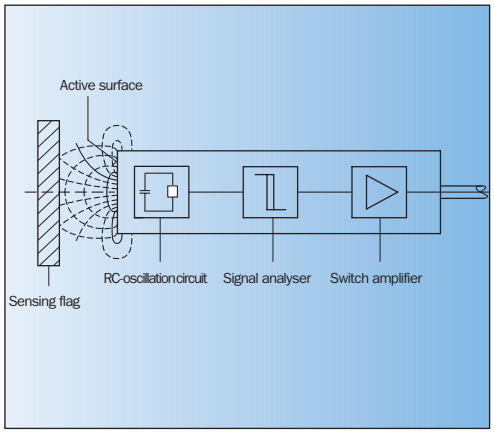


Fig. 1 Capacitive proximity sensor makeup

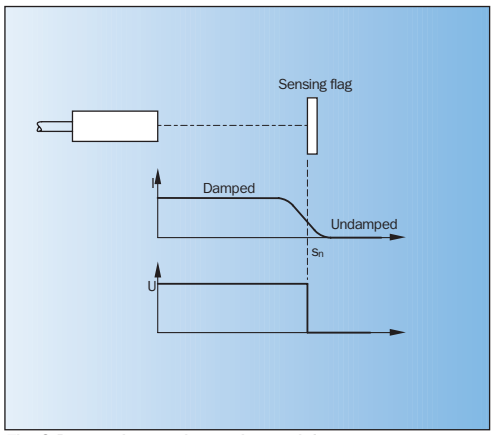


Fig. 2 Damped vs. undamped materials

The most important r eduction factors for capacitive pr oximity sensors are:

iron, earthed	1.0
water	1.0
(corn)	0.3...0.6
(moisture content 12%)	
wood	0.2...0.9
glass	0.3...0.7
oil	0.2
PVC	0.4
PE	0.37
ceramic material	0.3

The reduction factor dependes on the watercontent of the material.

Fig. 3 Reduction factors for capacitive proximity sensors

About Capacitive Proximity Sensors

The active element is formed by two metallic electrodes positioned much like and "opened" capacitor (see Fig. 1). Electrodes A and B are placed in the feedback loop of a high frequency oscillator. When no target is present, the sensor's capacitance is low, therefore the oscillation amplitude is small. When a target approaches the face of the sensor, it increases the capacitance of the capacitor. This increase in capacitance, in return, increases the amplitude of oscillation. The amplitude of oscillation is measured by an evaluating circuit that generates a signal to turn the output ON or OFF.

Capacitance (C) is a function of the surface area of either electrode (A), the distance between the electrodes (d), and the dielectric constant of the material (e) between the electrodes.

When a conductive target enters the sensor's field, it forms a counter electrode to the active face of the sensor, thus decreasing the distance between the electrodes (d), and increasing the average surface area (A) of the electrodes. The capacitance with a metal target present is always greater than the capacitance of the circuit in the absence of the target. Reduction factors for different metals are not a consideration when using capacitive sensors. (see Fig. 3)

When a non-conductive target enters the sensor's field, it acts as an electrical insulator between electrodes. The dielectric constant of the material (e symbol) is a measure of its insulation properties. All liquids and solids have a greater dielectric constant than air (e symbol = 1). Therefore, the capacitance with a non-metallic target present is always greater than the capacitance of the circuit in the absence of the target. This change is nevertheless very small, so only a short sensing range can be achieved.

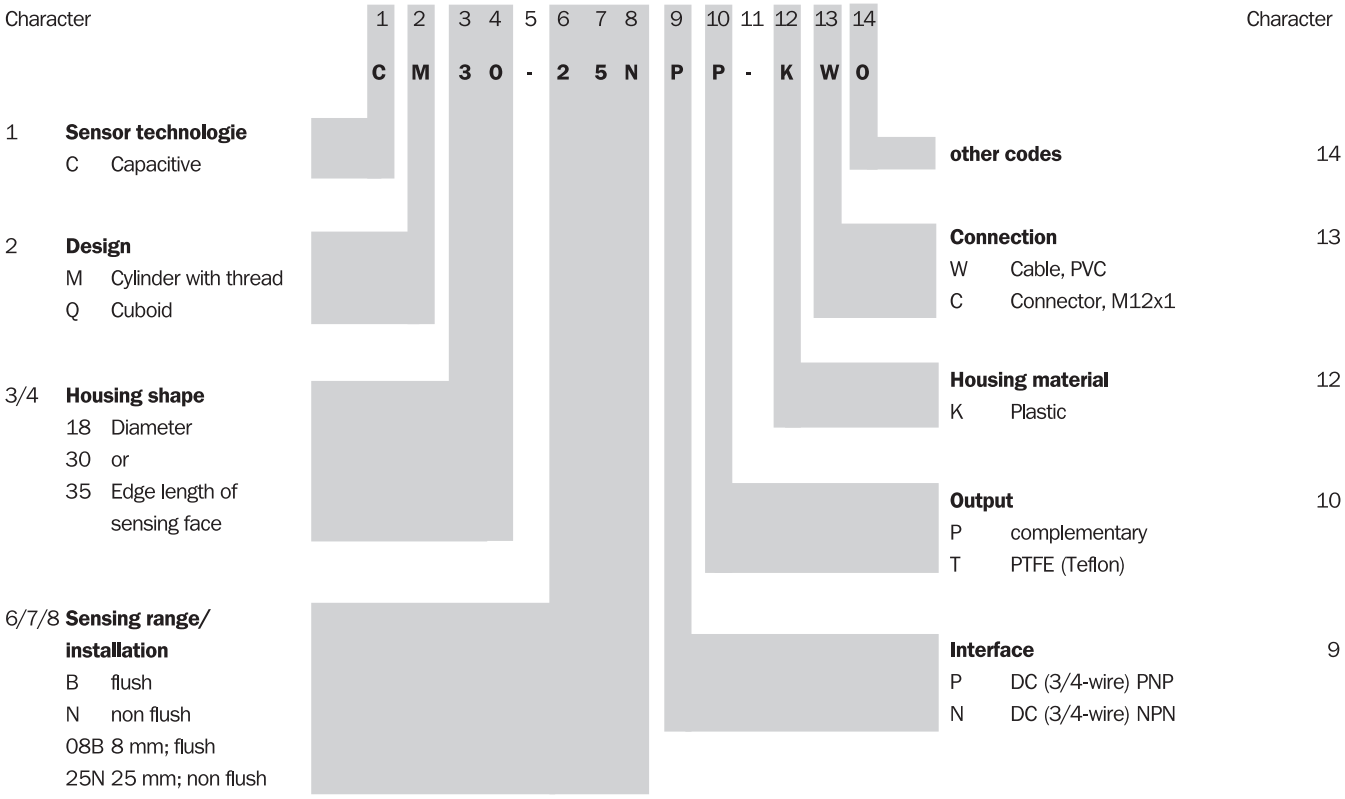
The nominal sensing ranges refer, as with inductive sensors, to a metal target (mild steel). On different materials, different sensing ranges apply.

EMC-overview

Test	Standard	Product Standard EN 60947-5-2	Generic Standard EN 50082-2	SICK Capacitive Sensors
Electrostatic Discharge ESD	EN 61000-4-2 (IEC 1000-4-2)	4 kV cd / 8 kV ad*	4 kV cd78 kV ad*	17 kV cd/ad*
HF radiated	EN 61000-4-3 (IEC 1000-4-3)	3 V/m 80 ... 1000 MHz	10 V/m 80 ... 1000 MHz	< 15 V/m 80 ... 1000 MHz
HF wire conducted	EN 61000-4-6 (IEC 1000-4-6)	–	10 V 0,15 ... 80 MHz	> 10 V
Burst	EN 61000-4-4 (IEC 1000-4-4)	1 kV	2 kV	4 kV
Surge	IEC 255-5	1 kV, 500 Ohm	–	2.5 kV, 500 Ohm

*cd = contact discharge ad = air discharge

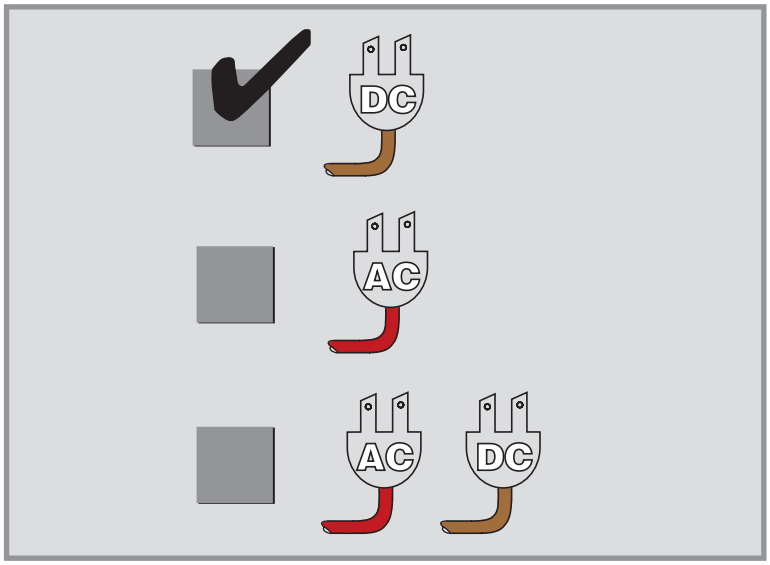
Capacitive Proximity Sensors...Type Code



SICK

Capacitive Proximity Sensors

Capacitive Proximity Sensors



CM 18 Capacitive

Capacitive Proximity Sensors

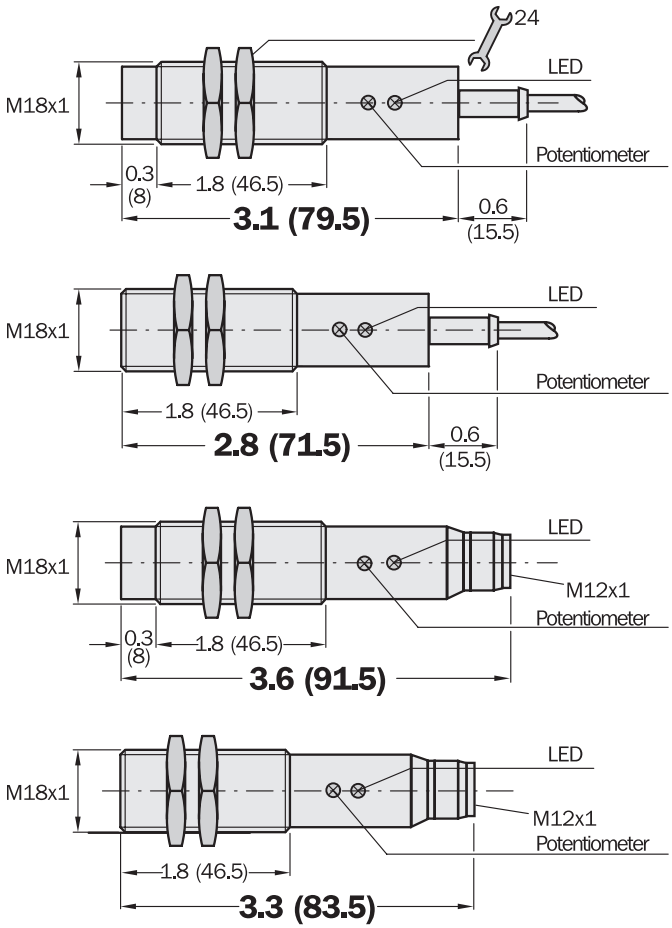
Highlights

- High EMC-immunity
- Shielded or unshielded
- PNP or NPN output
- Adjustable sensing range
- Complementary output function
- Short-circuit protection (pulsed)
- Plastic housing with fine thread M18 x 1 mm• Cable or connector
- Enclosure rating IP 67
- LED-status indicator

CM 18 Capacitive

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

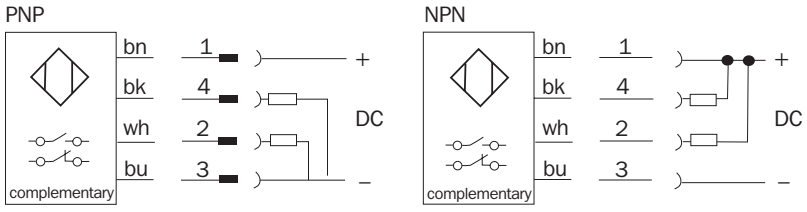
Electrical and Mechanical Data

Operating voltage U_b	10...40 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2.5 V
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	4% - 20% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Plastic
Tightening torque	2.6 Nm
Connection cable	PVC, 4 x 0.34 mm^2

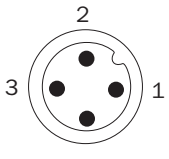
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.3 (8)		PNP	 complementary	30	Cable 2 m	CM18-08BPP-KW1	6 020 136
0.3 (8)		PNP	 complementary	30	Connector M12 x 1 mm	CM18-08BPP-KC1	6 020 388
0.3 (8)		NPN	 complementary	30	Cable 2 m	CM18-08BNP-KW1	6 021 455
0.3 (8)		NPN	 complementary	30	Connector M12 x 1 mm	CM18-08BNP-KC1	6 020 410
0.5 (12)		PNP	 complementary	30	Cable 2 m	CM18-12NPP-KW1	6 020 389
0.5 (12)		PNP	 complementary	30	Connector M12 x 1 mm	CM18-12NPP-KC1	6 021 456
0.5 (12)		NPN	 complementary	30	Cable 2 m	CM18-12NNP-KW1	6 021 457
0.5 (12)		NPN	 complementary	30	Connector M12 x 1 mm	CM18-12NNP-KC1	6 021 458

Connection Diagram



Wire Color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
wh	white	2	NC
bu	blue	3	- V DC



SICK

CM 18-PTFE Capacitive

Capacitive Proximity Sensors

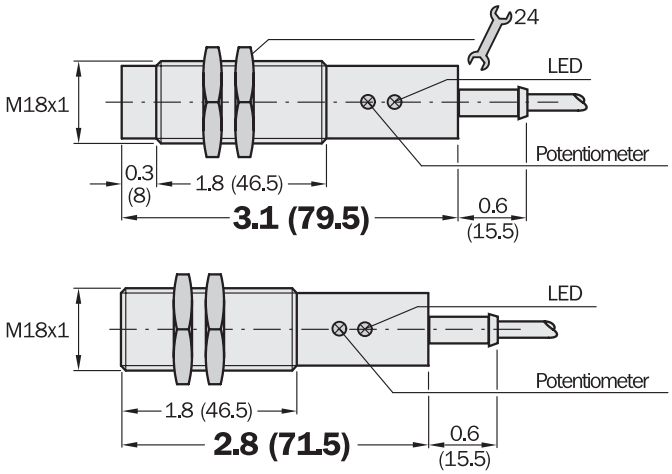
Highlights

- High EMC-immunity
- Shielded
- PNP or NPN output
- Adjustable sensing range
- Complementary output function
- Short-circuit protection (pulsed)
- PTFE housing with fine thread M18 x 1 mm, PVC cable
- Enclosure rating IP 67
- LED-status indicator

CM 18 Capacitive

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926

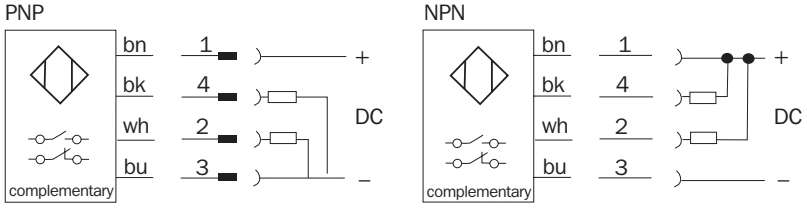
Electrical and Mechanical Data

Operating voltage U_b	10...40 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2.5 V
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	4% - 20% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...140°F (-25...60°C)
Housing material	PTFE
Tightening torque	2.6 Nm
Connection cable	PVC, 4 x 0.34 mm²

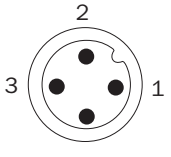
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.3 (8)	⊟	PNP	complementary	30	Cable 2 m	CM18-08BPP-TW0	6 026 195
0.3 (8)	⊟	NPN	complementary	30	Cable 2 m	CM18-08BNP-TW0	6 026 194

Connection Diagram



Wire Color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
wh	white	2	NC
bu	blue	3	- V DC



SICK

CM 30 Capacitive

Capacitive Proximity Sensors

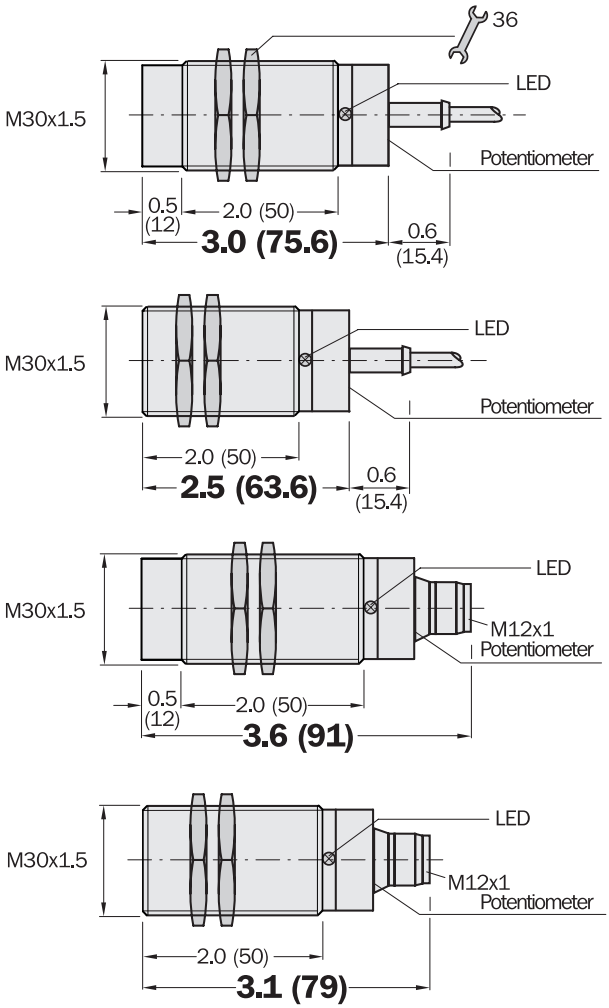
Highlights

- High EMC-immunity
- Shielded or unshielded
- PNP output
- Adjustable sensing range
- Complementary output function
- Short-circuit protection (pulsed)
- Plastic housing with fine thread M30 x 1.5 mm
- Cable or connector
- Enclosure rating IP 67
- LED-status indicator

CM 30 Capacitive

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	926, 927

Electrical and Mechanical Data

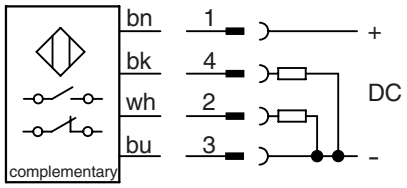
Operating voltage U_b	10...40 V DC
Ripple U_{pp}	≤ 10% U_b
Voltage drop U_b	≤ 2.5 V
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	4% - 20% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	13...176°F (-25...80°C)
Housing material	Plastic
Tightening torque	7.5 Nm
Connection cable	PVC, 4 x 0.34 mm^2

Selection Table

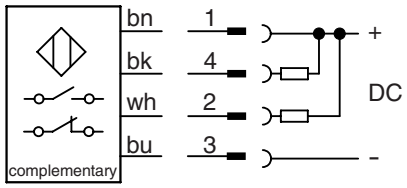
Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
0.6 (16)		PNP	 complementary	50	Cable 2 m	CM30-16BPP-KW1	6 020 473
0.6 (16)		PNP	 complementary	50	Connector M12 x 1 mm	CM30-16BPP-KC1	6 020 475
0.6 (16)		NPN	 complementary	50	Cable 2 m	CM30-16BNP-KW1	6 021 459
0.6 (16)		NPN	 complementary	50	Connector M12 x 1 mm	CM30-16BNP-KC1	6 021 460
1.0 (25)		PNP	 complementary	50	Cable 2 m	CM30-25NPP-KW1	6 020 476
1.0 (25)		PNP	 complementary	50	Connector M12 x 1 mm	CM30-25NPP-KC1	6 020 477
1.0 (25)		NPN	 complementary	50	Cable 2 m	CM30-25NNP-KW1	6 021 461
1.0 (25)		NPN	 complementary	50	Connector M12 x 1 mm	CM30-25NNP-KC1	6 021 462

Connection Diagram

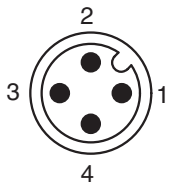
PNP



NPN



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
wh	white	2	NC
bu	blue	3	- V DC



SICK

CQ 35 Capacitive

Capacitive Proximity Sensors

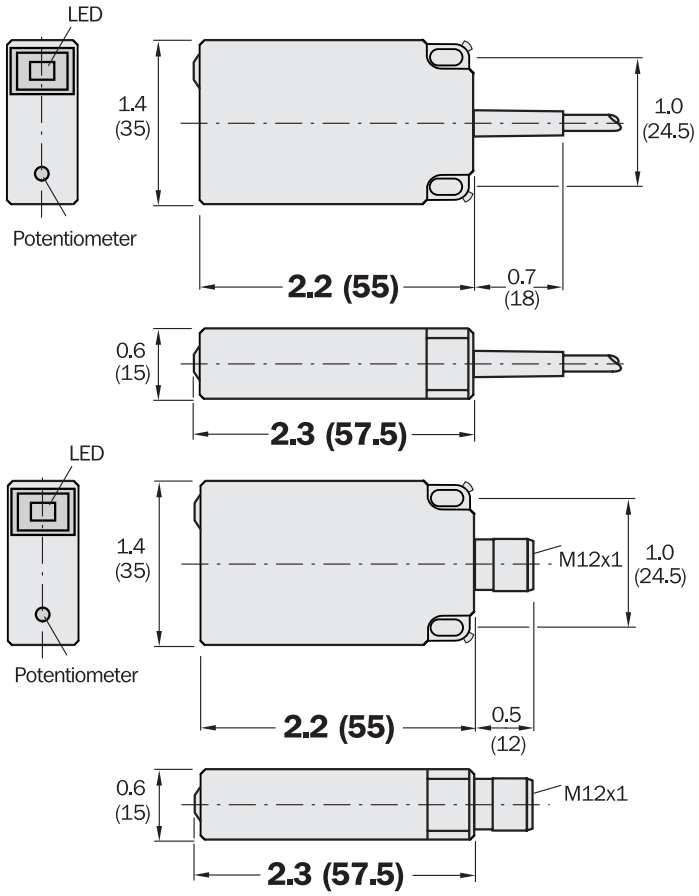
Highlights

- High EMC-immunity
- Shielded or unshielded
- PNP or NPN output
- Adjustable sensing range
- Device can be flush mounted, sensing range: 16 mm
- Complementary output function
- Short-circuit protection (pulsed)
- Plastic housing
- Cable or connector
- Enclosure rating IP 67
- LED-status indicator

CQ 35 Capacitive

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909

Electrical and Mechanical Data

Operating voltage U_b	10...40 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2.5 V
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 200 mA
Time delay before availability t_v	≤ 100 ms
Hysteresis H	4% - 20% of s_r
Repeatability R (U_b and T_a constant)	≤ 5% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable	PVC, 4 x 0.34 mm²

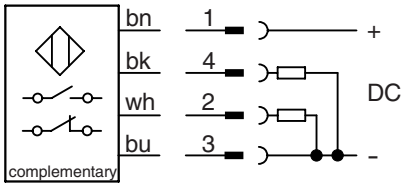
Selection Table

Sensing range S_n in (mm)	Installation in metal	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
1.0 (25)	*	PNP	complementary	50	Cable 2 m	CQ35-25NPP-KW1	6 020 478
1.0 (25)	*	PNP	complementary	50	Connector M12 x 1 mm	CQ35-25NPP-KC1	6 020 479
1.0 (25)	*	NPN	complementary	50	Cable 2 m	CQ35-25NNP-KW1	6 021 463
1.0 (25)	*	NPN	complementary	50	Connector M12 x 1 mm	CQ35-25NNP-KC1	6 021 464

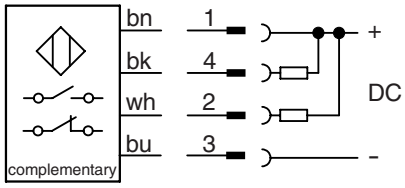
*Can be installed flush by reducing sensitivity with potentiometer

Connection Diagram

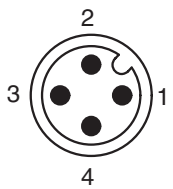
PNP



NPN



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
wh	white	2	NC
bu	blue	3	- V DC



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Theory of Operation...Magnetic Proximity Sensors

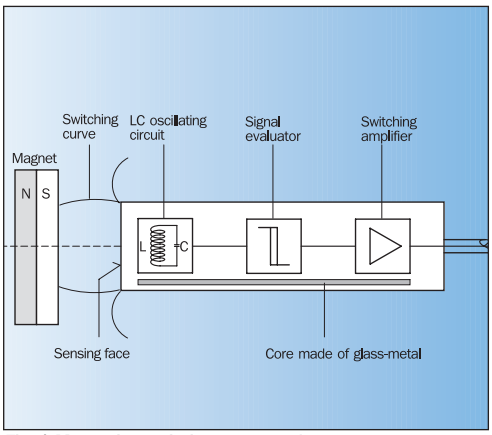


Fig. 1 Magnetic proximity sensor makeup

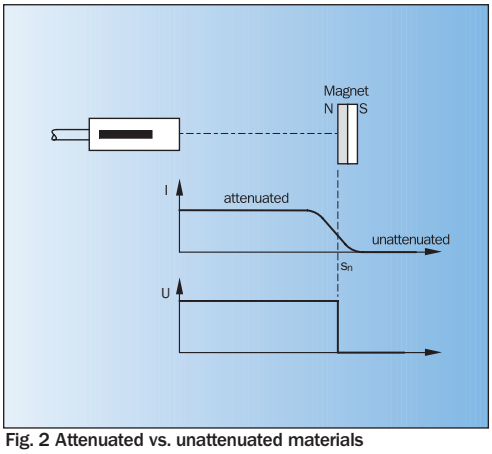


Fig. 2 Attenuated vs. unattenuated materials

About Magnetic Proximity Sensors

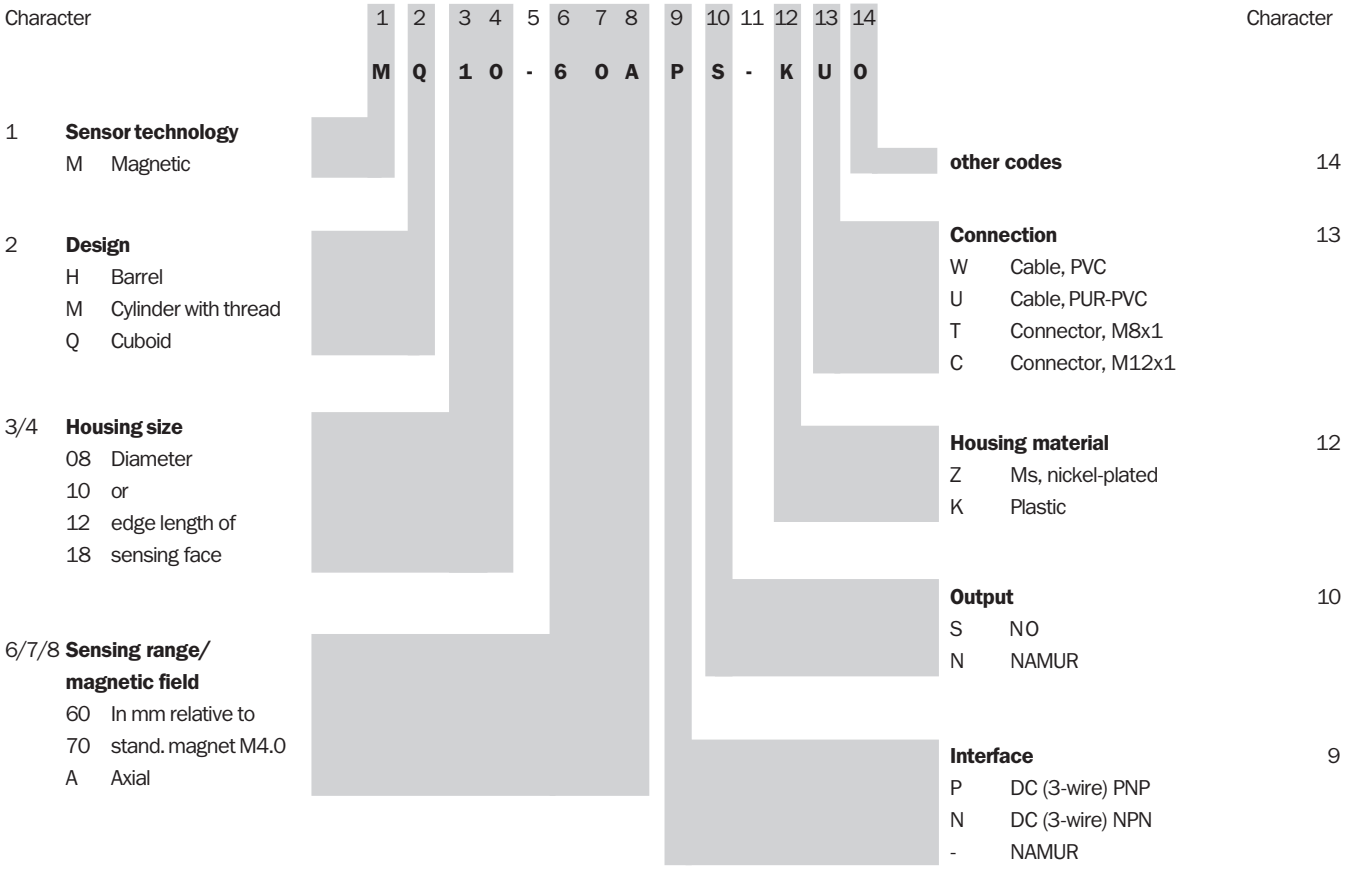
As with inductive proximity sensors, magnetic proximity sensors have an LC oscillating circuit, a signal strength indicator and a switching amplifier. They also have a core (strip) made of amorphous, highly permeable and magnetically soft glass-metal.

This strip attenuates the oscillating circuit using eddy-current losses. The core quickly becomes magnetically saturated very quickly if a magnetic field is applied, e.g., if a magnet is brought closer. The eddy-current losses attenuating the oscillating circuit are reduced and the oscillating de-attenuates. The power consumption of a magnetic proximity sensor therefore increases as a magnet is brought closer, in contrast to inductive proximity sensors where the power consumption reduces as the switching trigger is brought closer.

A major advantage of this technology is that large sensing ranges are possible even with small sensor types.

Permanent magnets are usually used to trigger magnetic proximity sensors. They comprise magnetically hard substances, such as steel alloyed with other metals such as aluminum, cobalt and nickel. Magnetically hard ferrite with similar properties can also be produced from sintered compounds containing iron oxide and other metal oxides.

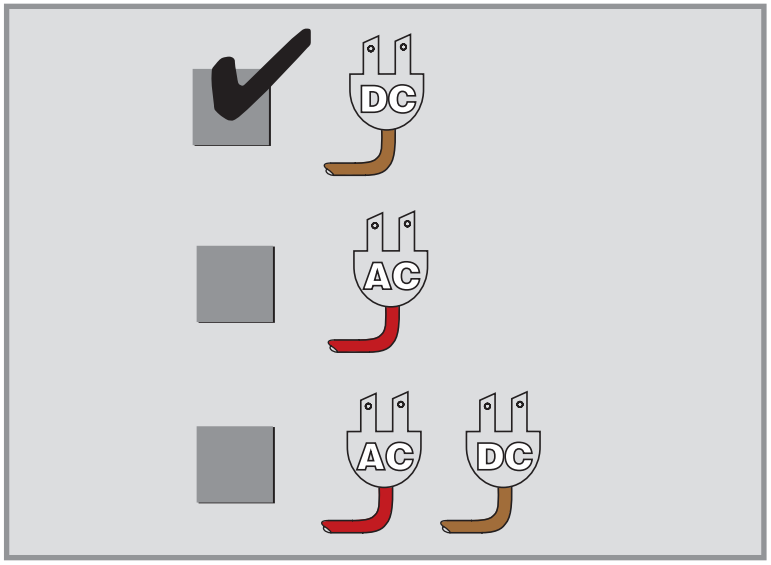
Magnetic Proximity Sensors...Type Code



SICK

Magnetic Proximity Sensors

Magnetic Proximity Sensors



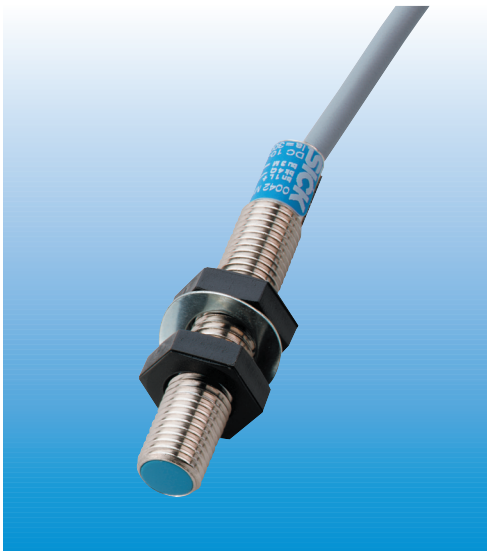
MM 08 Advanced

Magnetic Proximity Sensors

Highlights

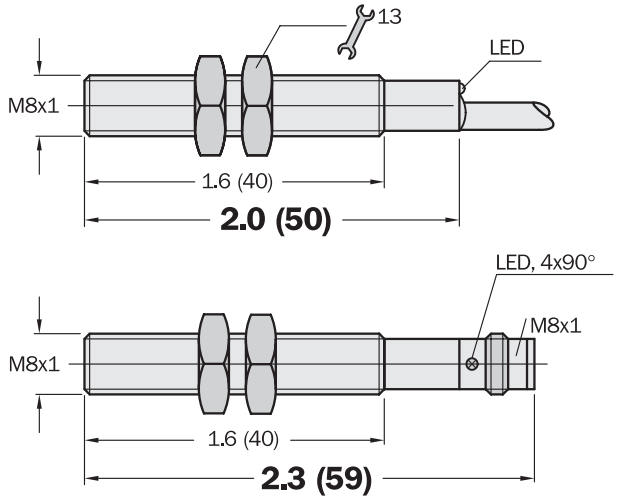
- Sensing range up to 60 mm
- PNP output
- High switching frequency
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

MM 08 Advanced



Dimensional Drawing

dimensions in inches (mm)

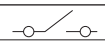


Accessories	page
Cables and connectors	908
Magnets	978, 979

Technical data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with Ia max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7.0 Nm
Connection cable	PUR-PVC, 3 x 0.25 mm²

Selection Table

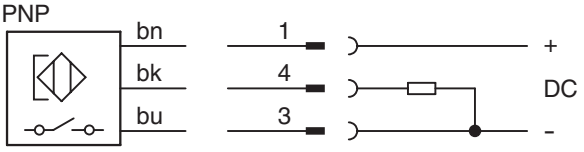
Sensing range S_n in (mm)	Magnetic alignment	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.4 (60)	Axial	PNP		5000	Cable 2 m	MM08-60APS-ZU0	7 900 264
2.4 (60)	Axial	PNP		5000	Connector M8 x 1 mm	MM08-60APS-ZT0	7 900 266

Sensing Ranges

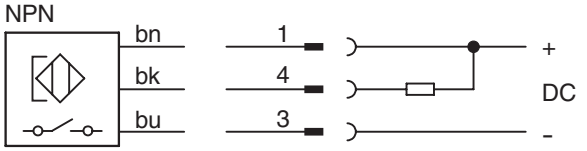
Magnet type	Sensing Range s_n Any installation type (flush or non-flush) in a non-magnetizable material	Sensing Range s_n Flush installation in a magnetizable material (e.g. iron)
M 1.0	0.9 in (23 mm)	0.5 in (12 mm)
M 2.0	0.9 in (24 mm)	0.4 in (10 mm)
M 3.0	1.4 in (36 mm)	0.6 in (15 mm)
M 4.0	2.4 in (60 mm)	0.8 in (20 mm)
M 5.0/5.1	2.7 in (68 mm)	1.0 in (25 mm)

Connection Diagram

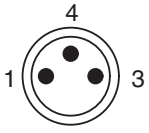
PNP



NPN



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

MM 12 Advanced

Magnetic Proximity Sensors

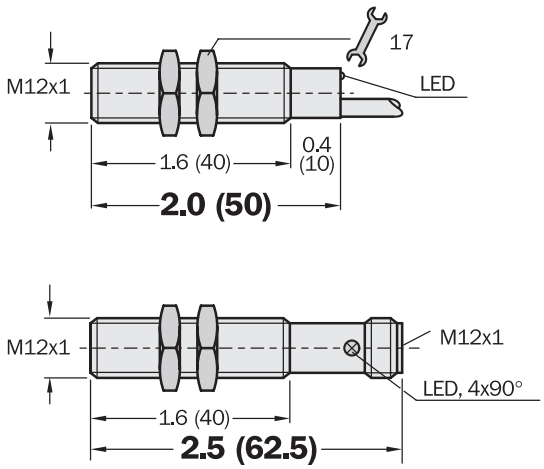
Highlights

- Sensing range up to 60 mm
- PNP output
- High switching frequency
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

MM 12 Advanced

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925
Magnets	978, 979

Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with Ia max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7.0 Nm
Connection cable	PUR-PVC, 3 x 0.25 mm^2

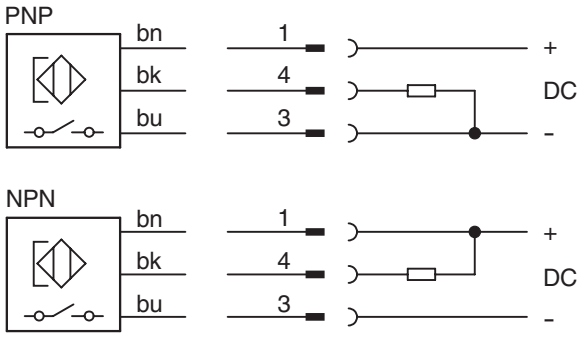
Selection Table

Sensing range S_n in (mm)	Magnetic alignment	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.4 (60)	Axial	PNP		5000	Cable 2 m	MM12-60APS-ZU0	7 900 268
2.4 (60)	Axial	PNP		5000	Connector M12 x 1 mm	MM12-60APS-ZC0	7 900 270

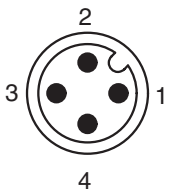
Sensing Ranges

Magnet type	Sensing Range s_n Any installation type (flush or non-flush) in a non-magnetizable material	Sensing Range s_n Flush installation in a magnetizable material (e.g. iron)M
M 1.0	0.9 in (23 mm)	0.7 in (17 mm)
M 2.0	0.9 in (24 mm)	0.6 in (14 mm)
M 3.0	1.4 in (36 mm)	0.9 in (23 mm)
M 4.0	2.4 in (60 mm)	1.5 in (37 mm)
M 5.0/5.1	2.7 in (68 mm)	1.7 in (44 mm)

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC
		2	free



SICK

MM 12 NAMUR

Magnetic Proximity Sensors

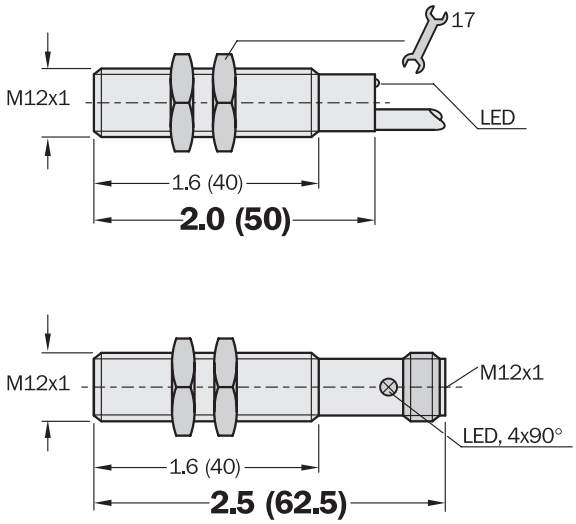
Highlights

- Sensing range up to 60 mm
- High switching frequency
- NAMUR to EN 50 227
- Shielded or unshielded
- LED status indicator
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67

MM 12 NAMUR

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925
Magnets	978, 979
Power supply	966

Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Ripple U_{pp}	≤ 5% of U_b
Power consumption, attenuated	≥ 2.5 mA
Power consumption, unattenuated	≤ 1.0 mA
Internal capacitance	≤ 15 nF
Internal inductance	≤ 25 µH
Cable resistance	≤ 50 w
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	7.0 Nm
Connection cable	PUR-PVC, 3 x 0.25 mm²
Max. data for connecting isolating unit EN 2	
EX or other approved isolating amplifier:	
Short circuit current I_K max	30 mA
No load voltage U_o	16 V
Power loss Pmax	75 mW

Selection Table

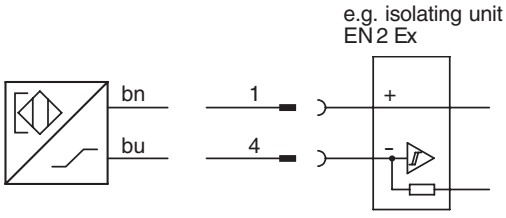
Sensing range S_n* in (mm)	Magnetic alignment	Version	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.4 (60)	Axial	NAMUR		5000	Cable 2 m	MM12-60A-N-ZW0	7 900 286
2.4 (60)	Axial	NAMUR		5000	Connector M12 x 1 mm	MM12-60A-N-ZC0	7 900 287

* Sensing range s_n based on installation in non-magnetizable material using magnet M 4.0.

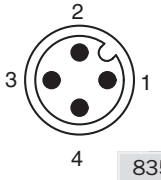
Sensing Ranges

Magnet type	Sensing Range s_n Any installation type (flush or non-flush) in a non-magnetizable material	Sensing Range s_n Flush installation in a magnetizable material (e.g. iron)M
M 1.0	0.9 in (23 mm)	0.7 in (17 mm)
M 2.0	0.9 in (24 mm)	0.6 in (14 mm)
M 3.0	1.4 in (36 mm)	0.9 in (23 mm)
M 4.0	2.4 in (60 mm)	1.5 in (37 mm)
M 5.0/5.1	2.7 in (68 mm)	1.7 in (44 mm)

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	4	- V DC
		3	free
		2	free



SICK

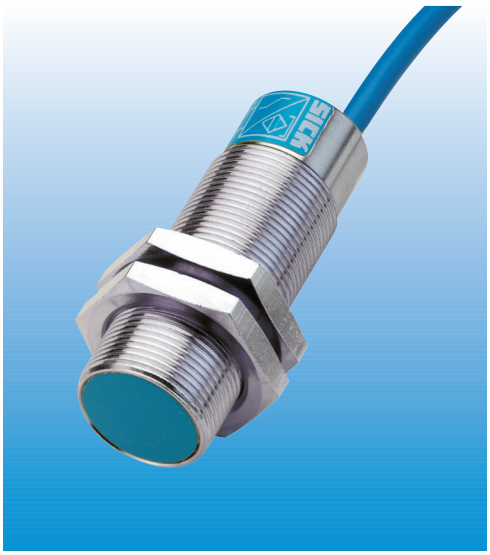
MM 18 Advanced

Magnetic Proximity Sensors

Highlights

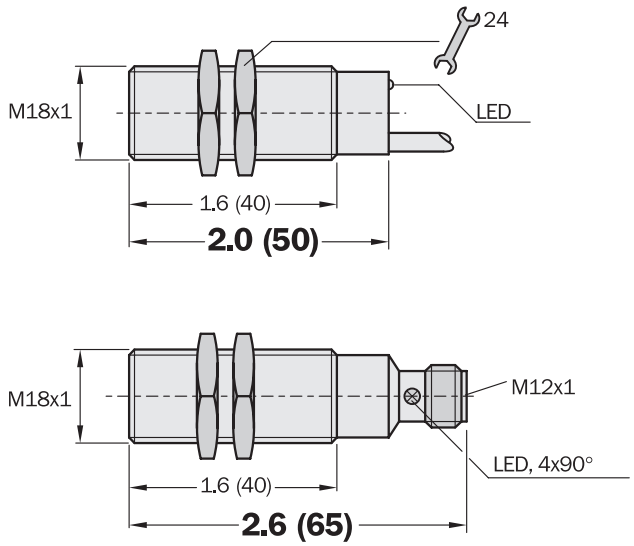
- Sensing range up to 70 mm
- PNP output
- High switching frequency
- Short-circuit protection (pulsed)
- Robust brass housing, nickel-plated with fine thread M18 x 1 mm
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

MM 18 Advanced



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926
Magnets	978, 979

Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2 V with Ia max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	25 Nm
Connection cable	PUR-PVC, 3 x 0.25 mm²

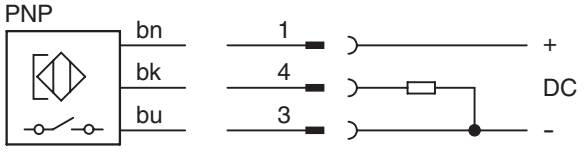
Selection Table

Sensing range S_n in (mm)	Magnetic alignment	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.8 (70)	Axial	PNP		5000	Cable 2 m	MM18-70APS-ZU0	7 900 272
2.8 (70)	Axial	PNP		5000	Connector M12 x 1 mm	MM18-70APS-ZC0	7 900 274

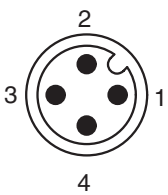
Sensing Ranges

Magnet type	Sensing Range s_n Any installation type (flush or non-flush) in a non-magnetizable material	Sensing Range s_n Flush installation in a magnetizable material (e.g. iron)
M 1.0	0.9 in (24 mm)	0.6 in (16 mm)
M 2.0	1.0 in (25 mm)	0.7 in (17 mm)
M 3.0	1.5 in (38 mm)	1.3 in (32 mm)
M 4.0	2.8 in (70 mm)	2.2 in (55 mm)
M 5.0/5.1	3.3 in (85 mm)	2.4 in (60 mm)

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC
		2	free



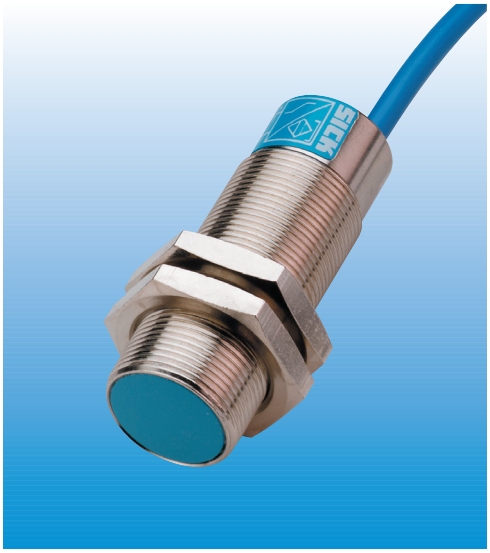
MM 18 NAMUR

Magnetic Proximity Sensors

Highlights

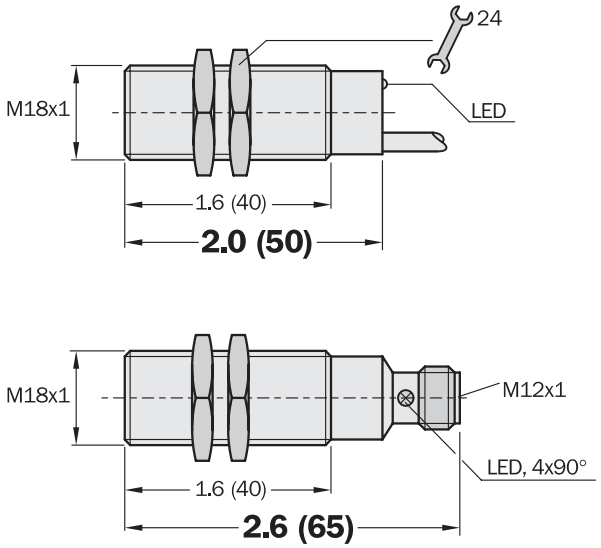
- Sensing range up to 60 mm
- High switching frequency
- NAMUR to EN 50 227
- Shielded or unshielded
- LED status indicator
- Robust brass housing, nickel-plated with fine thread M12 x 1 mm
- Cable or connector
- Enclosure rating IP 67

MM 18 NAMUR



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	925, 926
Magnets	978, 979
Power supply	966

Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Ripple U_{pp}	≤ 5% of U_b
Power consumption, attenuated	≥ 2.5 mA
Power consumption, unattenuated	≤ 1.0 mA
Internal capacitance	≤ 15 nF
Internal inductance	≤ 25 µH
Cable resistance	≤ 50 w
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	± 10% of s_r
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to EN 60529	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...158°F (-25...70°C)
Housing material	Brass, nickel-plated, plastic
Tightening torque	25 Nm
Connection cable	PVC, 2 x 0.34 mm^2
Max. data for connecting isolating unit EN 2	
EX or other approved isolating amplifier:	
Short circuit current I_K max	30 mA
No load voltage U_o	16 V
Power loss Pmax	75 mW

Selection Table

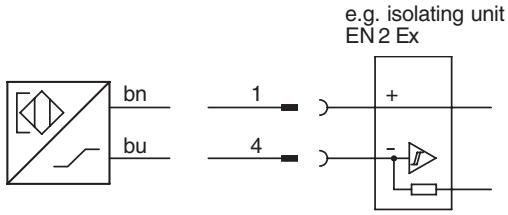
Sensing range S_n* in (mm)	Magnetic alignment	Version	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.8 (70)	Axial	NAMUR		5000	Cable 2 m	MM18-70A-N-ZW0	7 900 288
2.8 (70)	Axial	NAMUR		5000	Connector M12 x 1 mm	MM18-70A-N-ZC0	7 900 289

* Sensing range s_n based on installation in non-magnetizable material using magnet M 4.0.

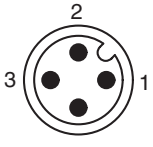
Sensing Ranges

Magnet type	Sensing Range s_n Any installation type (flush or non-flush) in a non-magnetizable material	Sensing Range s_n Flush installation in a magnetizable material (e.g. iron)M
M 1.0	0.9 in (24 mm)	0.6 in (16 mm)
M 2.0	1.0 in (25 mm)	0.7 in (17 mm)
M 3.0	1.5 in (38 mm)	1.3 in (32 mm)
M 4.0	2.8 in (70 mm)	2.2 in (55 mm)
M 5.0/5.1	3.3 in (85 mm)	2.4 in (60 mm)

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	4	- V DC
		3	free
		2	free



SICK

MQ 10 Advanced

Magnetic Proximity Sensors

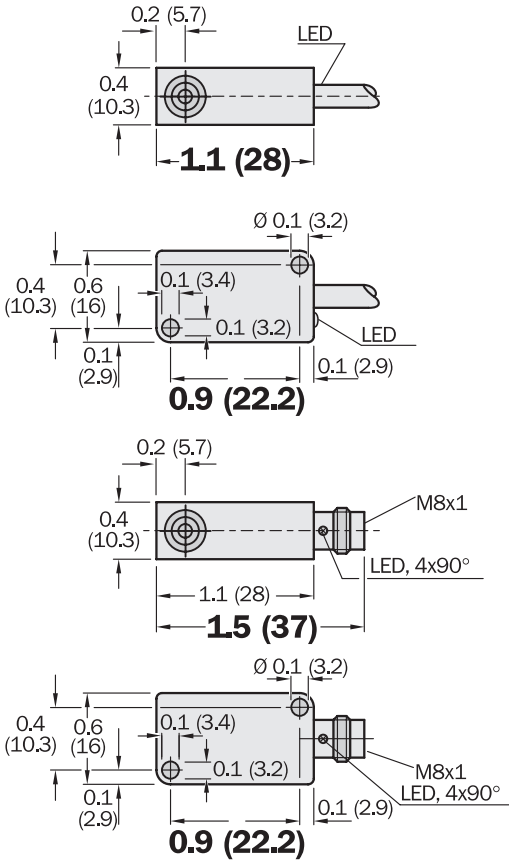
Highlights

- Sensing range up to 60 mm
- PNP or NPN output
- High switching frequency
- Short-circuit protection (pulsed)
- Plastic housing
- Cable or connector
- Enclosure rating IP 67
- LED status indicator

MQ 10 Advanced

Dimensional Drawing

dimensions in inches (mm)

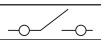
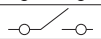
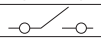


Accessories	page
Cables and connectors	908
Magnets	978, 979

Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2 V with Ia max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	1% - 10% of s_r
Repeatability R (U_b and T_a constant)	≤ 1% of s_r
Temperature drift	±10% of s_r
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

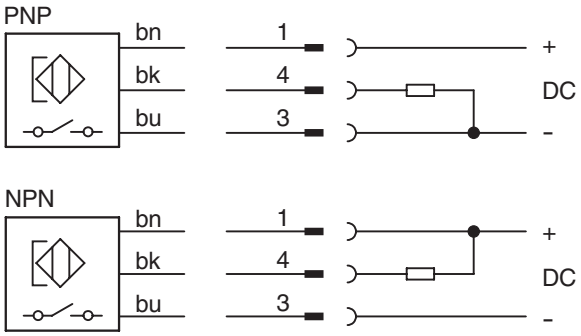
Selection Table

Sensing range S_n in (mm)	Magnetic alignment	Switching output	Output function	Switching frequency f in Hz	Connection type	Type	Part no.
2.4 (60)	Axial	PNP		5000	Cable 2 m	MQ10-60APS-KU0	7 900 278
2.4 (60)	Axial	NPN		5000	Cable 2 m	MQ10-60ANS-KU0	7 900 279
2.4 (60)	Axial	PNP		5000	Connector M8 x 1 mm	MQ10-60APS-KT0	7 900 280
2.4 (60)	Axial	NPN		5000	Connector M8 x 1 mm	MQ10-60ANS-KT0	7 900 281

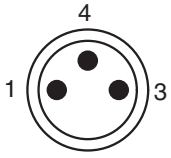
Sensing Ranges

Magnet type	Sensing Range s_n Any installation type (flush or non-flush) in a non-magnetizable material	Sensing Range s_n Flush installation in a magnetizable material (e.g. iron)
M 1.0	0.9 in (23 mm)	0.5 in (12 mm)
M 2.0	0.9 in (24 mm)	0.4 in (10 mm)
M 3.0	1.4 in (36 mm)	0.6 in (15 mm)
M 4.0	2.4 in (60 mm)	0.8 in (20 mm)
M 5.0/5.1	2.7 in (68 mm)	1.0 in (25 mm)

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

Theory of Operation...Magnetic Cylinder Sensors

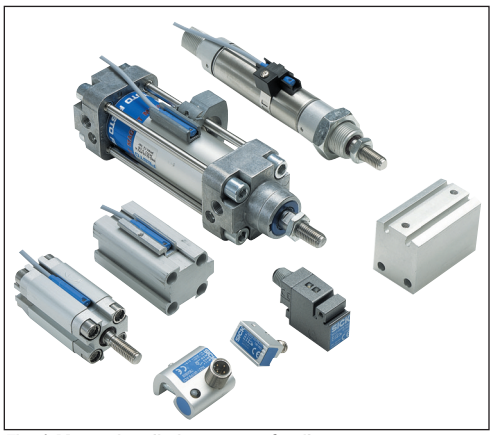


Fig. 1 Magnetic cylinder sensors family

About Magnetic Cylinder Sensors

Magnetic cylinder sensors are used to detect the position of pistons in pneumatic cylinders. They are attached directly to the cylinder body and operate according to the same principle as magnetic proximity sensors. They detect a ring magnet in the piston through the housing wall made of non-magnetizable material (aluminum, brass, stainless steel).

Response sensitivity

The magnetic induction of pneumatic cylinders is between 5 and 25 mTesla. A response sensitivity of 3 mTesla is enough to ensure signal triggering. Adaptation of the proximity sensors to different cylinder diameters or makes is therefore no longer necessary. The illustration (below) shows a proximity sensor with a typical switching curve attached to a cylinder containing a ring magnet.

Sensing face

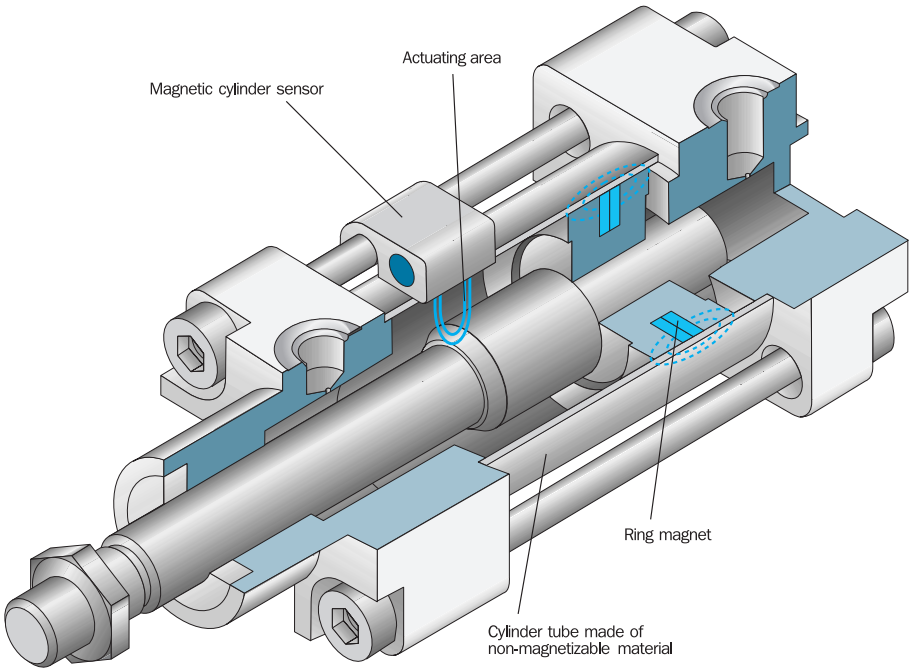
The active surface of a magnetic cylinder sensor is always on the opposite side of the LED status indicator.

Traverse distance su

The traverse distance su is between 5 and 20 mm, depending on the cylinder's construction (wall thickness, diameter and magnetic induction). The typical hysteresis is 1 mm and remains constant.

Actuating speed

The sort response times of the sensors allow actuating speeds of up to 5 m/s.



Magnetic Cylinder Sensors...Type Code

Character	1	2	3	4	5	6	7	8	9	11	12	13	14	Character
	M	**Z**	**R**	**1**	**-**	**0**	**3**	**V**	**P**	**-**	**A**	**U**	**0**	

1 **Sensor technology**
- M Magnetic
- R Reed switch

2 **Design**
- Z Cylinder sensor

3/4 **Application**
- R1 Round-body cylinder
- R2 Round-body cylinder
- Z1 Tie-rod cylinder
- Z2 Tie-rod cylinder
- P3 Integrated Profile cylinder
- P4 Integrated Profile cylinder
- K1 Short-stroke cylinder
- K3 Short-stroke cylinder
- F1 T-slot
- U2 Universal
- T1 T-Nut

6/7/8 **Response sensitivity, sensor position**
- 02 in mT
- 03 in mT
- V Sensor, front
- Z Sensor, centre

Interface 9
- P DC (3-wire) PNP
- N DC (3-wire) NPN
- U AC/DC 2-wire
- R Reed (3-wire)
- - NAMUR

Output 10
- S NO
- N NAMUR

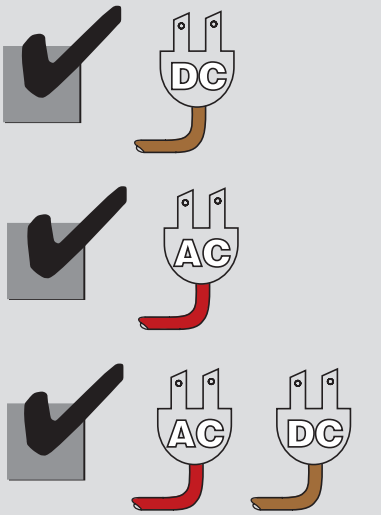
Housing material 12
- A Aluminium
- K Plastic
- D Die-cast zinc
- T Die-cast zinc with teflon coating

Connection 13
- W Cable, PVC
- U Cable, PUR-PVC
- P Cable with connector, M8x1
- T Connector, M8x1
- Q Cable with connector, M12x1
- C Connector, M12x1

other codes 14
- M Weld immune

Magnetic Cylinder Sensors

Magnetic Cylinder Sensors



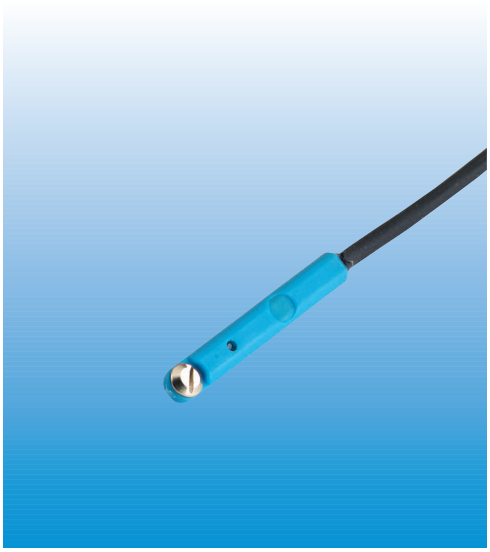
MZ N1

Magnetic Cylinder Sensors for C-slot Cylinders

Highlights

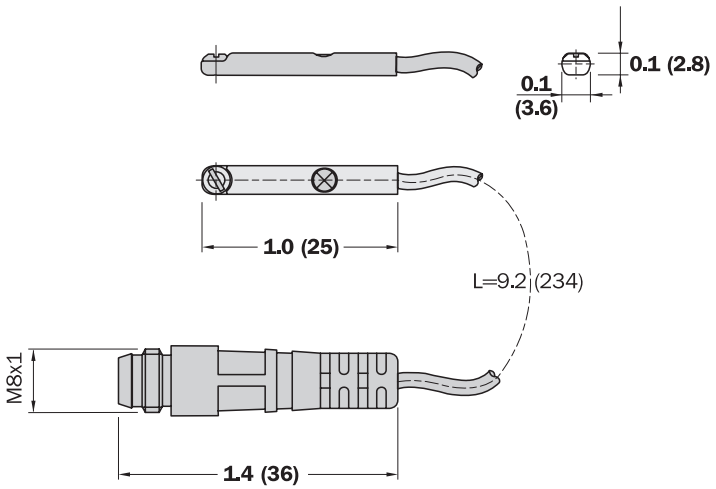
- Non-contact determination of piston position in pneumatic cylinders
- Drop-in mounting
- Enclosure rating IP 67
- Plastic housing with clamping screw
- LED status indicator
- For all commonly used C-slot (round slot) cylinders e.g. Festo, SMC
- Connection cable or connector on cable

MZ N1



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908

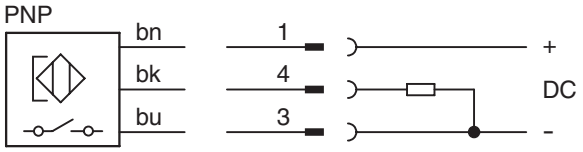
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_d	≤ 2.5 V DC
Power consumption (without load)	≤ 8 mA
Load current I_a	≤ 70 mA
Switching delay	≤ 0.1 ms
Hysteresis H	≤ 1.5 mT (15 gauss)
Repeatability R (U_b and T_a constant)	≤ ± 0.1 mm
EMC	to EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable 2 m	PUR, 3 x 0.09 mm²
Connection cable with M8 x 1 mm	PUR

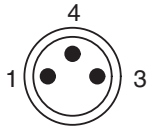
Selection Table

Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
	PNP		1000	Cable 2 m	MZN1-05VPS-KU0	1 022 053
	PNP		1000	Cable w. M8 x 1 mm	MZN1-05VPS-KP0	1 022 054

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



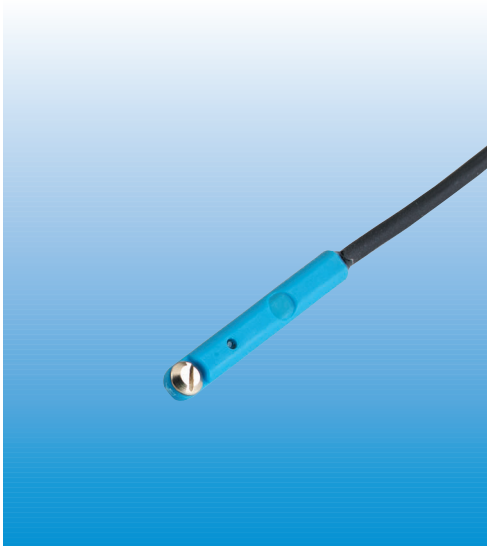
RZ N1 Reed

Magnetic Cylinder Sensors for C-slot Cylinders

Highlights

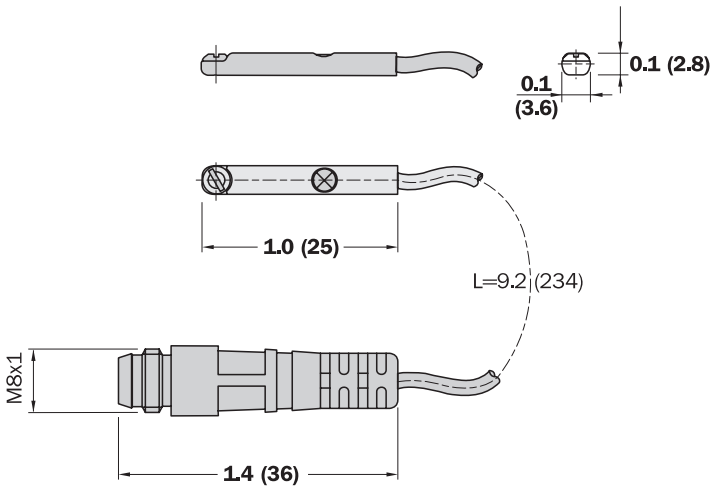
- Non-contact determination of piston position in pneumatic cylinders
- Drop-in mounting
- Enclosure rating IP 67
- Plastic housing with clamping screw
- LED status indicator
- For all commonly used C-slot (round slot) cylinders e.g. Festo, SMC
- Connection cable or connector on cable

RZ N1



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908

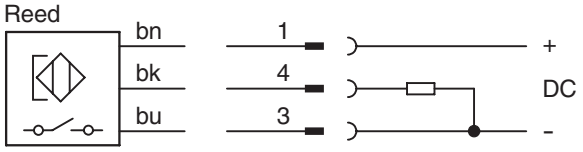
Electrical and Mechanical Data

Operating voltage U_b	10...30 V AC/DC
Max. switching power	10 W / VA
Continuous current I_a	≤ 500 mA DC / ≤ 300 mA AC
Switching delay **ON**	app. 1.0 ms
OUT	app. 0.5 ms
Hysteresis H	≤ 0.7 mT (70 gauss)
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
EMC	to EN 60 947-5-2
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	PA 12
Connection cable 2 m	PUR, 3 x 0.09 mm^2
Connection cable with M8 x 1 mm	PUR

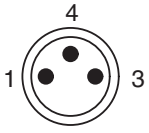
Selection Table

Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
	Reed		500	Cable 2 m	RZN1-05ZRS-KU0	1 022 055
	Reed		500	Cable w. M8 x 1 mm	RZN1-05ZRS-KP0	1 022 056

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



MZ U2 Weld Immune

Magnetic Cylinder Sensors

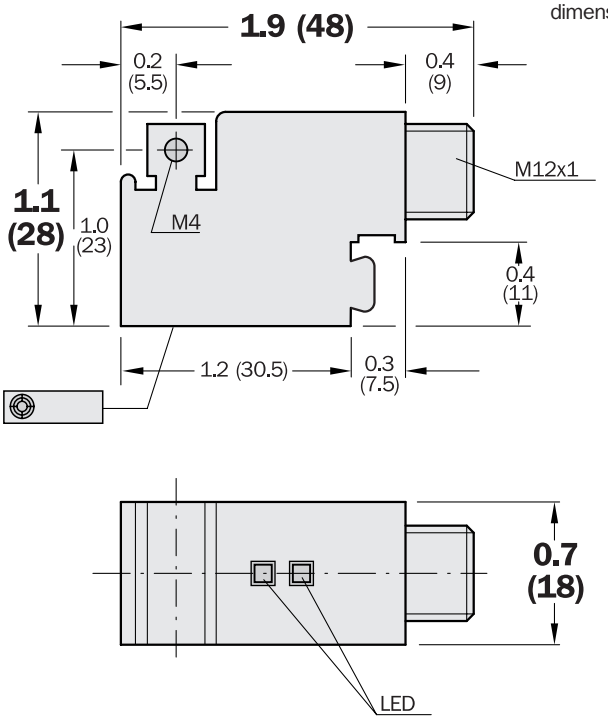
Highlights

- Non-contact detection of piston position in pneumatic cylinders in weld field environments
- Weld immune in all welding applications (AC, DC and medium frequency)
- Response sensitivity of interference field detector ≥ 2 mT
- During the welding process, the sensor updates the output accordingly
- Flexible mounting technique for different cylinder styles
- Solid metal housing in die cast zinc, optional with teflon coating

MZ U2 Weld Immune

Dimensional Drawing

dimensions in inches (mm)

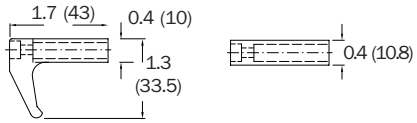


Accessories

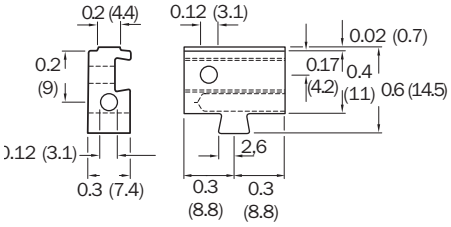
Mounting clamps for pneumatic cylinder sensor MZ U2 for tie-rod cylinders

Mounting clamp: BEF-KS-U2-S1
Material: Die cast zinc
Part no.: 7 030 922

Mounting clamp: BEF-KS-U2-S1T
Material: Die cast zinc with Teflon coating
Part no.: 7 031 632
Tie rod cylinder Ø4...20 mm

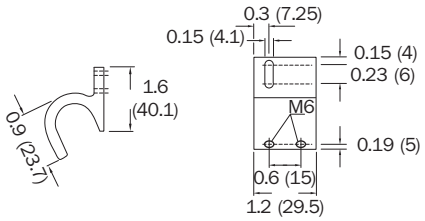


Mounting clamp: BEF-KS-U2-T1
Material: Aluminum
Part no.: 2 019 822
For cylinder with T-slot

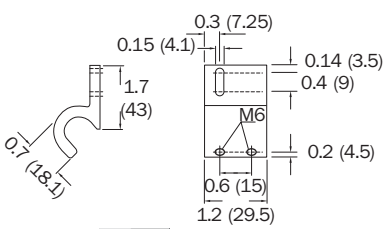


Mounting clamps for pneumatic cylinder sensor MZ U2
For integrated profile cylinder with max. rod diameter of 18 mm

Mounting clamp: BEF-KS-U2-P2
Material: Aluminum
Part no.: 2 019 823



Mounting clamp: BEF-KS-U2-P1
Material: Aluminum
Part no.: 2 019 824
For integrated profile cylinder with max. rod diameter of 13 mm

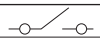
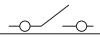


Accessories	page
Cables and connectors	909

Electrical and Mechanical Data

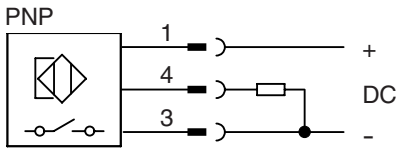
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2.0 V at I_a max.
Power consumption (without load)	≤ 18 mA (unattenuated), ≤ 32 mA (attenuated)
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 20 ms
Hysteresis H	≤ 1.5 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Die cast zinc, optional with teflon coating

Selection Table

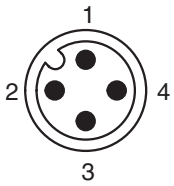
Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		40	Connector M12 x 1 mm	MZU2-03VPS-DCM	1 017 450
3 (30)		PNP		40	Connector M12 x 1 mm	MZU2-03VPS-TCM*	1 017 451

*with Teflon coating

Connection Diagram



Contact	Assignment
1	+ V DC
4	NO
3	- V DC
2	free

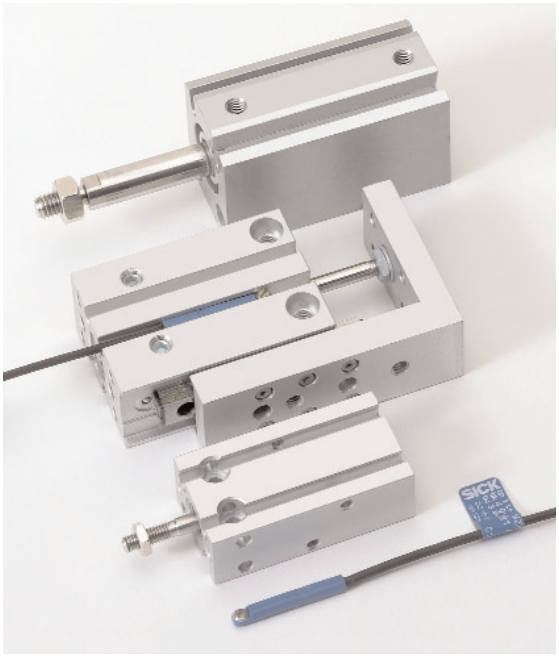


SICK

Magnetic Cylinder Sensors for T-slot Cylinders

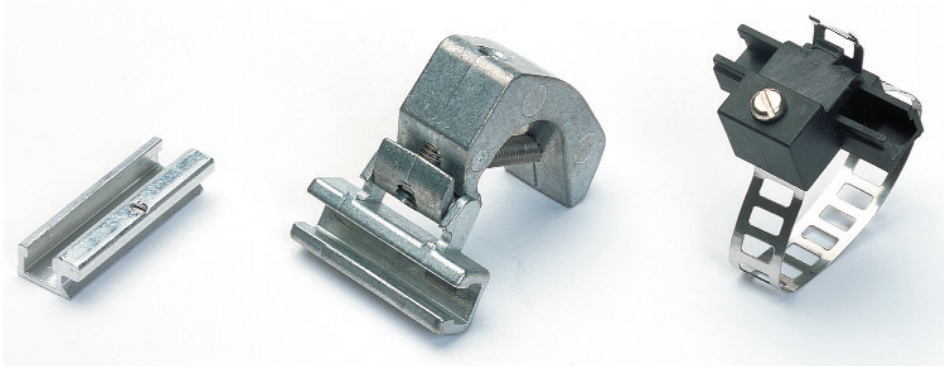
The MZ T1/RZ T1 and MZ T6/RZ T6 magnetic cylinder sensors are designed to provide a sensing solution for most common T-slot cylinders. MZ T1/RZ T1 and MZ T6/RZ T6 can also provide sensing solutions for integrated profile, tie-rod, round-body and dovetail cylinders with the use of the appropriate mounting systems.

Magnetic Cylinder Sensors for T-slot Cylinders



Highlights

- Drop-in mounting
- Fits all conventional slots of pneumatic cylinders
- Easy mounting using standard tools



Highlights

- Time-saving thanks to easy mounting
- Optimization of storage costs
- A sensor for different pneumatic cylinder types

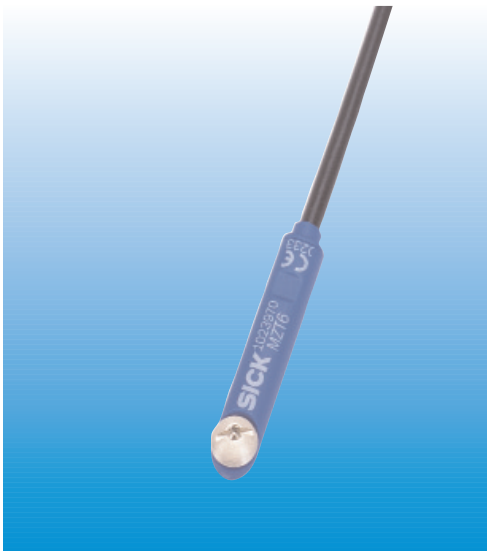
MZ T6

Magnetic Cylinder Sensors for T-slot Cylinders

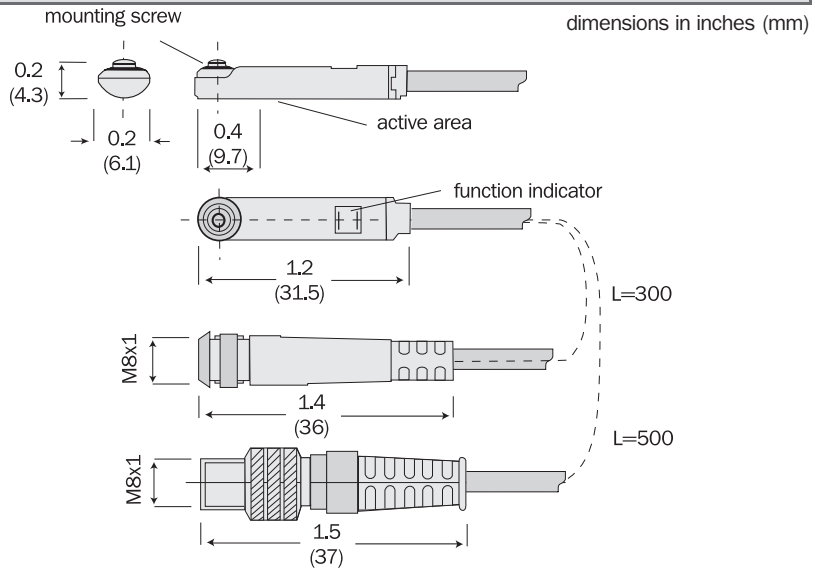
Highlights

- Non-contact detection of piston position in pneumatic cylinders
- Drop-in mounting
- For all common used T-slot cylinders e.g. Festo, SMC
- Plastic housing with nickel; silver
- Connection cable or connector on cable
- Enclosure rating IP 67
- LED function indicator
- Magneto-resistive element (MZT6 only)
- Adjustable with allen wrench or screwdriver

MZ T6



Dimensional Drawing



Accessories

MZ T6/RZ T6 and MZ T1/RZ T1 sensors provide a perfect sensing solution for round-body, tie-rod, integrated profile and dovetail pneumatic cylinders with the help of SICK mounting systems.

BEF-KHZ-PT1/Integrated profile and tie-rod cylinders
Using the BEF-KHZ-PT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ Z1, MZ Z2, MZ P3, MZ P4.

BEF-KHZ-ST1/Pneumatic cylinder with dovetail groove
The profile dimensions of the BEF-KHZ-ST1 mounting system correspond to the groove dimensions of the MZ K1, MZ K3, RZ K1 and RZ K3 magnetic cylinder sensors.
Compare the dimensions of the groove with the dimensions of the mounting rails.

BEF-KHZ-RT1/Round-body cylinder
Using the BEF-KHZ-RT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ R1, RZ R1, MZ R2, RZ R2.

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Order Information

Type	Part number	Material	Description
BEF-KHZ-PT1	2 022 702	Zinc die cast (GD-ZnA15Cu1)	For integrated profile and tie-rod cylinders
BEF-KHZ-ST1	2 022 703	Aluminum alloy	For dovetail cylinders
BEF-KHZ-RT1-25	5 311 171	Plastic/stainless steel	For round-body cylinder Ø 8…25 mm
BEF-KHZ-RT1-63	5 311 172	Plastic/stainless steel	For round-body cylinder Ø 32…63 mm
BEF-KHZ-RT1-130	5 311 506	Plastic/stainless steel	For round-body cylinder Ø 80…130 mm

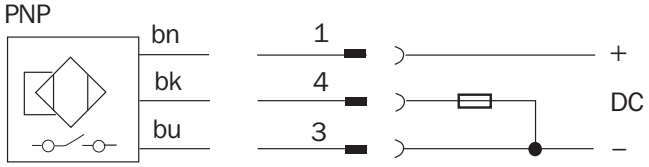
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_d	≤ 2.5 V DC
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 100 mA
Response sensitivity	2.8 mT ±25%
Hysteresis H	≤ 0.85 mT (8.5 gauss)
Repeatability R (U_b and T_a constant)	≤ ± 0.1 mT (1 gauss)
EMC	to EN 60 947-5-2
Wire break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable 2 m	PVC, 3 x 0.14 mm^2
Connection cable with M8 x 1 mm	PUR

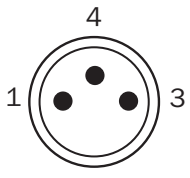
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
2.8 (28)		PNP		5000	Cable 2 m	MZT6-03VPS-KW0	1 023 970
2.8 (28)		PNP		5000	Cable with M8 x 1 mm	MZT6-03VPS-KP0	1 023 971
2.8 (28)		PNP		5000	Cable with M8 x 1 mm, knurled screw	MZT6-03VPS-KR0	1 023 972

Connection Diagram



Wire Color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



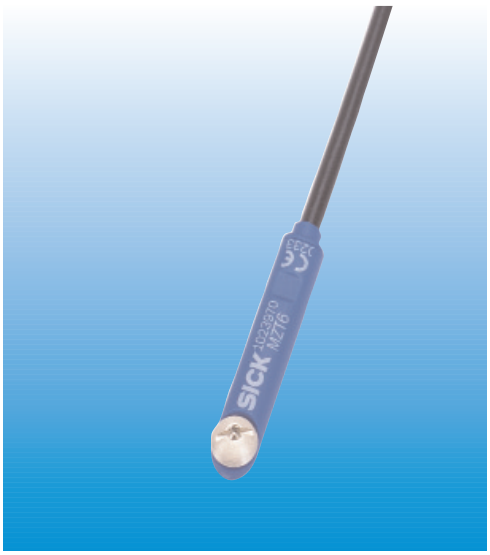
RZ T6

Magnetic Cylinder Sensors for T-slot Cylinders

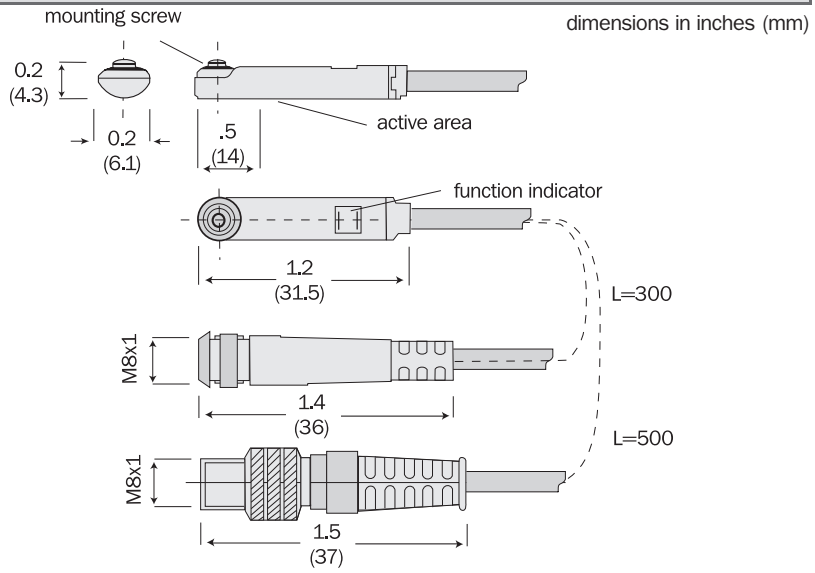
Highlights

- Non-contact detection of piston position in pneumatic cylinders
- Mountable from the top
- For all common used T-slot cylinders e.g. Festo, SMC
- Plastic housing with nickel; silver
- Connection cable or connector on cable
- Enclosure rating IP 67
- LED function indicator
- Adjustable with allen wrench or screwdriver

RZ T6



Dimensional Drawing



Accessories

MZ T6/RZ T6 and MZ T1/RZ T1 sensors provide a perfect sensing solution for round-body, tie-rod, integrated profile and dovetail pneumatic cylinders with the help of SICK mounting systems.

BEF-KHZ-PT1/Integrated profile and tie-rod cylinders
Using the BEF-KHZ-PT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ Z1, MZ Z2, MZ P3, MZ P4.

BEF-KHZ-ST1/Pneumatic cylinder with dovetail groove
The profile dimensions of the BEF-KHZ-ST1 mounting system correspond to the groove dimensions of the MZ K1, MZ K3, RZ K1 and RZ K3 magnetic cylinder sensors.
Compare the dimensions of the groove with the dimensions of the mounting rails.

BEF-KHZ-RT1/Round-body cylinder
Using the BEF-KHZ-RT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ R1, RZ R1, MZ R2, RZ R2.

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Order Information

Type	Part number	Material	Description
BEF-KHZ-PT1	2 022 702	Zinc die cast (GD-ZnA15Cu1)	For integrated profile and tie-rod cylinders
BEF-KHZ-ST1	2 022 703	Aluminum alloy	For dovetail cylinders
BEF-KHZ-RT1-25	5 311 171	Plastic/stainless steel	For round-body cylinder Ø 8…25 mm
BEF-KHZ-RT1-63	5 311 172	Plastic/stainless steel	For round-body cylinder Ø 32…63 mm
BEF-KHZ-RT1-130	5 311 506	Plastic/stainless steel	For round-body cylinder Ø 80…130 mm

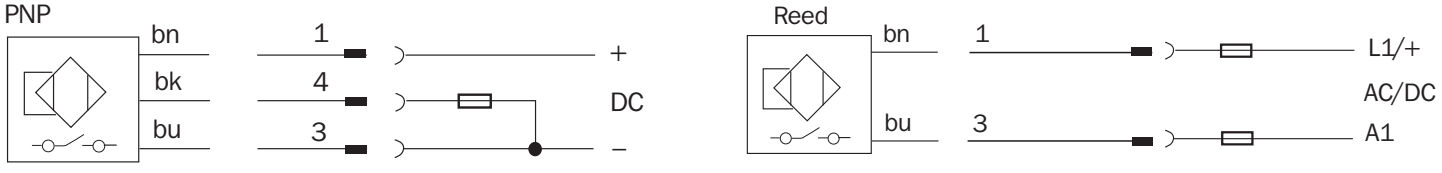
Electrical and Mechanical Data

	RZ T6 (3-wire)	RZ T6 (2-wire)
Operating voltage U_b	10...30 V DC	10...120 V AC
Max. switching power	6 W/ VA	3 W/6 W peak
Continuous current I_a	≤ 500 mA	100 mA
Switching delay	app. 1.5 ms (on), app. 0.5 ms (off)	app. 1.5 ms (on), app. 0.5 ms (off)
Response sensitivity	2.8 mT ±25%	2.8 mT ±25%
Hysteresis H	≤ 0.9 mT (5 gauss)	≤ 0.9 mT (5 gauss)
Repeatability R (U_b and T_a constant)	≤ ± 0.1 mT (1 gauss)	≤ ± 0.1 mT (1 gauss)
EMC	to EN 60 947-5-2	to EN 60 947-5-2
Enclosure rating to DIN 40050	IP 67	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)	-13...167°F (-25...75°C)
Housing material	Plastic	Plastic
Connection cable 2 m	PVC, 3 x 0.14 mm²	PVC, 3 x 0.14 mm²
Connection cable with M8 x 1 mm	PUR	PUR

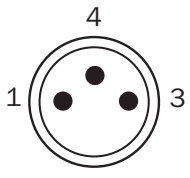
Selection Table

Response sensitivity in mT (gauss))	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		Reed		400	Cable 2 m	RZT6-03ZRS-KW0	1 023 974
3 (30)		Reed		400	Cable with M8 x 1 mm	RZT6-03ZRS-KP0	1 023 973
3 (30)		Reed		400	Cable with M8 x 1 mm	RZT6-03ZRS-KR0	1 023 975
3 (30)		Reed		400	2-wire, cable 2 m	RZT6-03ZUS-KW0	1 025 522

Connection Diagram



Wire Color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

MZ T1

Magnetic Cylinder Sensors for T-slot Cylinders

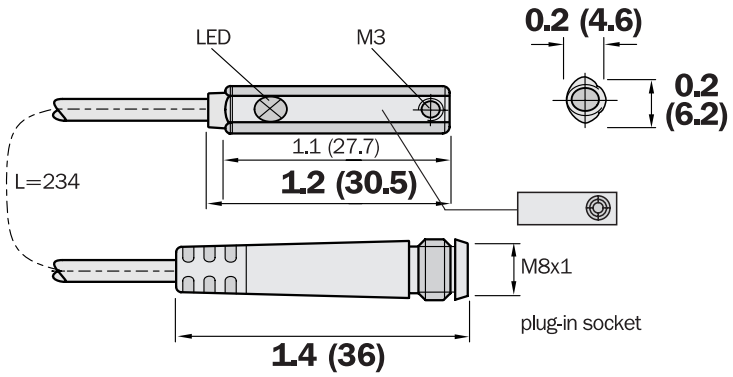
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- No secondary switching ranges
- Actuating speed ≤ 5 m/s
- LED status indicator
- Magneto-resistive element
- For all commonly used T-slot cylinders e.g. Festo, SMC

MZ T1

Dimensional Drawing

dimensions in inches (mm)



Accessories

MZ T6/RZ T6 and MZ T1/RZ T1 sensors provide a perfect sensing solution for round-body, tie-rod, integrated profile and dovetail pneumatic cylinders with the help of SICK mounting systems.

BEF-KHZ-PT1/Integrated profile and tie-rod cylinders
Using the BEF-KHZ-PT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ Z1, MZ Z2, MZ P3, MZ P4.

BEF-KHZ-ST1/Pneumatic cylinder with dovetail groove
The profile dimensions of the BEF-KHZ-ST1 mounting system correspond to the groove dimensions of the MZ K1, MZ K3, RZ K1 and RZ K3 magnetic cylinder sensors.
Compare the dimensions of the groove with the dimensions of the mounting rails.

BEF-KHZ-RT1/Round-body cylinder
Using the BEF-KHZ-RT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ R1, RZ R1, MZ R2, RZ R2.

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Order Information

Type	Part number	Material	Description
BEF-KHZ-PT1	2 022 702	Zinc die cast (GD-ZnA15Cu1)	For integrated profile and tie-rod cylinders
BEF-KHZ-ST1	2 022 703	Aluminum alloy	For dovetail cylinders
BEF-KHZ-RT1-25	5 311 171	Plastic/stainless steel	For round-body cylinder Ø 8…25 mm
BEF-KHZ-RT1-63	5 311 172	Plastic/stainless steel	For round-body cylinder Ø 32…63 mm
BEF-KHZ-RT1-130	5 311 506	Plastic/stainless steel	For round-body cylinder Ø 80…130 mm

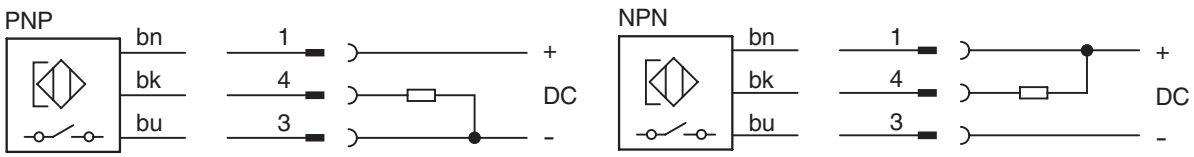
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 2 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 150 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.5 mm
Repeatability R (U_b and T_a constant)	≤ 0.2 mm
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable 2 m	PUR-PVC, 3 x 0.25 mm^2
Connection cable with M8 x 1 mm	PUR, 3 x 0.25 mm^2

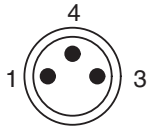
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZT1-03VPS-KW0	1 016 809
3 (30)		PNP		5000	Cable w. M8 x 1 mm	MZT1-03VPS-KP0	1 016 910
3 (30)		NPN		5000	Cable w. M8 x 1 mm	MZT1-03VNS-KP0	1 017 851

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

RZ T1 Reed

Magnetic Cylinder Sensors for T-slot Cylinders

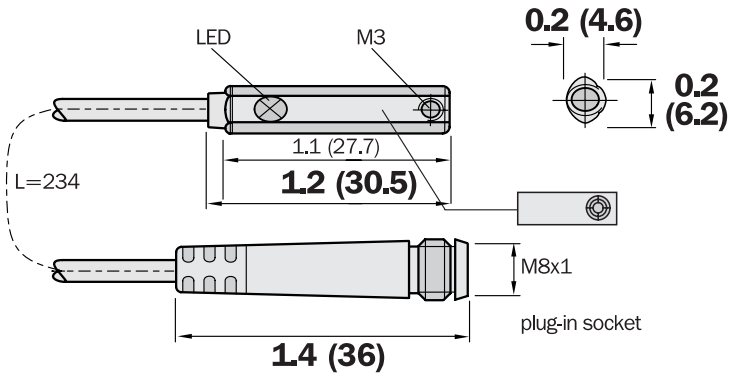
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- High response sensitivity ≥ 3 mT
- Mountable from the top
- No secondary switching ranges
- Enclosure rating IP 67
- LED status indicator
- For all commonly used T-slot cylinders e.g. Festo, SMC

RZ T1 Reed

Dimensional Drawing

dimensions in inches (mm)



Accessories

MZ T6/RZ T6 and MZ T1/RZ T1 sensors provide a perfect sensing solution for round-body, tie-rod, integrated profile and dovetail pneumatic cylinders with the help of SICK mounting systems.

BEF-KHZ-PT1/Integrated profile and tie-rod cylinders
Using the BEF-KHZ-PT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ Z1, MZ Z2, MZ P3, MZ P4.

BEF-KHZ-ST1/Pneumatic cylinder with dovetail groove
The profile dimensions of the BEF-KHZ-ST1 mounting system correspond to the groove dimensions of the MZ K1, MZ K3, RZ K1 and RZ K3 magnetic cylinder sensors.
Compare the dimensions of the groove with the dimensions of the mounting rails.

BEF-KHZ-RT1/Round-body cylinder
Using the BEF-KHZ-RT1 mounting system together with the MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ R1, RZ R1, MZ R2, RZ R2.

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Order Information

Type	Part number	Material	Description
BEF-KHZ-PT1	2 022 702	Zinc die cast (GD-ZnA15Cu1)	For integrated profile and tie-rod cylinders
BEF-KHZ-ST1	2 022 703	Aluminum alloy	For dovetail cylinders
BEF-KHZ-RT1-25	5 311 171	Plastic/stainless steel	For round-body cylinder Ø 8…25 mm
BEF-KHZ-RT1-63	5 311 172	Plastic/stainless steel	For round-body cylinder Ø 32…63 mm
BEF-KHZ-RT1-130	5 311 506	Plastic/stainless steel	For round-body cylinder Ø 80…130 mm

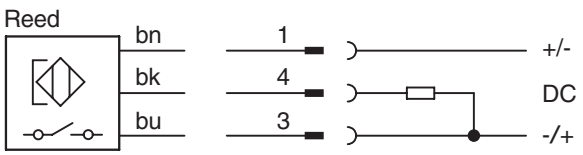
Electrical and Mechanical Data

Operating voltage U_b	10...30 V AC/DC
Max. switching power	6 W / VA
Continuous current I_a	≤ 500 mA
Switching delay	app. 1.5 ms (ON), app. 0.5 ms (OUT)
Hysteresis H	≤ 1.5 mm
Repeatability R (U_b and T_a constant)	≤ 0.2 mm
EMC	to EN 60 947-5-2
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Plastic
Connection cable 2 m	PUR-PVC, 3 x 0.25 mm²
Connection cable with M8 x 1 mm	PUR, 3 x 0.25 mm²

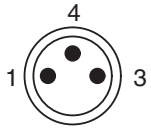
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		Reed		400	Cable 2 m	RZT1-03ZRS-KW0	1 016 911
3 (30)		Reed		400	Cable w. M8 x 1 mm	RZT1-03ZRS-KP0	1 016 912

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ (-)
bk	black	4	NO
bu	blue	3	- (+)



SICK

MZ F1

Magnetic Cylinder Sensors for T-slot Cylinders

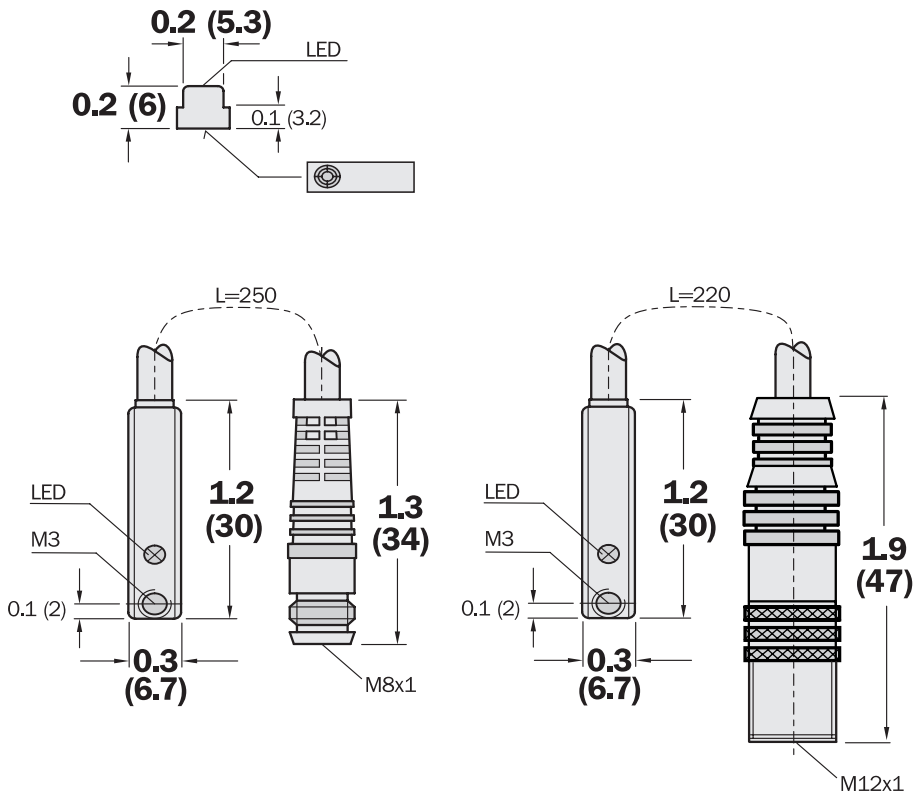
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Slide-in mounting
- Simple mounting on short-stroke cylinders
- High response sensitivity ≥ 2 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator

MZ F1

Dimensional Drawing

dimensions in inches (mm)



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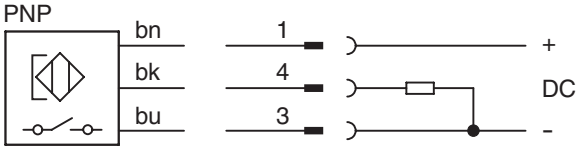
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm^2

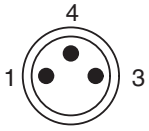
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZF1-03VPS-KU0	7 900 596
3 (30)		PNP		5000	Cable with M8 x 1 mm	MZF1-03VPS-KP0	7 900 597

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

Sensor Solutions for Tie-rod Cylinders

Mounting Bracket for MZ T1/RZ T1 and MZ T6/RZ T6

The BEF-KHZ-PT1 bracket makes installation of magnetic cylinder sensors possible on integrated profile and tie-rod cylinders. For MZ T6/RZ T6 and MZ T1/RZ T1.

BEF-KHZ-PT1 Mounting Bracket

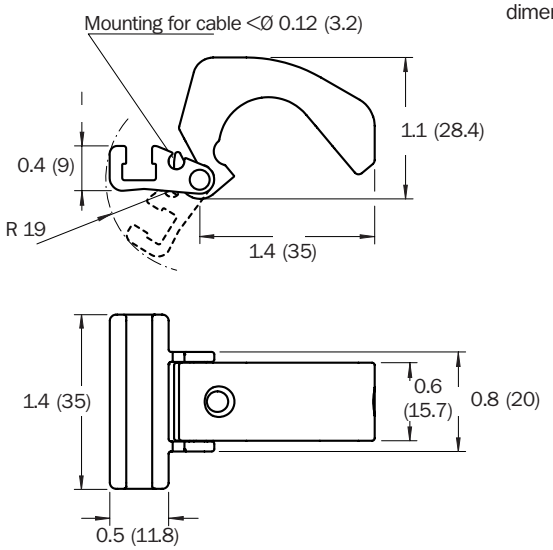
Highlights

- Adaptable to integrated profile cylinders: Ø pistons 32...100 mm, Ø profile rods 5...18 mm
- Adaptable to tie-rod cylinders: Ø pistons 32...160 mm, Ø tension rods 5...18 mm
- Fits tightly on profile rods/tension rod cylinders (no slipping)
- MZ T1/RZ T1 and MZ T6/RZ T6 sensors can be mounted from above onto the mounting rails
- Made of die cast zinc

BEF-KHZ-PT1

Dimensional Drawing

dimensions in inches (mm)



Note

Using the BEF-KHZ-PT1 mounting system together with the MZ T1/RZ T1 and MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ Z1, MZ Z2, MZ P3 and MZ P4.

Order Information

Type	Part no.
BEF-KHZ-PT1	2 022 702

MZ Z1

Magnetic Cylinder Sensors for Tie-rod Cylinders

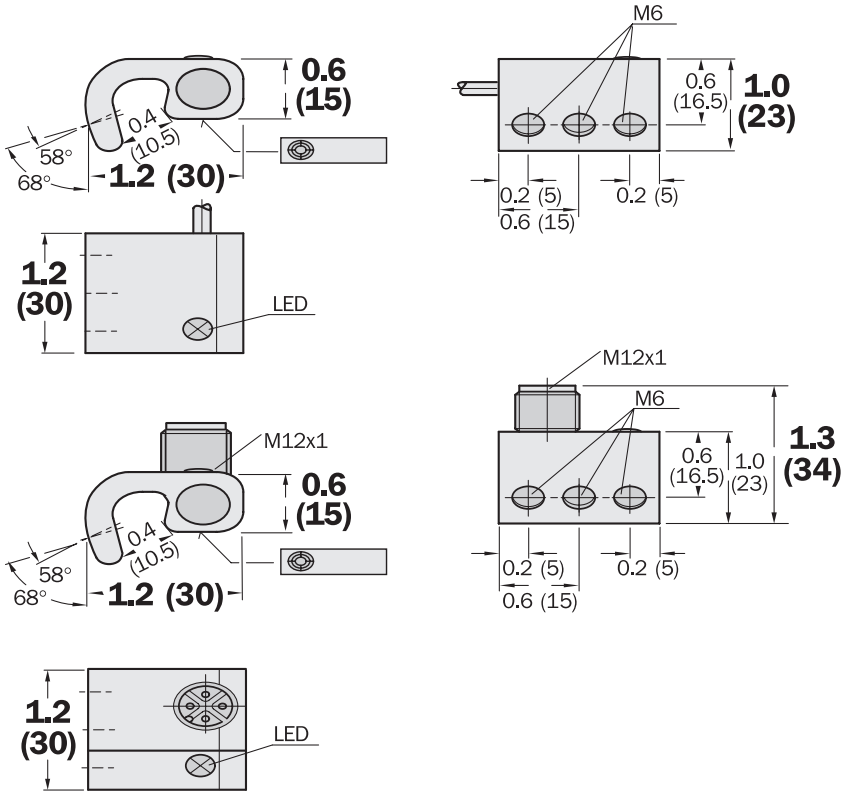
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Tie-rod mounting for max. rod diameter of 10 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- Solid aluminum housing with integrated mounting clamp

MZ Z1

Dimensional Drawing

dimensions in inches (mm)



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Mounting brackets	865

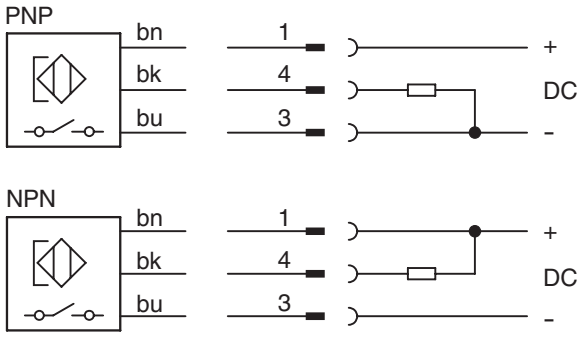
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	of EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

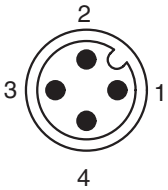
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZZ1-03VPS-AU0	7 900 606
3 (30)		PNP		5000	Connector M12 x 1 mm	MZZ1-03VPS-AC0	7 900 608
3 (30)		NPN		5000	Connector M12 x 1 mm	MZZ1-03VNS-AC0	7 900 609

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC
		2	free



SICK

MZ Z1 NAMUR

Magnetic Cylinder Sensors for Tie-rod Cylinders

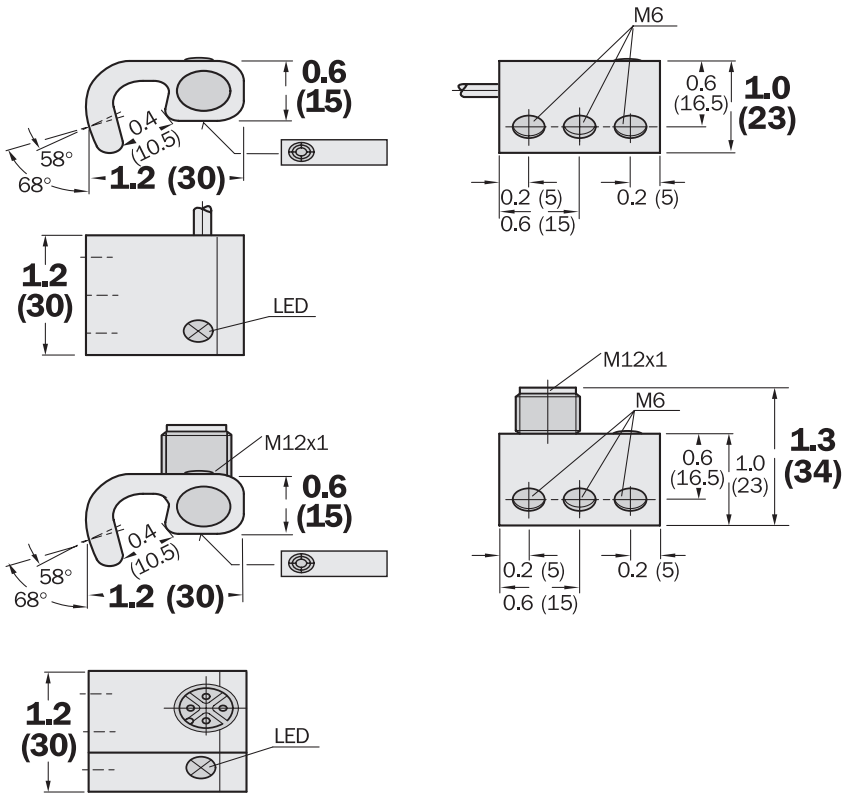
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Tie-rod mounting for max. rod diameter of 10 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- Solid aluminum housing with integrated mounting clamp
- NAMUR to EN50 227

MZ Z1 NAMUR

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
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Mounting brackets	865
Power supply	966

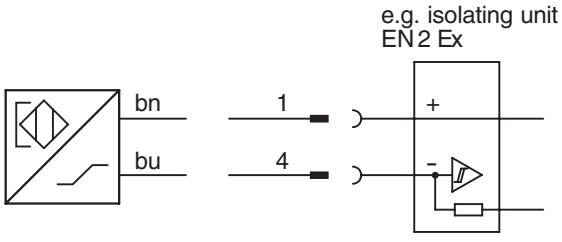
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Ripple U_{pp}	≤ 5% of U_b
Power consumption, attenuated	≥ 2.5 mA
Power consumption, unattenuated	≤ 1.0 mA
Internal capacitance	≤ 45 nF
Internal inductance	≤ 30 µH
Cable resistance	≤ 50 W
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	of EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...160°F (-25...70°C)
Housing material	Aluminum, plastic
Connection cable	PVC, 2 x 0.34 mm² blue

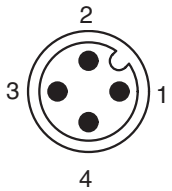
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Version	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		NAMUR		5000	Cable 2 m	MZZ1-03V-N-AW0	7 901 323
3 (30)		NAMUR		5000	Connector M12 x 1 mm	MZZ1-03V-N-AC0	7 901 324

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	4	- V DC
		3	free
		2	free



SICK

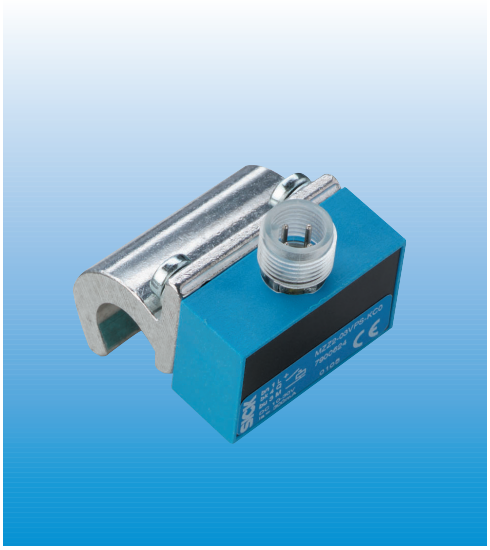
MZ Z2

Magnetic Cylinder Sensors for Tie-rod Cylinders

Highlights

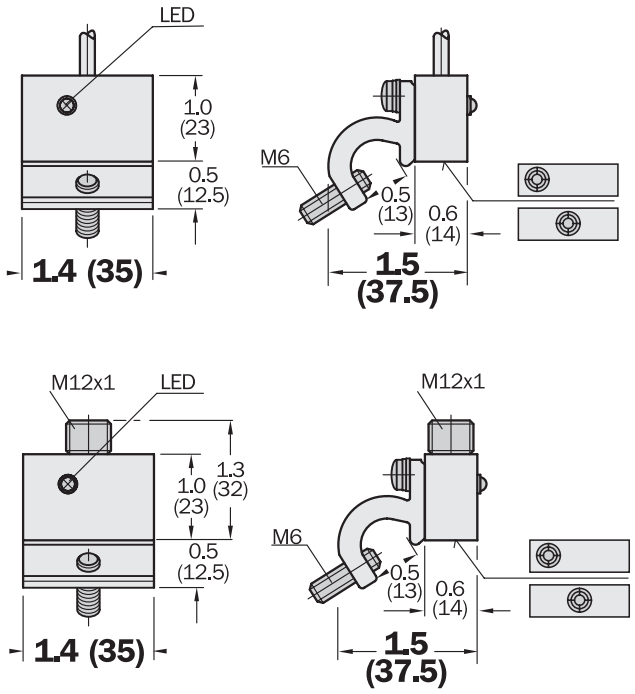
- Non-contact determination of piston position in pneumatic cylinders
- Mounting on tie-rods with max. rod diameter of 12.5 mm
- High response sensitivity ≥ 3 mT
- Frontal or central sensing face
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- Solid aluminum construction with integrated mounting clamp and plastic housing

MZ Z2



Dimensional Drawing

dimensions in inches (mm)



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Cables and connectors	909
Mounting brackets	865

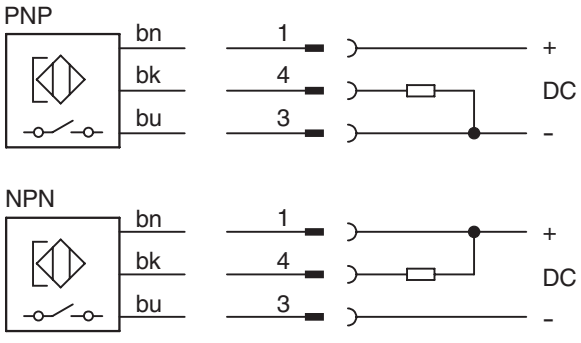
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	± 0.005 mm / °C
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

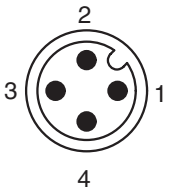
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZZ2-03ZPS-KU0	7 900 618
3 (30)		NPN		5000	Cable 2 m	MZZ2-03ZNS-KU0	7 900 619
3 (30)		PNP		5000	Connector M12 x 1 mm	MZZ2-03ZPS-KC0	7 900 620
3 (30)		PNP		5000	Cable 2 m	MZZ2-03VPS-KU0	7 900 622
3 (30)		NPN		5000	Cable 2 m	MZZ2-03VNS-KU0	7 900 623
3 (30)		PNP		5000	Connector M12 x 1 mm	MZZ2-03VPS-KC0	7 900 624

Connection Diagram



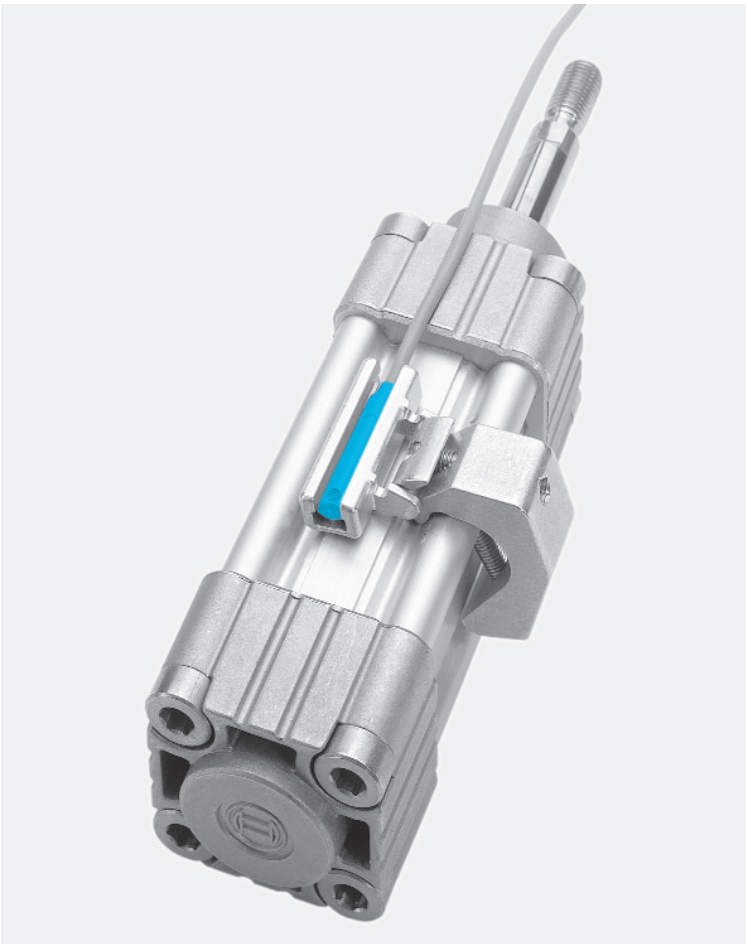
Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC
		2	free



SICK

Sensor Solutions for Integrated Profile Cylinders

Mounting Bracket for MZ T1/RZ T1 and MZ T6/RZ T6



The BEF-KHZ-PT1 bracket makes installation of magnetic cylinder sensors possible on integrated profile and tie-rod cylinders. For MZ T6/RZ T6 and MZ T1/RZ T1.

BEF-KHZ-PT1 Mounting Bracket

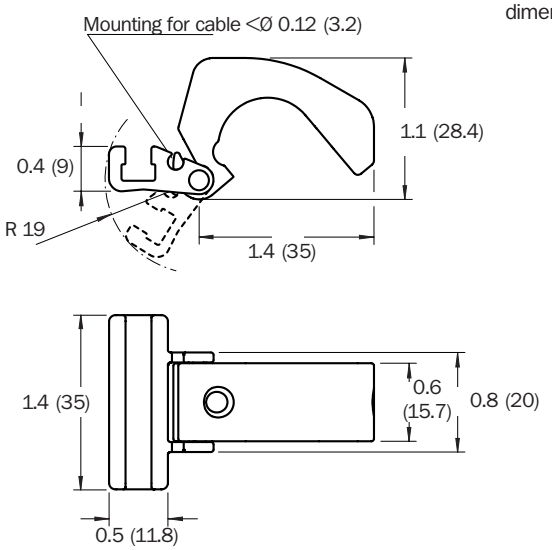
Highlights

- Adaptable to integrated profile cylinders: Ø pistons 32...100 mm, Ø profile rods 5...18 mm
- Adaptable to tie-rod cylinders: Ø pistons 32...160 mm, Ø tension rods 5...18 mm
- Fits tightly on profile rods/tension rod cylinders (no slipping)
- MZ T1/RZ T1 and MZ T6/RZ T6 sensors can be mounted from above onto the mounting rails
- Made of die cast zinc

BEF-KHZ-PT1

Dimensional Drawing

dimensions in inches (mm)



Note

Using the BEF-KHZ-PT1 mounting system together with the MZ T1/RZ T1 and MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ Z1, MZ Z2, MZ P3 and MZ P4.

Order Information

Type	Part no.
BEF-KHZ-PT1	2 022 702

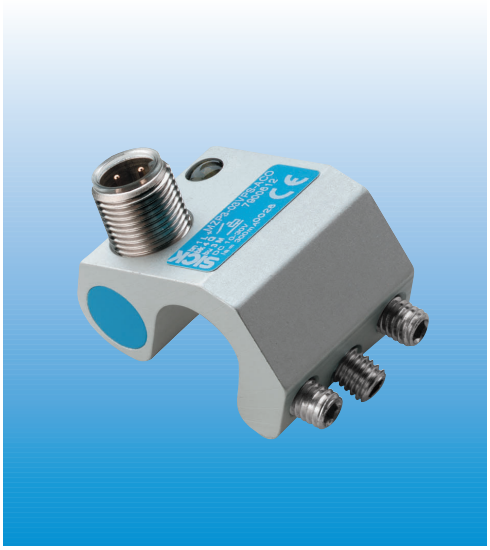
MZ P3

Magnetic Cylinder Sensors for Integrated Profile Cylinders

Highlights

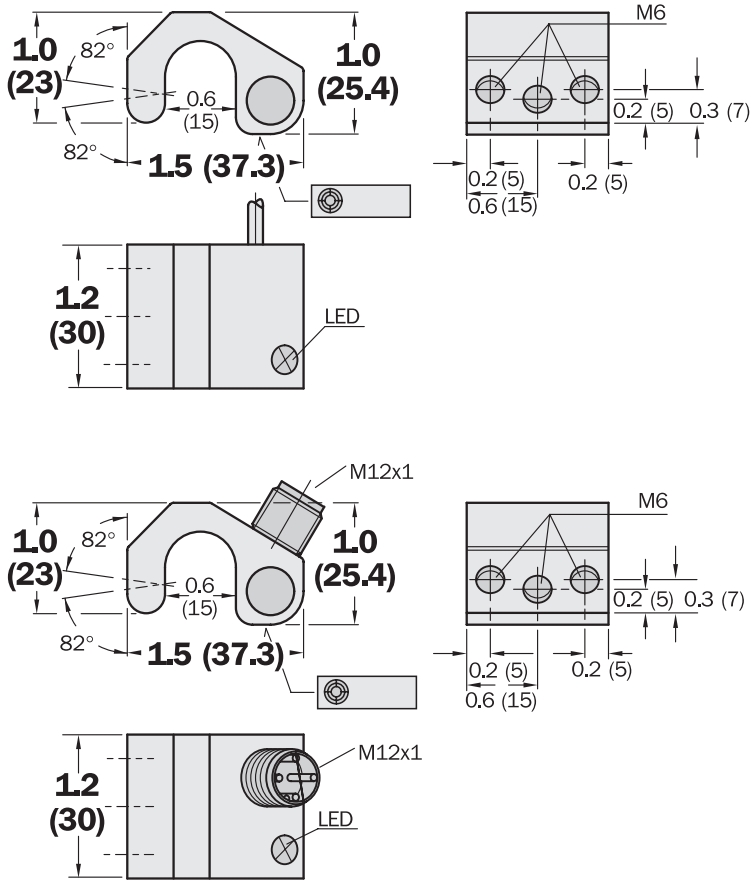
- Non-contact determination of piston position in pneumatic cylinders
- Mounting on integrated profile with max. width of 14 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- PNP or NPN output

MZ P3



Dimensional Drawing

dimensions in inches (mm)



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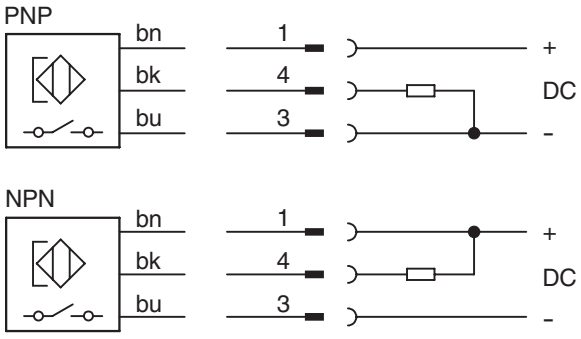
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

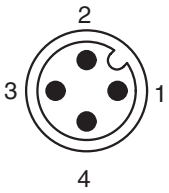
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZP3-03VPS-AU0	7 900 610
3 (30)		NPN		5000	Cable 2 m	MZP3-03VNS-AU0	7 900 611
3 (30)		PNP		5000	Connector M12 x 1 mm	MZP3-03VPS-AC0	7 900 612
3 (30)		NPN		5000	Connector M12 x 1 mm	MZP3-03VNS-AC0	7 900 613

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC
		2	free



SICK

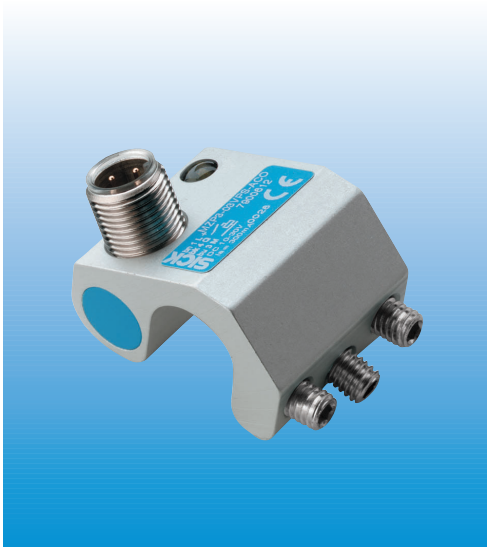
MZ P3 NAMUR

Magnetic Cylinder Sensors for Integrated Profile Cylinders

Highlights

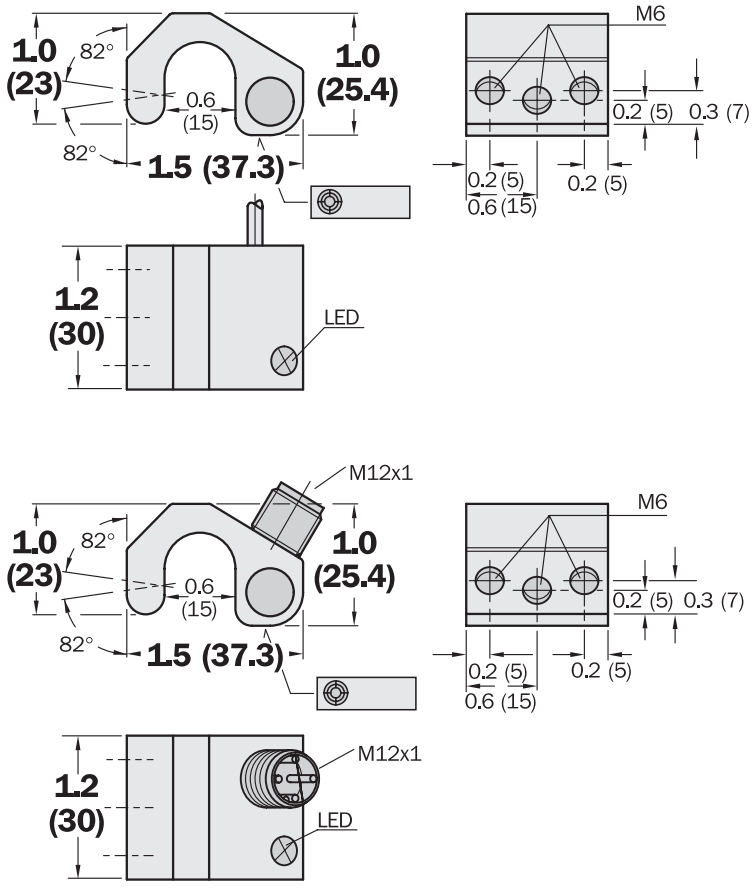
- Non-contact determination of piston position in pneumatic cylinders
- Mounting on integrated profile with max. width of 14 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- NAMUR to EN 50 227

MZ P3 NAMUR



Dimensional Drawing

dimensions in inches (mm)



Accessories	page
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Mounting brackets	873

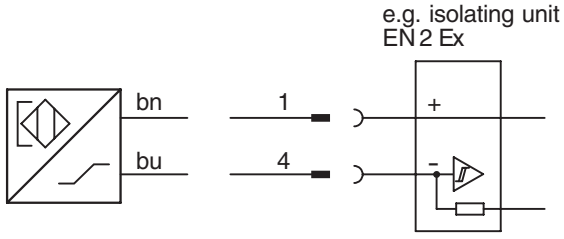
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Ripple U_{pp}	≤ 5% of U_b
Power consumption, attenuated	≥ 2.5 mA
Power consumption, unattenuated	≤ 1.0 mA
Internal capacitance	≤ 45 nF
Internal inductance	≤ 30 µH
Cable resistance	≤ 50 W
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	of EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...160°F (-25...70°C)
Housing material	Aluminum, plastic
Connection cable	PVC, 2 x 0.34 mm² blue

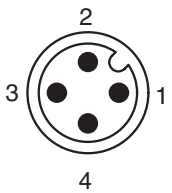
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Version	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		NAMUR		5000	Cable 2 m	MZP3-03V-N-AW0	7 901 440
3 (30)		NAMUR		5000	Connector M12 x 1 mm	MZP3-03V-N-AC0	7 901 441

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	4	- V DC
		3	free
		2	free



SICK

MZ P4

Magnetic Cylinder Sensors for Integrated Profile Cylinders

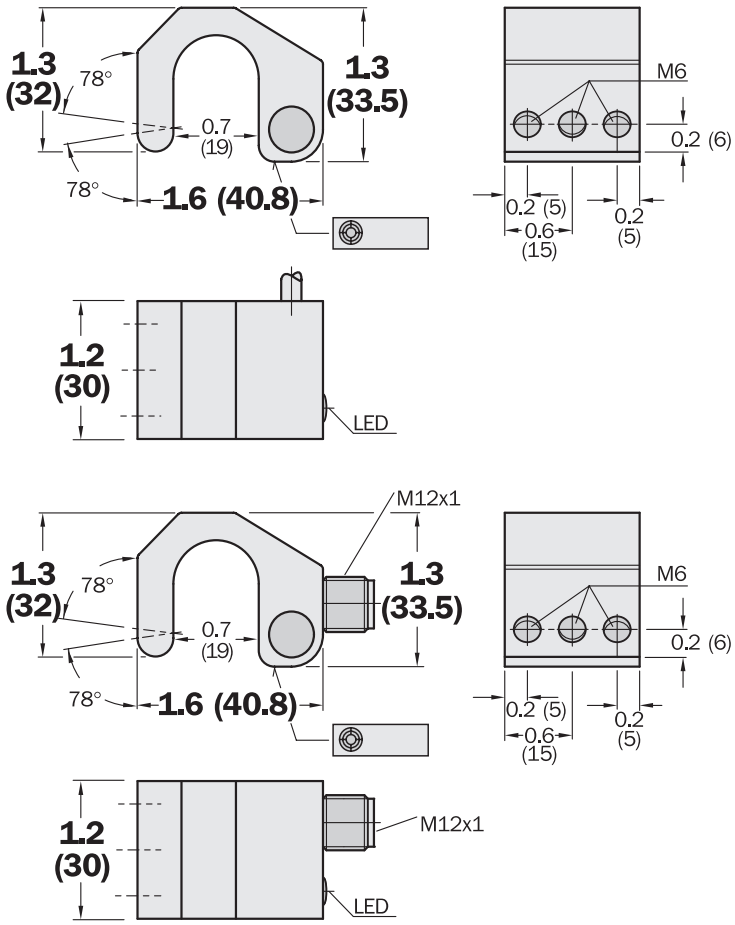
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Mounting on integrated profile with max. width of 18 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- Solid aluminum housing with integrated mounting clamp

MZ P4

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	909
Mounting brackets	873

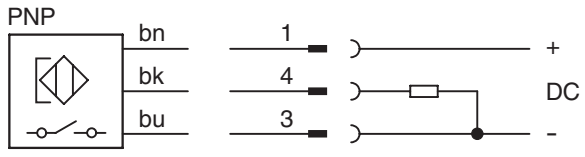
Electrical and Mechanical Data

Operating voltage U_b	10... 30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

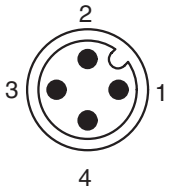
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZP4-03VPS-AU0	7 900 614
3 (30)		PNP		5000	Connector M12 x 1 mm	MZP4-03VPS-AC0	7 900 616

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC
		2	free



SICK

MZ P4 NAMUR

Magnetic Cylinder Sensors for Integrated Profile Cylinders

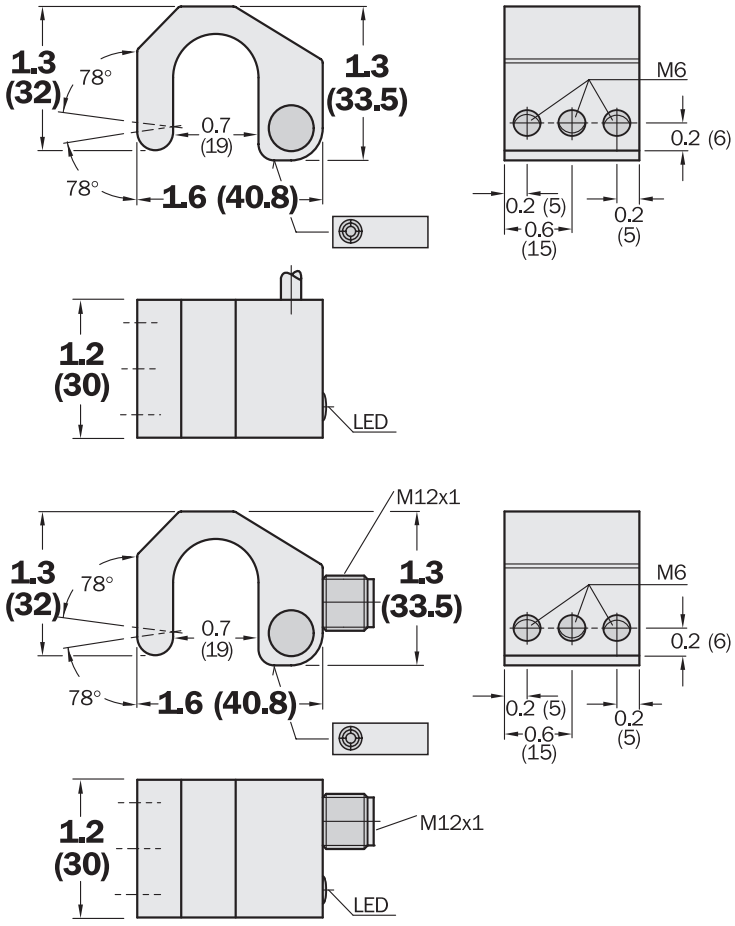
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Mounting on integrated profile with max. width of 18 mm
- High response sensitivity ≥ 3 mT
- NAMUR to DIN19234
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- Solid aluminum housing with integrated mounting clamp

MZ P4

Dimensional Drawing

dimensions in inches (mm)



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Power supply	966

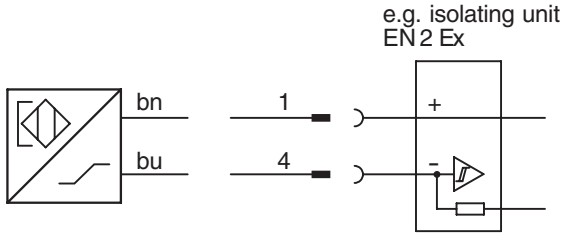
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Ripple U_{pp}	≤ 5% of U_b
Power consumption, attenuated	≥ 2.5 mA
Power consumption, unattenuated	≤ 1.0 mA
Internal capacitance	≤ 45 nF
Internal inductance	≤ 30 µH
Cable resistance	≤ 50 W
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	of EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...160°F (-25...70°C)
Housing material	Aluminum, plastic
Connection cable	PVC, 2 x 0.34 mm² blue

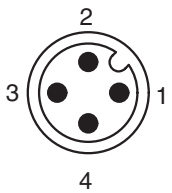
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Version	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		NAMUR		5000	Cable 2 m	MZP4-03V-N-AW0	7 901 329
3 (30)		NAMUR		5000	Connector M12 x 1 mm	MZP4-03V-N-AC0	7 901 330

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	4	- V DC
		3	free
		2	free



Sensor Solutions for Round-body Cylinders

Mounting Bracket for MZ T1/RZ T1 and MZ T6/RZ T6

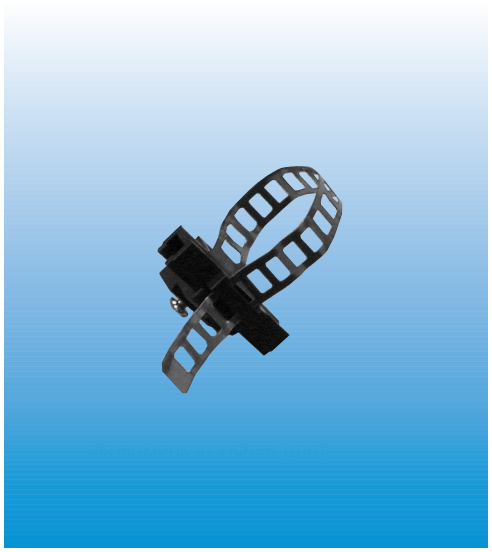
The BEF-KHZ-RT1 bracket makes installation of magnetic cylinder sensors possible on round-body cylinders. For MZ T6/RZ T6 and MZ T1/RZ T1.

BEF-KHZ-RT1 Mounting Bracket

Highlights

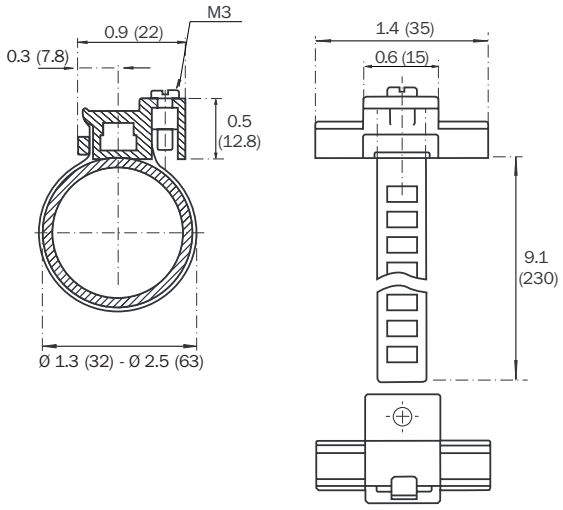
- Adaptable to round cylinders with piston diameters from 8...130 mm
- Fits tightly on integrated profile cylinders
- Made of plastic/stainless steel

BEF-KHZ-RT1



Dimensional Drawing

dimensions in inches (mm)



Note

Using the BEF-KHZ-RT1 mounting system together with the MZ T1/RZ T1 and MZ T6/RZ T6 magnetic cylinder sensors, the following magnetic cylinder sensors can be replaced for profile rod/tension rod cylinders: MZ R1, RZ R1, MZ R2 and RZ R2.

Order Information

Type	Part no.	Cylinder Ø piston
BEF-KHZ-RT1-25	5 311 171	8...25 mm
BEF-KHZ-RT1-63	5 311 172	32...63 mm
BEF-KHZ-RT1-130	5 311 506	80...130 mm

MZ R1

Magnetic Cylinder Sensors for Round-body Cylinders

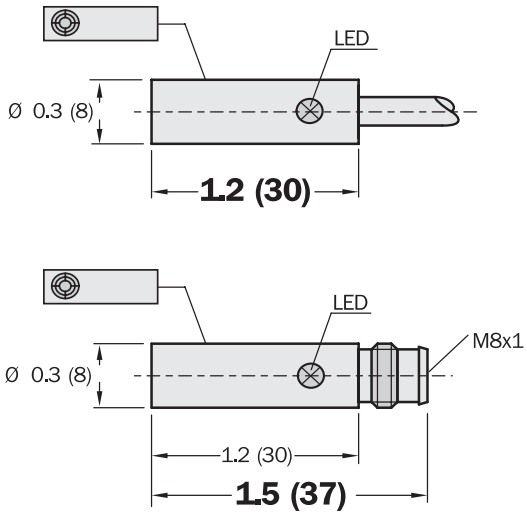
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Mounting on round-body cylinders 08…63 mm using MZ R1 mounting clamp
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator

MZ R1

Dimensional Drawing

dimensions in inches (mm)



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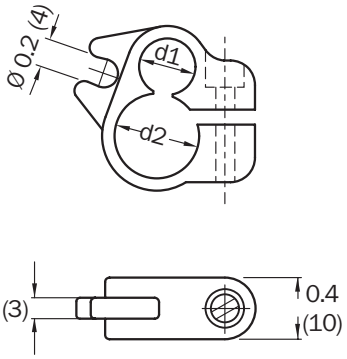
Accessories



Mounting clamp
Plastic
for magnetic cylinder sensor R1
with d1 Ø 8 mm

For cylinders with piston diameter	Clamping range d2 in mm	Type	Order-No.
8 mm	9.2 ... 10.0	BEF-S-R1-08	7902337
10 mm	10.9 ... 12.0	BEF-S-R1-10	7901753
12 mm	12.9 ... 14.0	BEF-S-R1-12	7901754
16 mm	16.9 ... 18.0	BEF-S-R1-16	7901755
20 mm	21.0 ... 22.0	BEF-S-R1-20	7901756
25 mm	26.1 ... 27.2	BEF-S-R1-25	7901757
32 mm	33.0 ... 35.0	BEF-S-R1-32	7901758
40 mm	41.4 ... 42.5	BEF-S-R1-40	7901759
50 mm	52.5 ... 54.0	BEF-S-R1-50	7901760
63 mm	66.0 ... 67.0	BEF-S-R1-63	7901761

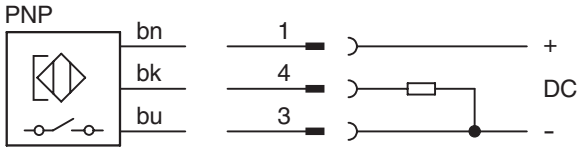
Electrical and Mechanical Data

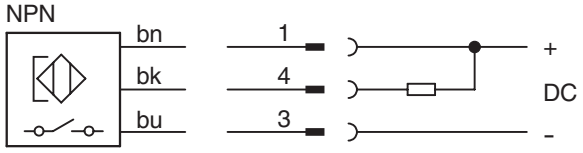
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

Selection Table

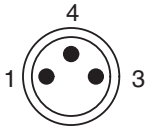
Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZR1-03VPS-AU0	7 900 592
3 (30)		NPN		5000	Cable 2 m	MZR1-03VNS-AU0	7 900 593
3 (30)		PNP		5000	Connector M8 x 1 mm	MZR1-03VPS-AT0	7 900 594
3 (30)		NPN		5000	Connector M8 x 1 mm	MZR1-03VNS-AT0	7 900 595

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

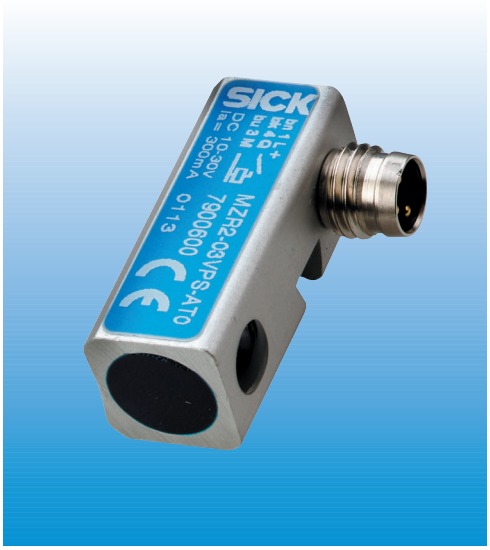
MZ R2

Magnetic Cylinder Sensors for Round-body Cylinders

Highlights

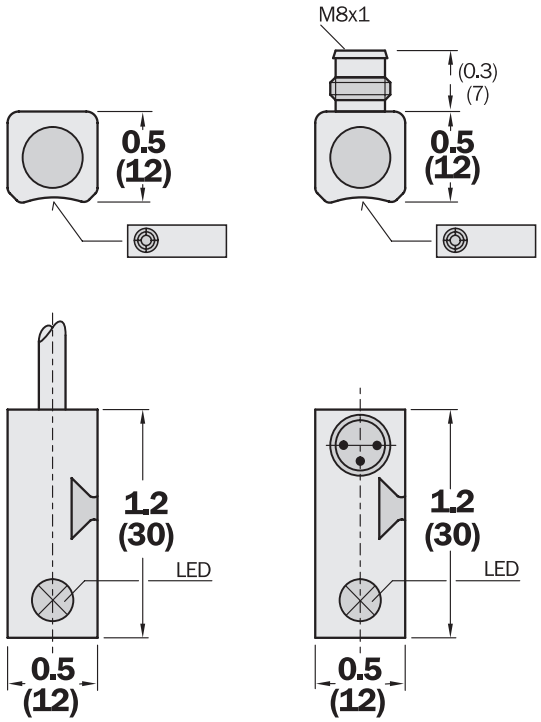
- Non-contact determination of piston position in pneumatic cylinders
- Universal mounting using clamping band for max. cylinder diameter of 100 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator

MZ R2



Dimensional Drawing

dimensions in inches (mm)



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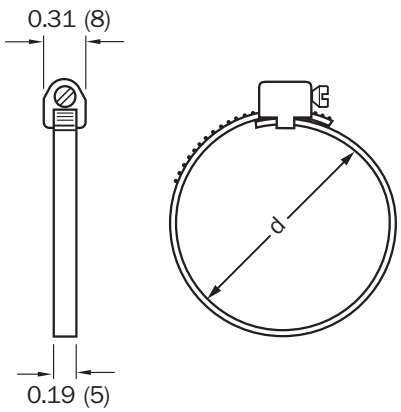
Accessories



Clamping band
stainless steel
for magnetic cylinder sensor R2

For cylinder range with piston diameter	Clamping range d in mm	Type	Order-No.
8 ... 16 mm	18 - 29	BEF-S-R2-16	7901762
20/25 mm	28 - 39	BEF-S-R2-25	7901763
32 mm	38 - 49	BEF-S-R2-30	7901764
40 mm	48 - 59	BEF-S-R2-40	7901765
50 mm	58 - 69	BEF-S-R2-50	7901766
63 mm	68 - 79	BEF-S-R2-63	7901767
80 mm	88 - 99	BEF-S-R2-80	7901768
100 mm	98 - 109	BEF-S-R2-100	7901769

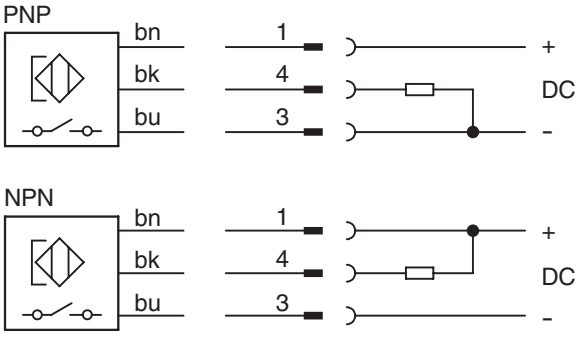
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

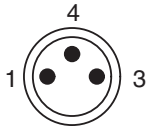
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		PNP		5000	Cable 2 m	MZR2-03VPS-AU0	7 900 598
3 (30)		NPN		5000	Cable 2 m	MZR2-03VNS-AU0	7 900 599
3 (30)		PNP		5000	Connector M8 x 1 mm	MZR2-03VPS-AT0	7 900 600
3 (30)		NPN		5000	Connector M8 x 1 mm	MZR2-03VNS-AT0	7 900 601

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

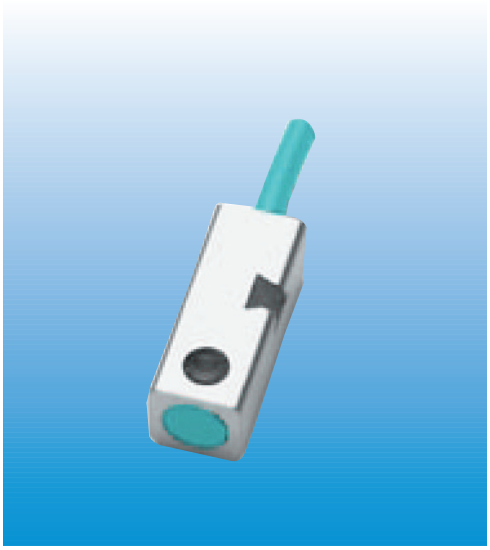
MZ R2 NAMUR

Magnetic Cylinder Sensors for Round-body Cylinders

Highlights

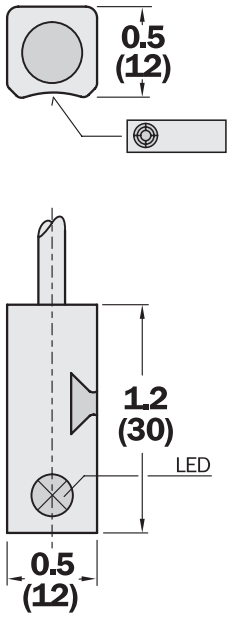
- Non-contact determination of piston position in pneumatic cylinders
- Universal mounting using clamping band for max. cylinder diameter of 100 mm
- High response sensitivity ≥ 3 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- NAMUR to EN 50 227

MZ R2 NAMUR



Dimensional Drawing

dimensions in inches (mm)



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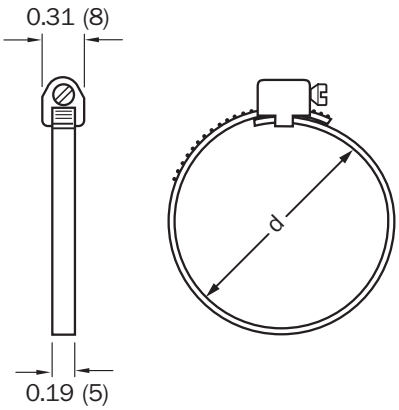
Accessories



Clamping band
stainless steel
for magnetic cylinder sensor R2

For cylinder range with piston diameter	Clamping range d in mm	Type	Order-No.
8 ... 16 mm	18 - 29	BEF-S-R2-16	7901762
20/25 mm	28 - 39	BEF-S-R2-25	7901763
32 mm	38 - 49	BEF-S-R2-30	7901764
40 mm	48 - 59	BEF-S-R2-40	7901765
50 mm	58 - 69	BEF-S-R2-50	7901766
63 mm	68 - 79	BEF-S-R2-63	7901767
80 mm	88 - 99	BEF-S-R2-80	7901768
100 mm	98 - 109	BEF-S-R2-100	7901769

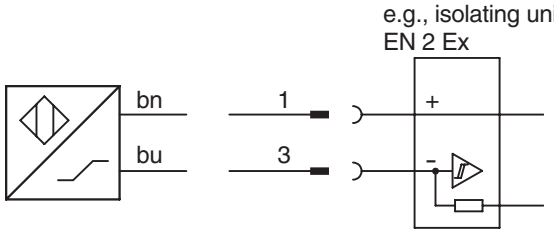
Electrical and Mechanical Data

Operating voltage U_b	5...25 V DC
Rated voltage U_n	8.2 V DC
Ripple U_{pp}	≤ 5% of U_b
Power consumption, attenuated	≥ 2.5 mA
Power consumption, unattenuated	≤ 1.0 mA
Internal capacitance	≤ 45 nF
Internal inductance	≤ 30 µH
Cable resistance	≤ 50 W
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	of EN 60 947-5-2
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...160°F (-25...70°C)
Housing material	Aluminum, plastic
Connection cable	PVC, 2 x 0.34 mm² blue

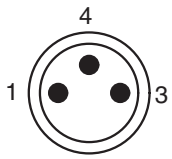
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Version	Output function	Switching frequency f in Hz	Connection	Type	Part no.
3 (30)		NAMUR		5000	Cable 2 m	MZR2-03V-N-AW0	7 901 321

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bu	blue	3	- V DC
		4	free



SICK

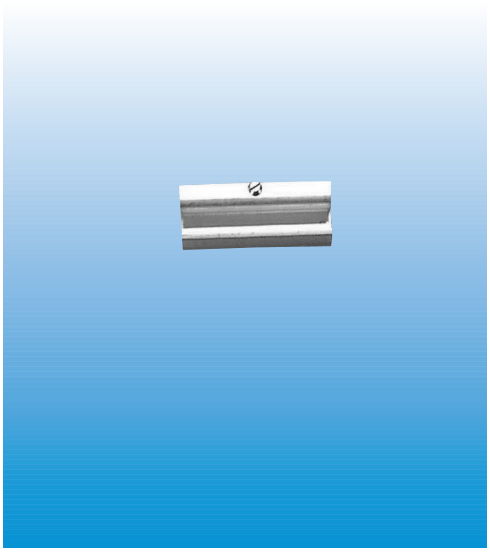
Sensors for Dovetail Cylinders

Mounting Bracket for MZ T1/RZ T1 and MZ T6/RZ T6

The BEF-KHZ-RT1 bracket makes installation of magnetic cylinder sensors possible on cylinders with a dovetail groove. For MZ T6/RZ T6 and MZ T1/RZ T1.

BEF-KHZ-ST1 Mounting Bracket

BEF-KHZ-ST1

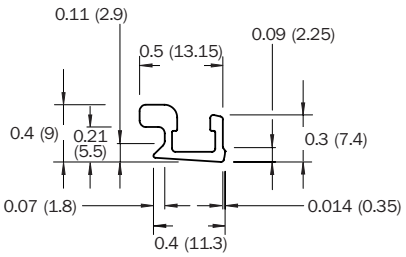


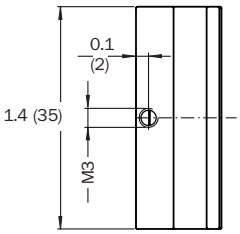
Highlights

- MZ T1/RZ T1 and MZ T6/RZ T6 sensors can be mounted from above onto the mounting rails
- Stable aluminum profile
- Fits tightly on dovetail groove (no slipping)
- Mounts from the top
- Made of aluminum alloy

Dimensional Drawing

dimensions in inches (mm)





Note

Using the BEF-KHZ-ST1 mounting system corresponds to the groove dimensions of the MZ K1, MZ K3, RZ K1 AND RZ K3 magnetic cylinder sensors.

Compare the dimensions of the groove with the dimensions of the mounting rails.

Order Information

Type	Part no.
BEF-KHZ-ST1	2 022 703

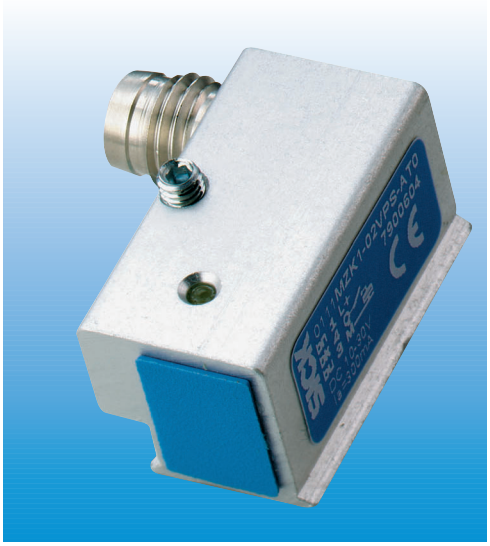
MZ K1 DC 3-wire

Magnetic Cylinder Sensors for Dovetail Cylinders

Highlights

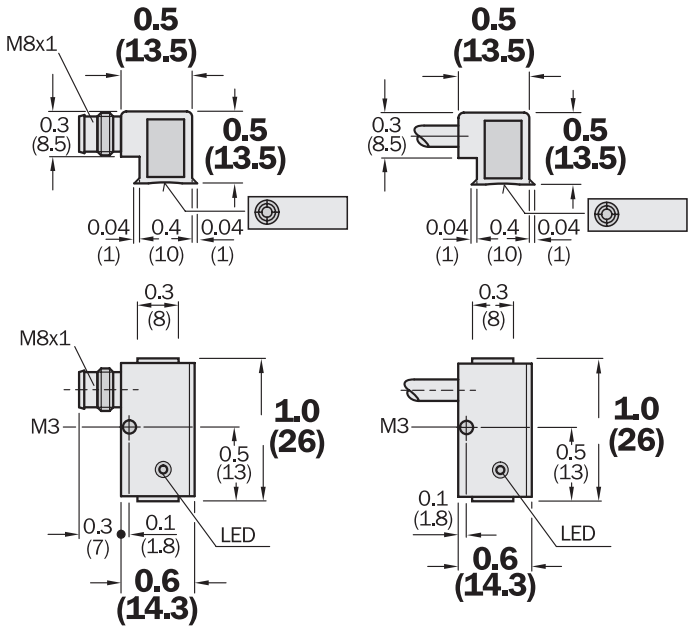
- Non-contact determination of piston position in pneumatic cylinders
- Simple mounting on short-stroke cylinders
- High response sensitivity ≥ 2 mT
- Frontal sensing face
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator
- Solid aluminum housing with special profile and clamping screw

MZ K1 DC 3-wire



Dimensional Drawing

dimensions in inches (mm)



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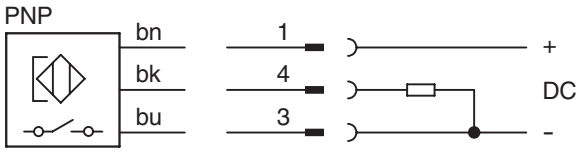
Electrical and Mechanical Data

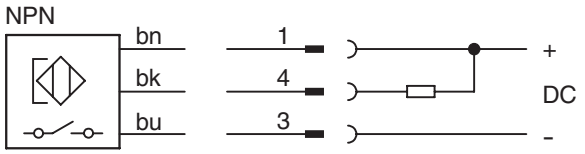
Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V with I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
Temperature drift	±0.005 mm / °C
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

Selection Table

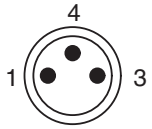
Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
2 (20)		PNP		5000	Cable 2 m	MZK1-02VPS-AU0	7 900 602
2 (20)		NPN		5000	Cable 2 m	MZK1-02VNS-AU0	7 900 603
2 (20)		PNP		5000	Connector M8 x 1 mm	MZK1-02VPS-AT0	7 900 604
2 (20)		NPN		5000	Connector M8 x 1 mm	MZK1-02VNS-AT0	7 900 605

Connection Diagram





Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



SICK

MZ K3 DC 3-wire

Magnetic Cylinder Sensors for Dovetail Cylinders

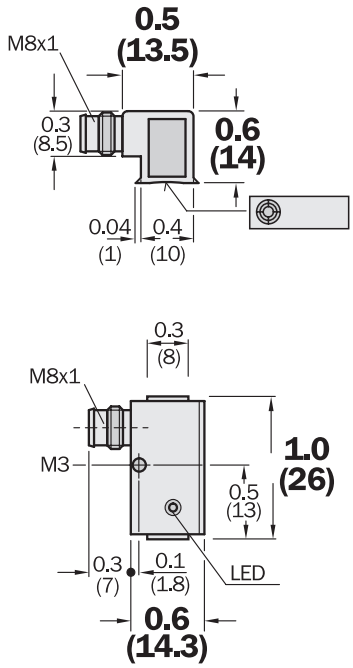
Highlights

- Non-contact determination of piston position in pneumatic cylinders
- Mountable from the top
- Simple mounting on short-stroke cylinders
- High response sensitivity ≥ 2 mT
- Frontal sensing face
- No secondary switching ranges
- High repeat accuracy
- Actuating speed ≤ 5 m/s
- LED status indicator

MZ K3 DC 3-wire

Dimensional Drawing

dimensions in inches (mm)



Accessories	page
Cables and connectors	908
Mounting brackets	891

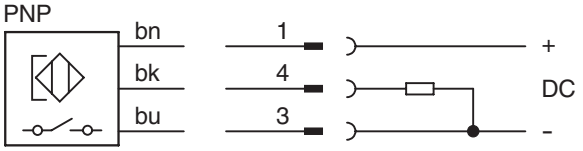
Electrical and Mechanical Data

Operating voltage U_b	10...30 V DC
Ripple U_{pp}	≤ 10% of U_b
Voltage drop U_b	≤ 1.5 V at I_a max.
Power consumption (without load)	≤ 10 mA
Continuous current I_a	≤ 300 mA
Time delay before availability t_v	≤ 2 ms
Hysteresis H	≤ 1.0 mm
Repeatability R (U_b and T_a constant)	≤ 0.1 mm
EMC	to EN 60 947-5-2
Wire-break protection	Yes
Short circuit protection (pulsed)	Yes
Reverse polarity protection	Yes
Power-up pulse suppression	Yes
Enclosure rating to DIN 40050	IP 67
Shock and vibration stress	30 g, 11 ms, 10 to 55 Hz, 1 mm
Ambient temperature T_a	-13...167°F (-25...75°C)
Housing material	Aluminum, plastic
Connection cable	PUR-PVC, 3 x 0.25 mm²

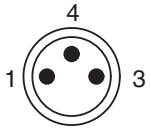
Selection Table

Response sensitivity in mT (gauss)	Sensing face	Switching output	Output function	Switching frequency f in Hz	Connection	Type	Part no.
2 (20)		PNP		5000	Connector M8 x 1 mm	MZK3-02VPS-AT0	7 901 952
2 (20)		PNP		5000	Cable 2 m	MZK3-02VPS-AU0	1 017 624

Connection Diagram



Wire color		Contact	Assignment
bn	brown	1	+ V DC
bk	black	4	NO
bu	blue	3	- V DC



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V.18 Selection Guide

Order data V 18 DC (10…30 V)

1 Basic type	
Through beam photoelectric sensor (sender only)	VS
Through beam photoelectric sensor (receiver only)	VE
Through beam photoelectric sensor (sender and receiver)	VS/VE
Photoelectric reflex sensor	VL
Photoelectric proximity sensor (F = focussed)	VTF
Photoelectric proximity sensor (E = energetic)	VTE

2 Size and series	
Housing M 18 (V 18 Series)	18

3 Switching outputs and switching mode	
Sender only VS (with test input)	0D
3 line; Q = PNP, dark switching (D.ON)	3P
3 line; Q = PNP, light switching (L.ON)	3F
3 line; Q = NPN, dark switching (D.ON)	3N
3 line; Q = NPN, light switching (L.ON)	3E
4 line; Q = PNP, L.ON or D.ON selectable via control wire	4P
4 line; Q = NPN, L.ON oder D.ON selectable via control wire	4N

4 Sensing range and light source	
Sender VS: infrared light; Receiver VE for infrared light	
Photoelectric reflex sensor VL: red light and polarizing filter	3
Photoelectric proximity sensor VTF: sensing range 50 mm, infrared light	5
Photoelectric proximity sensor VTF: sensing range 100 mm, infrared light	1
Photoelectric proximity sensor VTE: sensing range 200 mm, infrared light	2
Photoelectric proximity sensor VTE: sensing range 400 mm, infrared light	4
Photoelectric proximity sensor VTE: sensing range 800 mm, infrared light	8

5 Housing (material and form), sensitivity control	
Metal, axial, without potentiometer	1
Metal, axial, with potentiometer	2
Metal, 90°, without potentiometer	3
Metal, 90°, with potentiometer	4
Plastic, axial, without potentiometer	6
Plastic, axial, with potentiometer	7
Plastic, 90°, without potentiometer	8
Plastic, 90°, with potentiometer	9

6 Connection type	
Cable, 2 m	12
Plug, M12, 4-pin	40

How to find *your* sensor

1 Example

1	**Base type photoelectric reflex sensor** Photoelectric proximity sensor (E = energetic)	→ VTE
2	**Model of housing** Housing M 18 (V 18 Series)	→ 18
3	**Switching outputs and switching mode** 3 line; Q = PNP, light switching (L.ON)	→ 3F
4	**Sensing range and light source** Photoelectric proximity sensor VTE: sensing range 200 mm, infrared light	→ 2
5	**Housing (material and models)** **sensitivity control** Metal, 90°, without potentiometer	→ 3
6	**Connection type** Plug, M12, 4-pin	→ 40

2 Define type

VTE 18 – 3F 2 3 40

3 Select part number

(see register page xx)

Type	Part no.
VTE 18-3F 2340	6 013 422

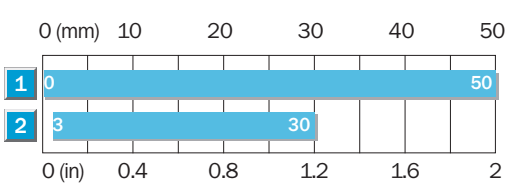
Note: Not all models stocked. Check web site or call for availability.

Sensing range 0…50 mm

VTF 18-3, VTF 18-4 selection table, photoelectric proximity sensor, focused optics

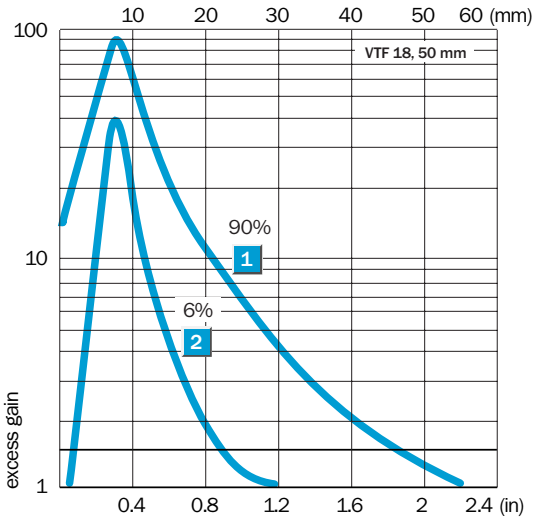
Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.
Housing material: metal									
Optical axis: axial									
3 wire									
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 5112	6 012 940	VTF 18-3 P 5112	6 012 949	VTF 18-3 N 5212	6 012 958	VTF 18-3 P 5212	6 012 967
	Plug M 12, 4-pin	VTF 18-3 N 5140	6 012 942	VTF 18-3 P 5140	6 012 951	VTF 18-3 N 5240	6 012 960	VTF 18-3 P 5240	6 012 969
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 5112	6 012 943	VTF 18-3 F 5112	6 012 952	VTF 18-3 E 5212	6 012 961	VTF 18-3 F 5212	6 012 970
	Plug M 12, 4-pin	VTF 18-3 E 5140	6 012 945	VTF 18-3 F 5140	6 012 954	VTF 18-3 E 5240	6 012 963	VTF 18-3 F 5240	6 012 972
4 wire, L/D control wire									
VTF 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 5112	6 012 946	VTF 18-4 P 5112	6 012 955	VTF 18-4 N 5212	6 012 964	VTF 18-4 P 5212	6 012 973
	Plug M 12, 4-pin	VTF 18-4 N 5140	6 012 948	VTF 18-4 P 5140	6 012 957	VTF 18-4 N 5240	6 012 966	VTF 18-4 P 5240	6 012 975
Optical axis: 90°									
3 wire									
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 5312	6 012 976	VTF 18-3 P 5312	6 012 985	VTF 18-3 N 5412	6 012 994	VTF 18-3 P 5412	6 013 003
	Plug M 12, 4-pin	VTF 18-3 N 5340	6 012 978	VTF 18-3 P 5340	6 012 987	VTF 18-3 N 5440	6 012 996	VTF 18-3 P 5440	6 013 005
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 5312	6 012 979	VTF 18-3 F 5312	6 012 988	VTF 18-3 E 5412	6 012 997	VTF 18-3 F 5412	6 013 006
	Plug M 12, 4-pin	VTF 18-3 E 5340	6 012 981	VTF 18-3 F 5340	6 012 990	VTF 18-3 E 5440	6 012 999	VTF 18-3 F 5440	6 013 008
4 wire, L/D control wire									
VTF 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 5312	6 012 982	VTF 18-4 P 5312	6 012 991	VTF 18-4 N 5412	6 013 000	VTF 18-4 P 5412	6 013 009
	Plug M 12, 4-pin	VTF 18-4 N 5340	6 012 984	VTF 18-4 P 5340	6 012 993	VTF 18-4 N 5440	6 013 002	VTF 18-4 P 5440	6 013 011
Housing material: plastic									
Optical axis: axial									
3 wire									
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 5612	6 013 012	VTF18-3 P 5612	6 013 021	VTF18-3 N 5712	6 013 030	VTF18-3 P 5712	6 013 039
	Plug M 12, 4-pin	VTF 18-3 N 5640	6 013 014	VTF18-3 P 5640	6 013 023	VTF18-3 N 5740	6 013 032	VTF18-3 P 5740	6 013 041
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 5612	6 013 015	VTF18-3 F 5612	6 013 024	VTF18-3 E 5712	6 013 033	VTF18-3 F 5712	6 013 042
	Plug M 12, 4-pin	VTF 18-3 E 5640	6 013 017	VTF18-3 F 5640	6 013 026	VTF18-3 E 5740	6 013 035	VTF18-3 F 5740	6 013 044
4 wire, L/D control wire									
VTB 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 5612	6 013 018	VTF 18-4 P 5612	6 013 027	VTF 18-4 N 5712	6 013 036	VTF 18-4 P 5712	6 013 045
	Plug M 12, 4-pin	VTF 18-4 N 5640	6 013 020	VTF 18-4 P 5640	6 013 029	VTF 18-4 N 5740	6 013 038	VTF 18-4 P 5740	6 013 047
Optical axis: 90°									
3 wire									
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 5812	6 013 048	VTF 18-3 P 5812	6 013 057	VTF 18-3 N 5912	6 013 066	VTF 18-3 P 5912	6 013 075
	Plug M 12, 4-pin	VTF 18-3 N 5840	6 013 050	VTF 18-3 P 5840	6 013 059	VTF 18-3 N 5940	6 013 068	VTF 18-3 P 5940	6 013 077
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 5812	6 013 051	VTF 18-3 F 5812	6 013 060	VTF 18-3 E 5912	6 013 069	VTF 18-3 F 5912	6 013 078
	Plug M 12, 4-pin	VTF 18-3 E 5840	6 013 053	VTF 18-3 F 5840	6 013 062	VTF 18-3 E 5940	6 013 071	VTF 18-3 F 5940	6 013 080
4 wire, L/D control wire									
VTF 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 5812	6 013 054	VTF 18-4 P 5812	6 013 063	VTF 18-4 N 5912	6 013 072	VTF 18-4 P 5912	6 013 081
	Plug M 12, 4-pin	VTF 18-4 N 5840	6 013 056	VTF 18-4 P 5840	6 013 065	VTF 18-4 N 5940	6 013 074	VTF 18-4 P 5940	6 013 083

Sensing range



Sensing range, max. typical

1 Sensing range on white, 90% remission
2 Sensing range on black, 6% remission



Note: Not all models stocked. Check web site or call for availability.

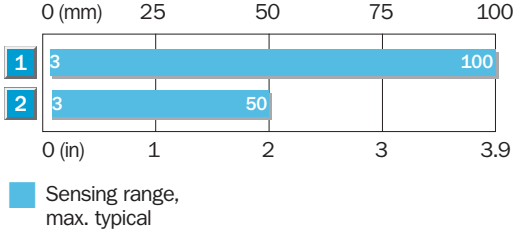
V.18 Selection Guide

Sensing range 3…100 mm

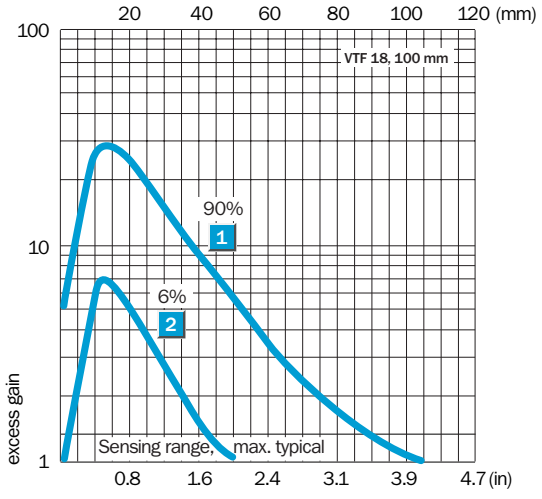
VTF 18-3, VTF 18-4 selection table, photoelectric proximity sensor, focused optics

Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.
Housing material: metal									
3 wire		**Optical axis: axial**							
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 1112	6 012 796	VTF 18-3 P 1112	6 012 805	VTF 18-3 N 1212	6 012 814	VTF 18-3 P 1212	6 012 823
	M 12 plug, 4-pin	VTF 18-3 N 1140	6 012 798	VTF 18-3 P 1140	6 012 807	VTF 18-3 N 1240	6 012 816	VTF 18-3 P 1240	6 012 825
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 1112	6 012 799	VTF 18-3 F 1112	6 012 808	VTF 18-3 E 1212	6 012 817	VTF 18-3 F 1212	6 012 826
	M 12 plug, 4-pin	VTF 18-3 E 1140	6 012 801	VTF 18-3 F 1140	6 012 810	VTF 18-3 E 1240	6 012 819	VTF 18-3 F 1240	6 012 828
4 wire, L/D control wire									
VTF 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 1112	6 012 802	VTF 18-4 P 1112	6 012 811	VTF 18-4 N 1212	6 012 820	VTF 18-4 P 1212	6 012 829
	M 12 plug, 4-pin	VTF 18-4 N 1140	6 012 804	VTF 18-4 P 1140	6 012 813	VTF 18-4 N 1240	6 012 822	VTF 18-4 P 1240	6 012 831
3 wire		**Optical axis: 90°**							
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 1312	6 012 832	VTF 18-3 P 1312	6 012 841	VTF 18-3 N 1412	6 012 850	VTF 18-3 P 1412	6 012 859
	M 12 plug, 4-pin	VTF 18-3 N 1340	6 012 834	VTF 18-3 P 1340	6 012 843	VTF 18-3 N 1440	6 012 852	VTF 18-3 P 1440	6 012 861
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 1312	6 012 835	VTF 18-3 F 1312	6 012 844	VTF 18-3 E 1412	6 012 853	VTF 18-3 F 1412	6 012 862
	M 12 plug, 4-pin	VTF 18-3 E 1340	6 012 837	VTF 18-3 F 1340	6 012 846	VTF 18-3 E 1440	6 012 855	VTF 18-3 F 1440	6 012 864
4 wire, L/D control wire									
VTF 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 1312	6 012 838	VTF 18-4 P 1312	6 012 847	VTF 18-4 N 1412	6 012 856	VTF 18-4 P 1412	6 012 865
	M 12 plug, 4-pin	VTF 18-4 N 1340	6 012 840	VTF 18-4 P 1340	6 012 849	VTF 18-4 N 1440	6 012 858	VTF 18-4 P 1440	6 012 867
Housing material: plastic									
3 wire		**Optical axis: axial**							
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 1612	6 012 868	VTF 18-3 P 1612	6 012 877	VTF 18-3 N 1712	6 012 886	VTF 18-3 P 1712	6 012 895
	M 12 plug, 4-pin	VTF 18-3 N 1640	6 012 870	VTF 18-3 P 1640	6 012 879	VTF 18-3 N 1740	6 012 888	VTF 18-3 P 1740	6 012 897
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 1612	6 012 871	VTF 18-3 F 1612	6 012 880	VTF 18-3 E 1712	6 012 889	VTF 18-3 F 1712	6 012 898
	M 12 plug, 4-pin	VTF 18-3 E 1640	6 012 873	VTF 18-3 F 1640	6 012 882	VTF 18-3 E 1740	6 012 891	VTF 18-3 F 1740	6 012 900
4 wire, L/D control wire									
VTB 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 1612	6 012 874	VTF 18-4 P 1612	6 012 883	VTF 18-4 N 1712	6 012 892	VTF 18-4 P 1712	6 012 901
	M 12 plug, 4-pin	VTF 18-4 N 1640	6 012 876	VTF 18-4 P 1640	6 012 885	VTF 18-4 N 1740	6 012 894	VTF 18-4 P 1740	6 012 903
3 wire		**Optical axis: 90°**							
VTF 18-3 Q = D.ON	Cable 2 m	VTF 18-3 N 1812	6 012 904	VTF 18-3 P 1812	6 012 913	VTF 18-3 N 1912	6 012 922	VTF 18-3 P 1912	6 012 931
	M 12 plug, 4-pin	VTF 18-3 N 1840	6 012 906	VTF 18-3 P 1840	6 012 915	VTF 18-3 N 1940	6 012 924	VTF 18-3 P 1940	6 012 933
VTF 18-3 Q = L.ON	Cable 2 m	VTF 18-3 E 1812	6 012 907	VTF 18-3 F 1812	6 012 916	VTF 18-3 E 1912	6 012 925	VTF 18-3 F 1912	6 012 934
	M 12 plug, 4-pin	VTF 18-3 E 1840	6 012 909	VTF 18-3 F 1840	6 012 918	VTF 18-3 E 1940	6 012 927	VTF 18-3 F 1940	6 012 936
4 wire, L/D control wire									
VTF 18-4 L.ON/D.ON	Cable 2 m	VTF 18-4 N 1812	6 012 910	VTF 18-4 P 1812	6 012 919	VTF 18-4 N 1912	6 012 928	VTF 18-4 P 1912	6 012 937
	M 12 plug, 4-pin	VTF 18-4 N 1840	6 012 912	VTF 18-4 P 1840	6 012 921	VTF 18-4 N 1940	6 012 930	VTF 18-4 P 1940	6 012 939

Sensing Range



1 Sensing range on white, 90% remission
2 Sensing range on black, 6% remission



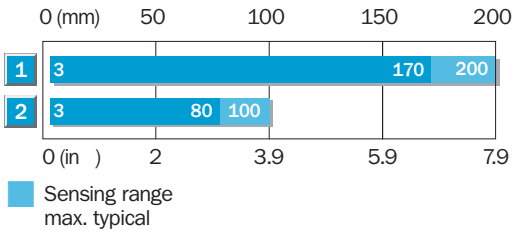
Note: Not all models stocked. Check web site or call for availability.

Sensing range 3…200 mm

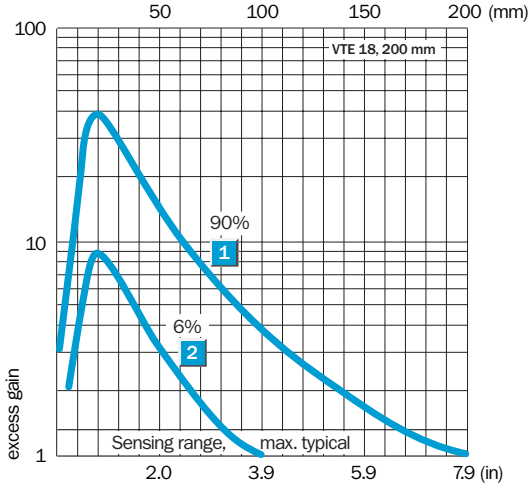
VTE 18-3, VTE 18-4 selection table, photoelectric proximity sensor, energetic

Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.
Housing material: metal									
3 wire		**Optical axis: axial**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 2112	6 013 372	VTE 18-3 P 2112	6 013 381	VTE 18-3 N 2212	6 013 390	VTE 18-3 P 2212	6 013 399
	M 12 plug, 4-pin	VTE 18-3 N 2140	6 013 374	VTE 18-3 P 2140	6 013 383	VTE 18-3 N 2240	6 013 392	VTE 18-3 P 2240	6 013 401
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 2112	6 013 375	VTE 18-3 F 2112	6 013 384	VTE 18-3 E 2212	6 013 393	VTE 18-3 F 2212	6 013 402
	M 12 plug, 4-pin	VTE 18-3 E 2140	6 013 377	VTE 18-3 F 2140	6 013 386	VTE 18-3 E 2240	6 013 395	VTE 18-3 F 2240	6 013 404
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 2112	6 013 378	VTE 18-4 P 2112	6 013 387	VTE 18-4 N 2212	6 013 396	VTE 18-4 P 2212	6 013 405
	M 12 plug, 4-pin	VTE 18-4 N 2140	6 013 380	VTE 18-4 P 2140	6 013 389	VTE 18-4 N 2240	6 013 398	VTE 18-4 P 2240	6 013 407
3 wire		**Optical axis: 90°**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 2312	6 013 408	VTE 18-3 P 2312	6 013 417	VTE 18-3 N 2412	6 013 426	VTE 18-3 P 2412	6 013 435
	M 12 plug, 4-pin	VTE 18-3 N 2340	6 013 410	VTE 18-3 P 2340	6 013 419	VTE 18-3 N 2440	6 013 428	VTE 18-3 P 2440	6 013 437
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 2312	6 013 411	VTE 18-3 F 2312	6 013 420	VTE 18-3 E 2412	6 013 429	VTE 18-3 F 2412	6 013 438
	M 12 plug, 4-pin	VTE 18-3 E 2340	6 013 413	VTE 18-3 F 2340	6 013 422	VTE 18-3 E 2440	6 013 431	VTE 18-3 F 2440	6 013 440
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 2312	6 013 414	VTE 18-4 P 2312	6 013 423	VTE 18-4 N 2412	6 013 432	VTE 18-4 P 2412	6 013 441
	M 12 plug, 4-pin	VTE 18-4 N 2340	6 013 416	VTE 18-4 P 2340	6 013 425	VTE 18-4 N 2440	6 013 434	VTE 18-4 P 2440	6 013 443
Housing material: plastic									
3 wire		**Optical axis: axial**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 2612	6 013 444	VTE 18-3 P 2612	6 013 453	VTE 18-3 N 2712	6 013 462	VTE 18-3 P 2712	6 013 471
	M 12 plug, 4-pin	VTE 18-3 N 2640	6 013 446	VTE 18-3 P 2640	6 013 455	VTE 18-3 N 2740	6 013 464	VTE 18-3 P 2740	6 013 473
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 2612	6 013 447	VTE 18-3 F 2612	6 013 456	VTE 18-3 E 2712	6 013 465	VTE 18-3 F 2712	6 013 474
	M 12 plug, 4-pin	VTE 18-3 E 2640	6 013 449	VTE 18-3 F 2640	6 013 458	VTE 18-3 E 2740	6 013 467	VTE 18-3 F 2740	6 013 476
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 2612	6 013 450	VTE 18-4 P 2612	6 013 459	VTE 18-4 N 2712	6 013 468	VTE 18-4 P 2712	6 013 477
	M 12 plug, 4-pin	VTE 18-4 N 2640	6 013 452	VTE 18-4 P 2640	6 013 461	VTE 18-4 N 2740	6 013 470	VTE 18-4 P 2740	6 013 479
3 wire		**Optical axis: 90°**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 2812	6 013 480	VTE 18-3 P 2812	6 013 489	VTE 18-3 N 2912	6 013 498	VTE 18-3 P 2912	6 013 507
	M 12 plug, 4-pin	VTE 18-3 N 2840	6 013 482	VTE 18-3 P 2840	6 013 491	VTE 18-3 N 2940	6 013 500	VTE 18-3 P 2940	6 013 509
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 2812	6 013 483	VTE 18-3 F 2812	6 013 492	VTE 18-3 E 2912	6 013 501	VTE 18-3 F 2912	6 013 510
	M 12 plug, 4-pin	VTE 18-3 E 2840	6 013 485	VTE 18-3 F 2840	6 013 494	VTE 18-3 E 2940	6 013 503	VTE 18-3 F 2940	6 013 512
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 2812	6 013 486	VTE 18-4 P 2812	6 013 495	VTE 18-4 N 2912	6 013 504	VTE 18-4 P 2912	6 013 513
	M 12 plug, 4-pin	VTE 18-4 N 2840	6 013 488	VTE 18-4 P 2840	6 013 497	VTE 18-4 N 2940	6 013 506	VTE 18-4 P 2940	6 013 515

Sensing Range



1 Sensing range on white, 90% remission
2 Sensing range on black, 6% remission



Note: Not all models stocked. Check web site or call for availability.

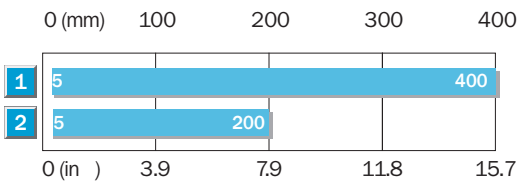
V.18 Selection Guide

Sensing range 5…400 mm

VTE 18-3, VTE 18-4 selection table, photoelectric proximity sensor, energetic

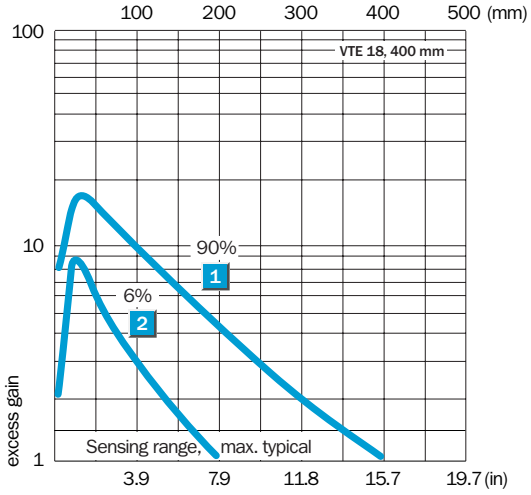
Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.
Housing material: metal									
3 wire		**Optical axis: axial**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 4112	6 013 228	VTE 18-3 P 4112	6 013 237	VTE 18-3 N 4212	6 013 246	VTE 18-3 P 4212	6 013 255
	M 12 plug, 4-pin	VTE 18-3 N 4140	6 013 230	VTE 18-3 P 4140	6 013 239	VTE 18-3 N 4240	6 013 248	VTE 18-3 P 4240	6 013 257
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 4112	6 013 231	VTE 18-3 F 4112	6 013 240	VTE 18-3 E 4212	6 013 249	VTE 18-3 F 4212	6 013 258
	M 12 plug, 4-pin	VTE 18-3 E 4140	6 013 233	VTE 18-3 F 4140	6 013 242	VTE 18-3 E 4240	6 013 251	VTE 18-3 F 4240	6 013 260
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 4112	6 013 234	VTE 18-4 P 4112	6 013 243	VTE 18-4 N 4212	6 013 252	VTE 18-4 P 4212	6 013 261
	M 12 plug, 4-pin	VTE 18-4 N 4140	6 013 236	VTE 18-4 P 4140	6 013 245	VTE 18-4 N 4240	6 013 254	VTE 18-4 P 4240	6 013 263
3 wire		**Optical axis: 90°**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 4312	6 013 264	VTE 18-3 P 4312	6 013 273	VTE 18-3 N 4412	6 013 282	VTE 18-3 P 4412	6 013 291
	M 12 plug, 4-pin	VTE 18-3 N 4340	6 013 266	VTE 18-3 P 4340	6 013 275	VTE 18-3 N 4440	6 013 284	VTE 18-3 P 4440	6 013 293
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 4312	6 013 267	VTE 18-3 F 4312	6 013 276	VTE 18-3 E 4412	6 013 285	VTE 18-3 F 4412	6 013 294
	M 12 plug, 4-pin	VTE 18-3 E 4340	6 013 269	VTE 18-3 F 4340	6 013 278	VTE 18-3 E 4440	6 013 287	VTE 18-3 F 4440	6 013 296
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 4312	6 013 270	VTE 18-4 P 4312	6 013 279	VTE 18-4 N 4412	6 013 288	VTE 18-4 P 4412	6 013 297
	M 12 plug, 4-pin	VTE 18-4 N 4340	6 013 272	VTE 18-4 P 4340	6 013 281	VTE 18-4 N 4440	6 013 290	VTE 18-4 P 4440	6 013 299
Housing material: plastic									
3 wire		**Optical axis: axial**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 4612	6 013 300	VTE 18-3 P 4612	6 013 309	VTE 18-3 N 4712	6 013 318	VTE 18-3 P 4712	6 013 327
	M 12 plug, 4-pin	VTE 18-3 N 4640	6 013 302	VTE 18-3 P 4640	6 013 311	VTE 18-3 N 4740	6 013 320	VTE 18-3 P 4740	6 013 329
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 4612	6 013 303	VTE 18-3 F 4612	6 013 312	VTE 18-3 E 4712	6 013 321	VTE 18-3 F 4712	6 013 330
	M 12 plug, 4-pin	VTE 18-3 E 4640	6 013 305	VTE 18-3 F 4640	6 013 314	VTE 18-3 E 4740	6 013 323	VTE 18-3 F 4740	6 013 332
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 4612	6 013 306	VTE 18-4 P 4612	6 013 315	VTE 18-4 N 4712	6 013 324	VTE 18-4 P 4712	6 013 333
	M 12 plug, 4-pin	VTE 18-4 N 4640	6 013 308	VTE 18-4 P 4640	6 013 317	VTE 18-4 N 4740	6 013 326	VTE 18-4 P 4740	6 013 335
3 wire		**Optical axis: 90°**							
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 4812	6 013 336	VTE 18-3 P 4812	6 013 345	VTE 18-3 N 4912	6 013 354	VTE 18-3 P 4912	6 013 363
	M 12 plug, 4-pin	VTE 18-3 N 4840	6 013 338	VTE 18-3 P 4840	6 013 347	VTE 18-3 N 4940	6 013 356	VTE 18-3 P 4940	6 013 365
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 4812	6 013 339	VTE 18-3 F 4812	6 013 348	VTE 18-3 E 4912	6 013 357	VTE 18-3 F 4912	6 013 366
	M 12 plug, 4-pin	VTE 18-3 E 4840	6 013 341	VTE 18-3 F 4840	6 013 350	VTE 18-3 E 4940	6 013 359	VTE 18-3 F 4940	6 013 368
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 4812	6 013 342	VTE 18-4 P 4812	6 013 351	VTE 18-4 N 4912	6 013 360	VTE 18-4 P 4912	6 013 369
	M 12 plug, 4-pin	VTE 18-4 N 4840	6 013 344	VTE 18-4 P 4840	6 013 353	VTE 18-4 N 4940	6 013 362	VTE 18-4 P 4940	6 013 371

Sensing Range



Scanning distance, max. typical

1 Sensing range on white, 90% remission
2 Sensing range on black, 6% remission



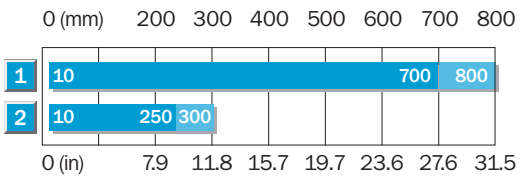
Note: Not all models stocked. Check web site or call for availability.

Sensing range 10…800 mm

VTE 18-3, VTE 18-4 selection table, photoelectric proximity sensor, energetic

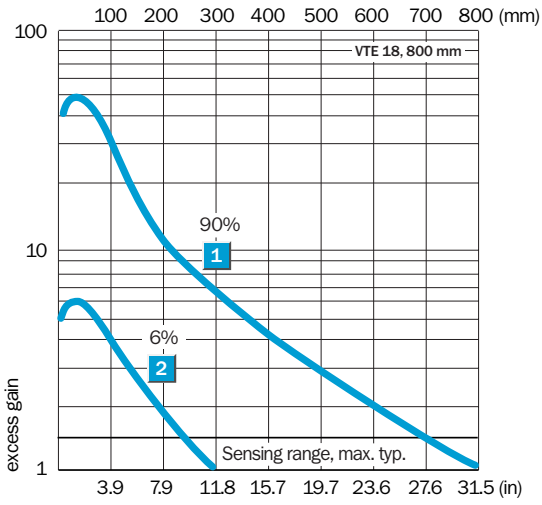
Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.
Housing material: metal									
Optical axis: axial									
3 wire									
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 8112	6 013 084	VTE 18-3 P 8112	6 013 093	VTE 18-3 N 8212	6 013 102	VTE 18-3 P 8212	6 013 111
	M12 plug, 4-pin	VTE 18-3 N 8140	6 013 086	VTE 18-3 P 8140	6 013 095	VTE 18-3 N 8240	6 013 104	VTE 18-3 P 8240	6 013 113
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 8112	6 013 087	VTE 18-3 F 8112	6 013 096	VTE 18-3 E 8212	6 013 105	VTE 18-3 F 8212	6 013 114
	M12 plug, 4-pin	VTE 18-3 E 8140	6 013 089	VTE 18-3 F 8140	6 013 098	VTE 18-3 E 8240	6 013 107	VTE 18-3 F 8240	6 013 116
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 8112	6 013 090	VTE 18-4 P 8112	6 013 099	VTE 18-4 N 8212	6 013 108	VTE 18-4 P 8212	6 013 117
	M12 plug, 4-pin	VTE 18-4 N 8140	6 013 092	VTE 18-4 P 8140	6 013 101	VTE 18-4 N 8240	6 013 110	VTE 18-4 P 8240	6 013 119
Optical axis: 90°									
3 wire									
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 8312	6 013 120	VTE 18-3 P 8312	6 013 129	VTE 18-3 N 8412	6 013 138	VTE 18-3 P 8412	6 013 147
	M12 plug, 4-pin	VTE 18-3 N 8340	6 013 122	VTE 18-3 P 8340	6 013 131	VTE 18-3 N 8440	6 013 140	VTE 18-3 P 8440	6 013 149
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 8312	6 013 123	VTE 18-3 F 8312	6 013 132	VTE 18-3 E 8412	6 013 141	VTE 18-3 F 8412	6 013 150
	M12 plug, 4-pin	VTE 18-3 E 8340	6 013 125	VTE 18-3 F 8340	6 013 134	VTE 18-3 E 8440	6 013 143	VTE 18-3 F 8440	6 013 152
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 8312	6 013 126	VTE 18-4 P 8312	6 013 135	VTE 18-4 N 8412	6 013 144	VTE 18-4 P 8412	6 013 153
	M12 plug, 4-pin	VTE 18-4 N 8340	6 013 128	VTE 18-4 P 8340	6 013 137	VTE 18-4 N 8440	6 013 146	VTE 18-4 P 8440	6 013 155
Housing material: plastic									
Optical axis: axial									
3 wire									
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 8612	6 013 156	VTE 18-3 P 8612	6 013 165	VTE 18-3 N 8712	6 013 174	VTE 18-3 P 8712	6 013 183
	M12 plug, 4-pin	VTE 18-3 N 8640	6 013 158	VTE 18-3 P 8640	6 013 167	VTE 18-3 N 8740	6 013 176	VTE 18-3 P 8740	6 013 185
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 8612	6 013 159	VTE 18-3 F 8612	6 013 168	VTE 18-3 E 8712	6 013 177	VTE 18-3 F 8712	6 013 186
	M12 plug, 4-pin	VTE 18-3 E 8640	6 013 161	VTE 18-3 F 8640	6 013 170	VTE 18-3 E 8740	6 013 179	VTE 18-3 F 8740	6 013 188
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 8612	6 013 162	VTE 18-4 P 8612	6 013 171	VTE 18-4 N 8712	6 013 180	VTE 18-4 P 8712	6 013 189
	M12 plug, 4-pin	VTE 18-4 N 8640	6 013 164	VTE 18-4 P 8640	6 013 173	VTE 18-4 N 8740	6 013 182	VTE 18-4 P 8740	6 013 191
Optical axis: 90°									
3 wire									
VTE 18-3 Q = D.ON	Cable 2 m	VTE 18-3 N 8812	6 013 192	VTE 18-3 P 8812	6 013 201	VTE 18-3 N 8912	6 013 210	VTE 18-3 P 8912	6 013 219
	M12 plug, 4-pin	VTE 18-3 N 8840	6 013 194	VTE 18-3 P 8840	6 013 203	VTE 18-3 N 8940	6 013 212	VTE 18-3 P 8940	6 013 221
VTE 18-3 Q = L.ON	Cable 2 m	VTE 18-3 E 8812	6 013 195	VTE 18-3 F 8812	6 013 204	VTE 18-3 E 8912	6 013 213	VTE 18-3 F 8912	6 013 222
	M12 plug, 4-pin	VTE 18-3 E 8840	6 013 197	VTE 18-3 F 8840	6 013 206	VTE 18-3 E 8940	6 013 215	VTE 18-3 F 8940	6 013 224
4 wire, L/D control wire									
VTE 18-4 L.ON/D.ON	Cable 2 m	VTE 18-4 N 8812	6 013 198	VTE 18-4 P 8812	6 013 207	VTE 18-4 N 8912	6 013 216	VTE 18-4 P 8912	6 013 225
	M12 plug, 4-pin	VTE 18-4 N 8840	6 013 200	VTE 18-4 P 8840	6 013 209	VTE 18-4 N 8940	6 013 218	VTE 18-4 P 8940	6 013 227

Operating distance and function reserve



Sensing range, max. typical

1	Sensing range on white, 90% remission
2	Sensing range on black, 6% remission



Note: Not all models stocked. Check web site or call for availability.

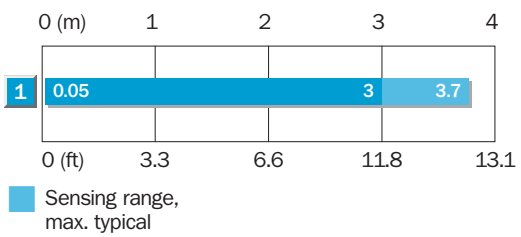
V.18 Selection Guide

Sensing range 0.05…3.7 m

VL 18-3, VL 18-4 selection table, photoelectric reflex sensor, with polarizing filter

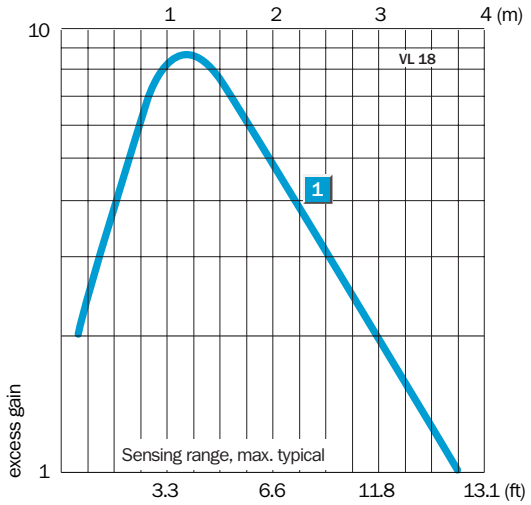
Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	PNP output Type	Part no.
Housing material: metal									
3 wire		**Optical axis: axial**							
VL 18-3 Q = D.ON	Cable 2 m	VL 18-3 N 3112	6 013 516	VL 18-3 P 3112	6 013 525	VL 18-3 N 3212	6 013 534	VL 18-3 P 3212	6 013 543
	M12 plug, 4-pin	VL 18-3 N 3140	6 013 518	VL 18-3 P 3140	6 013 527	VL 18-3 N 3240	6 013 536	VL 18-3 P 3240	6 013 545
VL 18-3 Q = L.ON	Cable 2 m	VL 18-3 E 3112	6 013 519	VL 18-3 F 3112	6 013 528	VL 18-3 E 3212	6 013 537	VL 18-3 F 3212	6 013 546
	M12 plug, 4-pin	VL 18-3 E 3140	6 013 521	VL 18-3 F 3140	6 013 530	VL 18-3 E 3240	6 013 539	VL 18-3 F 3240	6 013 548
4 wire, L/D control wire									
VL 18-4 L.ON/D.ON	Cable 2 m	VL 18-4 N 3112	6 013 522	VL 18-4 P 3112	6 013 531	VL 18-4 N 3212	6 013 540	VL 18-4 P 3212	6 013 549
	M12 plug, 4-pin	VL 18-4 N 3140	6 013 524	VL 18-4 P 3140	6 013 533	VL 18-4 N 3240	6 013 542	VL 18-4 P 3240	6 013 551
3 wire		**Optical axis: 90°**							
VL 18-3 Q = D.ON	Cable 2 m	VL 18-3 N 3312	6 013 552	VL 18-3 P 3312	6 013 561	VL 18-3 N 3412	6 013 570	VL 18-3 P 3412	6 013 579
	M12 plug, 4-pin	VL 18-3 N 3340	6 013 554	VL 18-3 P 3340	6 013 563	VL 18-3 N 3440	6 013 572	VL 18-3 P 3440	6 013 581
VL 18-3 Q = L.ON	Cable 2 m	VL 18-3 E 3312	6 013 555	VL 18-3 F 3312	6 013 564	VL 18-3 E 3412	6 013 573	VL 18-3 F 3412	6 013 582
	M12 plug, 4-pin	VL 18-3 E 3340	6 013 557	VL 18-3 F 3340	6 013 566	VL 18-3 E 3440	6 013 575	VL 18-3 F 3440	6 013 584
4 wire, L/D control wire									
VL 18-4 L.ON/D.ON	Cable 2 m	VL 18-4 N 3312	6 013 558	VL 18-4 P 3312	6 013 567	VL 18-4 N 3412	6 013 576	VL 18-4 P 3412	6 013 585
	M12 plug, 4-pin	VL 18-4 N 3340	6 013 560	VL 18-4 P 3340	6 013 569	VL 18-4 N 3440	6 013 578	VL 18-4 P 3440	6 013 587
Housing material: plastic									
3 wire		**Optical axis: axial**							
VL 18-3 Q = D.ON	Cable 2 m	VL 18-3 N 3612	6 013 588	VL 18-3 P 3612	6 013 597	VL 18-3 N 3712	6 013 606	VL 18-3 P 3712	6 013 615
	M12 plug, 4-pin	VL 18-3 N 3640	6 013 590	VL 18-3 P 3640	6 013 599	VL 18-3 N 3740	6 013 608	VL 18-3 P 3740	6 013 617
VL 18-3 Q = L.ON	Cable 2 m	VL 18-3 E 3612	6 013 591	VL 18-3 F 3612	6 013 600	VL 18-3 E 3712	6 013 609	VL 18-3 F 3712	6 013 618
	M12 plug, 4-pin	VL 18-3 E 3640	6 013 593	VL 18-3 F 3640	6 013 602	VL 18-3 E 3740	6 013 611	VL 18-3 F 3740	6 013 620
4 wire, L/D control wire									
VL 18-4 L.ON/D.ON	Cable 2 m	VL 18-4 N 3612	6 013 594	VL 18-4 P 3612	6 013 603	VL 18-4 N 3712	6 013 612	VL 18-4 P 3712	6 013 621
	M12 plug, 4-pin	VL 18-4 N 3640	6 013 596	VL 18-4 P 3640	6 013 605	VL 18-4 N 3740	6 013 614	VL 18-4 P 3740	6 013 623
3 wire		**Optical axis: 90°**							
VL 18-3 Q = D.ON	Cable 2 m	VL 18-3 N 3812	6 013 624	VL 18-3 P 3812	6 013 633	VL 18-3 N 3912	6 013 642	VL 18-3 P 3912	6 013 651
	M12 plug, 4-pin	VL 18-3 N 3840	6 013 626	VL 18-3 P 3840	6 013 635	VL 18-3 N 3940	6 013 644	VL 18-3 P 3940	6 013 653
VL 18-3 Q = L.ON	Cable 2 m	VL 18-3 E 3812	6 013 627	VL 18-3 F 3812	6 013 636	VL 18-3 E 3912	6 013 645	VL 18-3 F 3912	6 013 654
	M12 plug, 4-pin	VL 18-3 E 3840	6 013 629	VL 18-3 F 3840	6 013 638	VL 18-3 E 3940	6 013 647	VL 18-3 F 3940	6 013 656
4 wire, L/D control wire									
VL 18-4 L.ON/D.ON	M12 plug, 3 pin	VL 18-4 N 3812	6 013 630	VL 18-4 P 3812	6 013 639	VL 18-4 N 3912	6 013 648	VL 18-4 P 3912	6 013 657
	M12 plug, 4-pin	VL 18-4 N 3840	6 013 632	VL 18-4 P 3840	6 013 641	VL 18-4 N 3940	6 013 650	VL 18-4 P 3940	6 013 659

Sensing Range



Sensing range, max. typical

Reflector type		Sensing range
1	C 110	0.05… 3 m



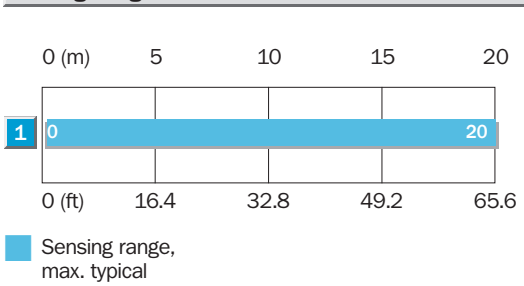
Note: Not all models stocked. Check web site or call for availability.

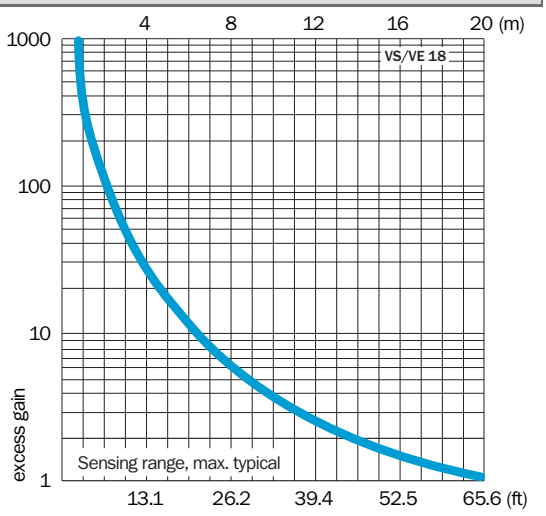
Sensing range 20 m

VS/VE 18-3, VS/VE 18-4 selection table, through beam photoelectric sensor, pair

Switching mode	Connection type	Without sensitivity control: NPN output Type	Part no.	Without sensitivity control: PNP output Type	Part no.	With sensitivity control: NPN output Type	Part no.	With sensitivity control: PNP output Type	Part no.
Housing material: metal									
3 wire		**Optical axis: axial**							
VS/VE 18-3 Q = D.ON	Cable 2 m	VS/VE18-3N3112	6 013 660	VS/VE18-3P3112	6 013 669	VS/VE18-3N3212	6 013 678	VS/VE18-3P3212	6 013 687
	M12 plug, 4-pin	VS/VE18-3N3140	6 013 662	VS/VE18-3P3140	6 013 671	VS/VE18-3N3240	6 013 680	VS/VE18-3P3240	6 013 689
VS/VE 18-3 Q = L.ON	Cable 2 m	VS/VE18-3E3112	6 013 663	VS/VE18-3F3112	6 013 672	VS/VE18-3E3212	6 013 681	VS/VE18-3F3212	6 013 690
	M12 plug, 4-pin	VS/VE18-3E3140	6 013 665	VS/VE18-3F3140	6 013 674	VS/VE18-3E3240	6 013 683	VS/VE18-3F3240	6 013 692
4 wire, L/D control wire									
VS/VE 18-4 L.ON/D.ON	Cable 2 m	VS/VE18-4N3112	6 013 666	VS/VE18-4P3112	6 013 675	VS/VE18-4N3212	6 013 684	VS/VE18-4P3212	6 013 693
	M12 plug, 4-pin	VS/VE18-4N3140	6 013 668	VS/VE18-4P3140	6 013 677	VS/VE18-4N3240	6 013 686	VS/VE18-4P3240	6 013 695
3 wire		**Optical axis: 90°**							
VS/VE 18-3 Q = D.ON	Cable 2 m	VS/VE18-3N3312	6 013 696	VS/VE18-3P3312	6 013 705	VS/VE18-3N3412	6 013 714	VS/VE18-3P3412	6 013 723
	M12 plug, 4-pin	VS/VE18-3N3340	6 013 698	VS/VE18-3P3340	6 013 707	VS/VE18-3N3440	6 013 716	VS/VE18-3P3440	6 013 725
VS/VE 18-3 Q = L.ON	Cable 2 m	VS/VE18-3E3312	6 013 699	VS/VE18-3F3312	6 013 708	VS/VE18-3E3412	6 013 717	VS/VE18-3F3412	6 013 726
	M12 plug, 4-pin	VS/VE18-3E3340	6 013 701	VS/VE18-3F3340	6 013 710	VS/VE18-3E3440	6 013 719	VS/VE18-3F3440	6 013 728
4 wire, L/D control wire									
VS/VE 18-4 L.ON/D.ON	Cable 2 m	VS/VE18-4N3312	6 013 702	VS/VE18-4P3312	6 013 711	VS/VE18-4N3412	6 013 720	VS/VE18-4P3412	6 013 729
	M12 plug, 4-pin	VS/VE18-4N3340	6 013 704	VS/VE18-4P3340	6 013 713	VS/VE18-4N3440	6 013 722	VS/VE18-4P3440	6 013 731
Housing material: plastic									
3 wire		**Optical axis: axial**							
VS/VE 18-3 Q = D.ON	Cable 2 m	VS/VE18-3N3612	6 013 732	VS/VE18-3P3612	6 013 741	VS/VE18-3N3712	6 013 750	VS/VE18-3P3712	6 013 759
	M12 plug, 4-pin	VS/VE18-3N3640	6 013 734	VS/VE18-3P3640	6 013 743	VS/VE18-3N3740	6 013 752	VS/VE18-3P3740	6 013 761
VS/VE 18-3 Q = L.ON	Cable 2 m	VS/VE18-3E3612	6 013 735	VS/VE18-3F3612	6 013 744	VS/VE18-3E3712	6 013 753	VS/VE18-3F3712	6 013 762
	M12 plug, 4-pin	VS/VE18-3E3640	6 013 737	VS/VE18-3F3640	6 013 746	VS/VE18-3E3740	6 013 755	VS/VE18-3F3740	6 013 764
4 wire, L/D control wire									
VS/VE 18-4 L.ON/D.ON	Cable 2 m	VS/VE18-4N3612	6 013 738	VS/VE18-4P3612	6 013 747	VS/VE18-4N3712	6 013 756	VS/VE18-4P3712	6 013 765
	M12 plug, 4-pin	VS/VE18-4N3640	6 013 740	VS/VE18-4P3640	6 013 749	VS/VE18-4N3740	6 013 758	VS/VE18-4P3740	6 013 767
3 wire		**Optical axis: 90°**							
VS/VE 18-3 Q = D.ON	Cable 2 m	VS/VE18-3N3812	6 013 768	VS/VE18-3P3812	6 013 777	VS/VE18-3N3912	6 013 786	VS/VE18-3P3912	6 013 795
	M12 plug, 4-pin	VS/VE18-3N3840	6 013 770	VS/VE18-3P3840	6 013 779	VS/VE18-3N3940	6 013 788	VS/VE18-3P3940	6 013 797
VS/VE 18-3 Q = L.ON	Cable 2 m	VS/VE18-3E3812	6 013 771	VS/VE18-3F3812	6 013 780	VS/VE18-3E3912	6 013 789	VS/VE18-3F3912	6 013 798
	M12 plug, 4-pin	VS/VE18-3E3840	6 013 773	VS/VE18-3F3840	6 013 782	VS/VE18-3E3940	6 013 791	VS/VE18-3F3940	6 013 800
4 wire, L/D control wire									
VS/VE 18-4 L.ON/D.ON	Cable 2 m	VS/VE18-4N3812	6 013 774	VS/VE18-4P3812	6 013 783	VS/VE18-4N3912	6 013 792	VS/VE18-4P3912	6 013 801
	M12 plug, 4-pin	VS/VE18-4N3840	6 013 776	VS/VE18-4P3840	6 013 785	VS/VE18-4N3940	6 013 794	VS/VE18-4P3940	6 013 803

Sensing Range





Note: Not all models stocked. Check web site or call for availability.

Accessories

Selection Table for Cables and Connectors

Type	Part no.	Notes	Page
M8 3-pin DC Cables			
RD3-SM8	7 023 101	Receptacle, DC, 3-pin M8, straight female, field wireable	908
RD3-RM8	7 023 102	Receptacle, DC, 3-pin M8, right-angle female, field wireable	908
RD3-SM8M	7 026 124	Receptacle, DC, 3-pin M8, straight male, field wireable	908
KD3-SUM82	7 022 768	Cable, DC, 3-wire M8, straight female, 2 m, PUR	908
KD3-SUM85	7 022 769	Cable, DC, 3-wire M8, straight female, 5 m, PUR	908
KD3-SUM810	7 023 113	Cable, DC, 3-wire M8, straight female, 10 m, PUR	908
KD3-RUM82	7 023 099	Cable, DC, 3-wire M8, right-angle female, 2 m, PUR	908
KD3-RUM85	7 023 100	Cable, DC, 3-wire M8, right-angle female, 5 m, PUR	908
KD3-RUM810	7 023 114	Cable, DC, 3-wire M8, right-angle female, 10 m, PUR	908
M8 4-pin DC Cables			
RD4-SM8	6 009 974	Receptacle, DC, 4-pin M8, straight female, field wireable	908
RD4-RM8	6 009 975	Receptacle, DC, 4-pin M8, right-angle female, field wireable	908
RD4-SM8M	7 025 749	Receptacle, DC, 4-pin M8, straight male, field wireable	908
KD4-SUM82	7 022 754	Cable, DC, 4-wire M8, straight female, 2 m, PUR	908
KD4-SUM85	7 022 784	Cable, DC, 4-wire M8, straight female, 5 m, PUR	908
KD4-SUM810	7 023 016	Cable, DC, 4-wire M8, straight female, 10 m, PUR	908
KD4-RUM82	7 023 775	Cable, DC, 4-wire M8, right-angle female, 2 m, PUR	908
KD4-RUM85	7 023 776	Cable, DC, 4-wire M8, right-angle female, 5 m, PUR	908
KD4-RUM810	7 023 020	Cable, DC, 4-wire M8, right-angle female, 10 m, PUR	908
KD4-SUM85E	7 023 663	Cable, DC, 4-wire M8, straight female, 5 m, PUR, extension cable	908
M12 5-pin AC Cables			
KA15-SIM122	7 021 883	Cable, AC, 5-wire M12, straight female, 2 m	908
KA15-SIM125	7 021 884	Cable, AC, 5-wire M12, straight female, 5 m	908
KA15-RIM122	7 021 885	Cable, AC, 5-wire M12, right-angle female, 2 m	908
KA15-RIM125	7 021 886	Cable, AC, 5-wire M12, right-angle female, 5 m	908
M12 4-pin DC Cables			
RD4-SM12	6 007 302	Receptacle, DC, 4-pin M12, straight female, field wireable	909
RD4-RM12	6 007 303	Receptacle, DC, 4-pin M12, right-angle female, field wireable	909
RD4-SM12M	7 021 273	Receptacle, DC, 4-pin M12, straight male, field wireable	909
KD4-SIM122	7 020 020	Cable, DC, 4-wire M12, straight female, 2 m	909
KD4-SIM125	7 020 678	Cable, DC, 4-wire M12, straight female, 5 m	909
KD4-SIM1210	7 020 080	Cable, DC, 4-wire M12, straight female, 10 m	909
KD4-SIM1215	7 023 473	Cable, DC, 4-wire M12, straight female, 15 m	909
KD4-SIM1220	7 023 145	Cable, DC, 4-wire M12, straight female, 20 m	909
KD4-RIM122	7 020 023	Cable, DC, 4-wire M12, right-angle female, 2 m	909
KD4-RIM125	7 020 679	Cable, DC, 4-wire M12, right-angle female, 5 m	909
KD4-RIM1210	7 021 244	Cable, DC, 4-wire M12, right-angle female, 10 m	909
KD4-SIM122E	7 023 135	Cable, 4-pin M12 female to 4-pin M12 male, extension, 2 m	909
KD4-RIM122E	7 023 565	Cable, 4-pin M12 R.A. female to 4-pin M12 S. male, extension, 2m	909
KD4-SYM122E	7 023 199	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, 2 m	909
KD4-SYM124E	7 023 200	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, 4 m	909
KD4-SYM1210E	7 023 201	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, 10 m	909

Selection Table for Cables and Connectors

Type	Part no.	Notes	Page
M12 5-pin DC Cables			
RD5-SM12	6 009 719	Receptacle, DC, 5-pin M12, straight female, field wireable	909
RD5-RM12	6 009 720	Receptacle, DC, 5-pin M12, right-angle female, field wireable	909
RD5-SM12M	7 022 310	Receptacle, DC, 5-pin M12, straight male, field wireable	909
KD5-SIM122	6 008 899	Cable, DC, 5-wire M12, straight female, 2 m	909
KD5-SIM122L2	7 023 876	Cable, DC, 5-wire M12, straight-angle female, LEDs for power and output, for W.27L, 2 m	909
KD5-SRW2C	7 020 324	Cable, DC, 5-wire M12, coiled, straight female, extended 2 m	909
KD5-SIM125	7 020 680	Cable, DC, 5-wire M12, straight female, 5 m	909
KD5-SIM1210	6 010 544	Cable, DC, 5-wire M12, straight female, 10m	909
KD5-SRW2C	7 020 324	Cable, DC, 5-wire M12, coiled, straight female, extended 2 m	909
KD5-RIM122	6 008 900	Cable, DC, 5-wire M12, right-angle female, 2 m	909
KD5-RIM125	7 020 681	Cable, DC, 5-wire M12, right-angle female, 5 m	909
KD5-RIM1210	6 010 542	Cable, DC, 5-wire M12, right-angle female, 10m	909
KD5-RIM122L2	7 022 775	Cable, DC, 5-wire M12, right-angle female, LEDs for power and output, for W.12L, 2 m	909
KD5-RIM125L2	7 022 776	Cable, DC, 5-wire M12, right-angle female, LEDs for power and output, for W.12L, 5 m	909
KD5-RIM1210L2	7 022 777	Cable, DC, 5-wire M12, right-angle female, LEDs for power and output, for W.12L, 10 m	909
M12 8-pin DC Cables			
KD8-SIM122	7 024 488	Cable, DC, 8-wire M12, straight female, 2 m	910
KD8-SIM125	7 022 334	Cable, DC, 8-wire M12, straight female, 5 m	910
KD8-SIM1210	7 022 335	Cable, DC, 8-wire M12, straight female, 10 m	910
KD8-SIM122S	6 020 663	Cable, DC, 8-wire M12, straight female, 2 m (for OD)	910
KD8-SIM125S	6 020 664	Cable, DC, 8-wire M12, straight female, 5 m (for OD)	910
Micro 3-pin Cables (1/2-20 thread)			
KA23-SIF22	7 023 593	Cable, 3-pin Micro, straight, 2m	910
KA23-RIF22	7 023 594	Cable, 3-pin Micro, right angle, 2m	910
Micro 4-pin Cables (1/2-20 thread)			
KA24-SIF22	7 023 591	Cable, 4-pin Micro, straight, 2m	910
KA24-RIF22	7 023 592	Cable, 4-pin Micro, right angle, 2m	910
Micro 5-pin Cables (1/2-20 thread)			
KA25-SIF22	7 020 014	Cable, 5-pin Micro, straight female, 2 m	910
KA25-SIF25	7 020 024	Cable, 5-pin Micro, straight female, 5 m	910
KA25-RIF22	7 020 016	Cable, 5-pin Micro, right-angle female, 2 m	910
KA25-RIF25	7 020 026	Cable, 5-pin Micro, right angle female, 5m	910

Accessories

Selection Table for Cables and Connectors

Type	Part no.	Notes	Page
Mini 3-pin Cables			
KA13-SYF86F	7 021 941	Cable, 3-pin Mini, straight, 6 ft	911
Mini 4-pin Cables			
KA14-SGF82	7 023 595	Cable, 4-pin Mini, straight, 2m	911
KA14-RGF82	7 023 596	Cable, 4-pin Mini, right angle, 2m	911
KA15-SGF85	7 023 788	Cable, 5-wire Mini, straight female, 5 m	911
KA15-RGF85	7 023 789	Cable, 5-wire Mini, right-angle female, 5 m	911
Mini 5-pin Cables			
RA15-SF8	7 023 284	Receptacle, 5-pin Mini, straight female, field wireable	911
KA15-SGF82	7 023 786	Cable, 5-wire Mini, straight female, 2 m	911
KA15-SGF85	7 023 788	Cable, 5-wire Mini, straight female, 5 m	911
KA15-RGF82	7 023 787	Cable, 5-wire Mini, right-angle female, 2 m	911
KA15-RGF85	7 023 789	Cable, 5-wire Mini, right-angle female, 5 m	911
KA15-SDF82	7 020 015	Cable, 5-wire Mini, straight female, 2 m, automotive std. colors	911
KA15-SDF85	7 020 025	Cable, 5-wire Mini, straight female, 5 m, automotive std. colors	911
KA15-RDF81	7 021 095	Cable, 5-wire Mini, right-angle female, 1 m, automotive std.colors	911
KA15-RDF82	7 020 017	Cable, 5-wire Mini, right-angle female, 2 m, automotive std. colors	911
KA15-RDF85	7 020 027	Cable, 5-wire Mini, right-angle female, 5 m, automotive std. colors	911
DME Cables			
DME-KS5M	2 013 353	Cable, DME 2000, straight, 5 m	912
RD12-S723	6 007 092	Receptacle, DME, 12-pin, straight, female	912
RD12-R723	6 007 988	Receptacle, DME, 12-pin, right-angle, female	912
KB10-8596	6 008 596	Bulk cable, 10 conductor, DME 3000, priced per meter	912
KB12-9219	6 009 219	Bulk cable, 12 conductor for DME 2000, priced per meter	912
DME-KS10M	7 021 834	Cable, DME 2000, straight, 10 m	912
DME-KR5M	7 021 835	Cable, DME 2000, right-angle, 5 m	912
DME-KR10M	7 021 622	Cable, DME 2000, right-angle, 10 m	912
DME-KR20M	7 023 559	Cable, DME 2000, right-angle, 20 m	912
DME3-KS5M	2 017 568	Cable, DME 3000, straight, 5 m	912
DME3-KS10M	7 023 694	Cable, DME 3000, straight, 10 m	912
DME3-KS25M	7 023 564	Cable, DME 3000, straight, 25 m	912
DOL-1608-G05MA	2 026 742	Cable for DME 5000, 5 m, M16 cable receptacle, 8-pin, straight	913
DOL-1608-G10MA	2 027 193	Cable for DME 5000, 10 m, M16 cable receptacle, 8-pin, straight	913
KT/NT Cables			
KD4-SIM122-AMP	2 015 687	Cable, 7-pin Amphenol-Tuchel plug to 4-pin M12, 2 m (adapt KT 5 to NT 6/8)	912
KD4-SIM125-AMP	2 015 688	Cable, 7-pin Amphenol-Tuchel plug to 4-pin M12, 5 m (adapt KT 5 to NT 6/8)	912
KD5-SIM122-AMP	7 024 015	Cable, 7-pin Amphenol-Tuchel plug to 5-pin M12, 5 m (adapt KT 5 to NT 6)	912
RU7-SC16M	6 004 193	Connector, 7-pin Amphenol-Tuchel plug, male (NT 6/8)	912
RU7-SC16	6 004 194	Connector, 7-pin Amphenol-Tuchel plug, female (NT 6/8)	912
RU7-SOSFC16	6 004 196	Receptacle, panel mount, female, for NT 6 or NT 8 with connector	912
KB4-1801	6 001 801	Raw cable, 4 conductor, NT 6/NT 8, priced per meter	912
KB5-0616	6 000 616	Raw cable, 5 conductor, for NT 8, for 8 m or less, priced p/meter	912
KB5-0628	7 020 628	Raw cable, 5 conductor, for NT 8, for 8 m or more, priced p/meter	912
KP-S05506-2	7 020 506	Extension cable for NT 6/NT 8, with 6004194 & bare leads, 2 m	912
KP-S05401-2	7 020 514	Extension cable for NT 6/NT 8, with 6004194 & bare leads, 2 m	912
KP-S05401-5	7 021 864	Extension cable for NT 6/NT 8, with 6004194 & bare leads, 5 m	912
KP-S05506-2.0E	2 002 264	Extension cable for NT 6/NT 8, with 6004194 & 6004193, 2 m	912
KP-S05506-4.0E	2 005 909	Extension cable for NT 6/NT 8, with 6004194 & 6004193, 4 m	912
KP-S05506-6.0E	2 006 810	Extension cable for NT 6/NT 8, with 6004194 & 6004193, 6 m	912

Selection Table for Cables and Connectors

Type	Part no.	Notes	Page
LUT 1-4 Cables			
LUT1-4-KR02	2 006 545	Cable for LUT 1-4, 2 m	913
LUT1-4-KR04	2 006 859	Cable for LUT 1-4, 4 m	913
LUT1-4-KR06	2 006 860	Cable for LUT 1-4, 6 m	913
LUT1-4-KR08	2 006 861	Cable for LUT 1-4, 8 m	913
LUT1-4-KR10	2 007 595	Cable for LUT 1-4, 10 m	913
LUT1-4-KR20	2 007 243	Cable for LUT 1-4, 20 m	913
RU7-QC146	2 007 901	Receptacle, LUT 1-5, 7-pin	913
KB7-0607	6 000 607	Raw cable, 7 conductor, LUT 1-4, priced per meter	913
LUT 1-5 Cables			
LUT1-5-KR02	2 008 423	Cable for LUT 1-5, 2 m	913
LUT1-5-KR04	2 008 424	Cable for LUT 1-5, 4 m	913
LUT1-5-KR06	2 008 425	Cable for LUT 1-5, 6 m	913
LUT1-5-KR08	2 008 426	Cable for LUT 1-5, 8 m	913
LUT1-5-KR10	2 008 427	Cable for LUT 1-5, 10 m	913
LUT1-5-KR20	2 008 428	Cable for LUT 1-5, 20 m	913
RU7-QC146	2 007 901	Receptacle, LUT 1-5, 7-pin	913
KB7-6501	6 006 501	Raw cable, 7 conductor, LUT 1-5, priced per meter	913
6-pin Square DC Cables			
KP-Q02502-2	2 009 477	Cable, DC, 6-pin Square plug 6006710, right-angle female, 2 m	914
KP-Q02502-3	2 009 478	Cable, DC, 6-pin Square plug 6006710, right-angle female, 3 m	914
KP-Q02502-5.5	2 009 479	Cable, DC, 6-pin Square plug 6006710, right-angle female, 5.5 m	914
KP-Q02502-10	2 009 480	Cable, DC, 6-pin Square plug 6006710, right-angle female, 10 m	914
6-pin Square AC Cables			
KP-Q01501-2	2 009 116	Cable, AC, 6-pin Square plug 6006685, right-angle female, 2 m	914
KP-Q01501-3	2 009 117	Cable, AC, 6-pin Square plug 6006685, right-angle female, 3 m	914
KP-Q01501-5.5	2 009 118	Cable, AC, 6-pin Square plug 6006685, right-angle female, 5.5 m	914
KP-Q01501-10	2 009 119	Cable, AC, 6-pin Square plug 6006685, right-angle female, 10 m	914
7-pin Square DC Cables			
KP-Q04502-2	7 020 484	Cable, DC, 7-pin Square plug 6006823, right-angle female, 2 m	915
KP-Q04502-3	7 020 242	Cable, DC, 7-pin Square plug 6006823, right-angle female, 3 m	915
7-pin Square AC Cables			
KP-Q03501-2	7 020 485	Cable, AC, 7-pin Square plug 6006821, right-angle female, 2 m	915

Accessories

Cables and Connectors - Dimensional Drawings and Order Information

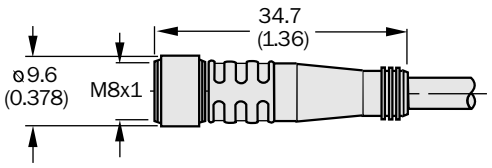
M8 3-pin DC Cables

Type	Part no.	Notes
RD3-SM8	7 023 101	Receptacle, DC, 3-pin M8, straight female, field wireable
RD3-RM8	7 023 102	Receptacle, DC, 3-pin M8, right-angle female, field wireable
RD3-SM8M	7 026 124	Receptacle, DC, 3-pin M8, straight male, field wireable
KD3-SUM82	7 022 768	Cable, DC, 3-wire M8, straight female, 2 m, PUR
KD3-SUM85	7 022 769	Cable, DC, 3-wire M8, straight female, 5 m, PUR
KD3-SUM810	7 023 113	Cable, DC, 3-wire M8, straight female, 10 m, PUR
KD3-RUM82	7 023 099	Cable, DC, 3-wire M8, right-angle female, 2 m, PUR
KD3-RUM85	7 023 100	Cable, DC, 3-wire M8, right-angle female, 5 m, PUR
KD3-RUM810	7 023 114	Cable, DC, 3-wire M8, right-angle female, 10 m, PUR

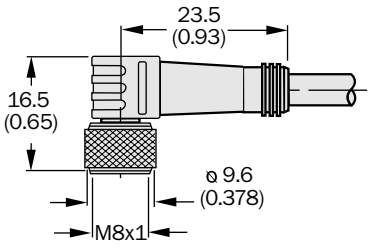
M8 4-pin DC Cables

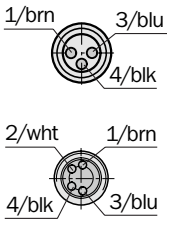
Type	Part no.	Notes
RD4-SM8	6 009 974	Receptacle, DC, 4-pin M8, straight female, field wireable
RD4-RM8	6 009 975	Receptacle, DC, 4-pin M8, right-angle female, field wireable
RD4-SM8M	7 025 749	Receptacle, DC, 4-pin M8, straight male, field wireable
KD4-SUM82	7 022 754	Cable, DC, 4-wire M8, straight female, 2 m, PUR
KD4-SUM85	7 022 784	Cable, DC, 4-wire M8, straight female, 5 m, PUR
KD4-SUM810	7 023 016	Cable, DC, 4-wire M8, straight female, 10 m, PUR
KD4-RUM82	7 023 775	Cable, DC, 4-wire M8, right-angle female, 2 m, PUR
KD4-RUM85	7 023 776	Cable, DC, 4-wire M8, right-angle female, 5 m, PUR
KD4-RUM810	7 023 020	Cable, DC, 4-wire M8, right-angle female, 10 m, PUR
KD4-SUM85E	7 023 663	Cable, DC, 4-wire M8, straight female, 5 m, PUR, extension cable

M8, Straight



M8, Right-angle

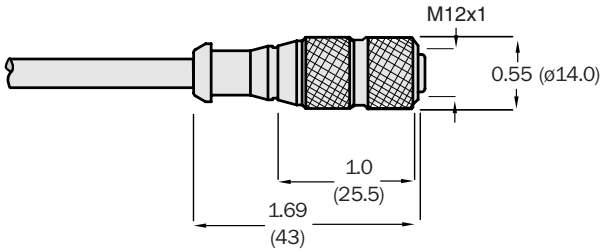


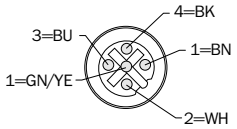


Dimensions in inches (mm)

M12 5-pin AC Cables

Type	Part no.	Notes
KA15-SIM122	7 021 883	Cable, AC, 5-wire M12, straight female, 2 m
KA15-SIM125	7 021 884	Cable, AC, 5-wire M12, straight female, 5 m
KA15-RIM122	7 021 885	Cable, AC, 5-wire M12, right-angle female, 2 m
KA15-RIM125	7 021 886	Cable, AC, 5-wire M12, right-angle female, 5 m





Dimensions in inches (mm)

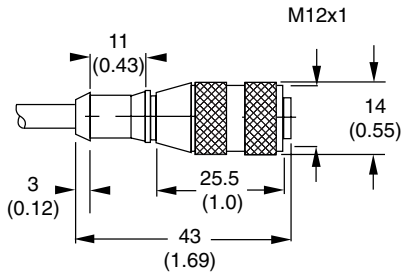
M12 4-pin DC Cables

Type	Part no.	Notes
RD4-SM12	6 007 302	Receptacle, DC, 4-pin M12, straight female, field wireable
RD4-RM12	6 007 303	Receptacle, DC, 4-pin M12, right-angle female, field wireable
RD4-SM12M	7 021 273	Receptacle, DC, 4-pin M12, straight male, field wireable
KD4-SIM122	7 020 020	Cable, DC, 4-wire M12, straight female, 2 m
KD4-SIM125	7 020 678	Cable, DC, 4-wire M12, straight female, 5 m
KD4-SIM1210	7 020 080	Cable, DC, 4-wire M12, straight female, 10 m
KD4-SIM1215	7 023 473	Cable, DC, 4-wire M12, straight female, 15 m
KD4-SIM1220	7 023 145	Cable, DC, 4-wire M12, straight female, 20 m
KD4-RIM122	7 020 023	Cable, DC, 4-wire M12, right-angle female, 2 m
KD4-RIM125	7 020 679	Cable, DC, 4-wire M12, right-angle female, 5 m
KD4-RIM1210	7 021 244	Cable, DC, 4-wire M12, right-angle female, 10 m
KD4-SIM122E	7 023 135	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, 2 m
KD4-RIM122E	7 023 565	Cable, 4-pin M12 R.A. female to 4-pin M12 S. male, extension cable, 2m
KD4-SYM122E	7 023 199	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, yellow jacket, 2 m
KD4-SYM124E	7 023 200	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, yellow jacket, 4 m
KD4-SYM1210E	7 023 201	Cable, 4-pin M12 female to 4-pin M12 male, extension cable, yellow jacket, 10 m

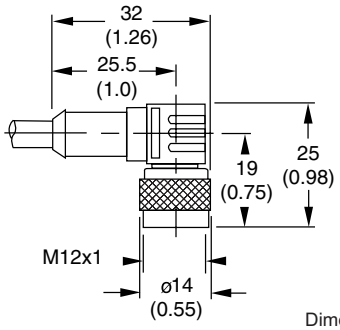
M12 5-pin DC Cables

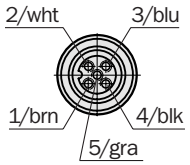
Type	Part no.	Notes
RD5-SM12	6 009 719	Receptacle, DC, 5-pin M12, straight female, field wireable
RD5-RM12	6 009 720	Receptacle, DC, 5-pin M12, right-angle female, field wireable
RD5-SM12M	7 022 310	Receptacle, DC, 5-pin M12, straight male, field wireable
KD5-SIM122	6 008 899	Cable, DC, 5-wire M12, straight female, 2 m
KD5-SIM122L2	7 023 876	Cable, DC, 5-wire M12, straight-angle female, LEDs for power and output, for W.27L, 2 m
KD5-SRW2C	7 020 324	Cable, DC, 5-wire M12, coiled, straight female, extended length 2 m
KD5-SIM125	7 020 680	Cable, DC, 5-wire M12, straight female, 5 m
KD5-SIM1210	6 010 544	Cable, DC, 5-wire M12, straight female, 10m
KD5-SRW2C	7 020 324	Cable, DC, 5-wire M12, coiled, straight female, extended length 2 m
KD5-RIM122	6 008 900	Cable, DC, 5-wire M12, right-angle female, 2 m
KD5-RIM125	7 020 681	Cable, DC, 5-wire M12, right-angle female, 5 m
KD5-RIM1210	6 010 542	Cable, DC, 5-wire M12, right-angle female, 10m
KD5-RIM122L2	7 022 775	Cable, DC, 5-wire M12, right-angle female, LEDs for power and output, for W.12L, 2 m
KD5-RIM125L2	7 022 776	Cable, DC, 5-wire M12, right-angle female, LEDs for power and output, for W.12L, 5 m
KD5-RIM1210L2	7 022 777	Cable, DC, 5-wire M12, right-angle female, LEDs for power and output, for W.12L, 10 m

M12, Straight



M12, Right-angle





Dimensions in inches (mm)

Accessories

Cables and Connectors - Dimensional Drawings and Order Information

M12 8-pin DC Cables

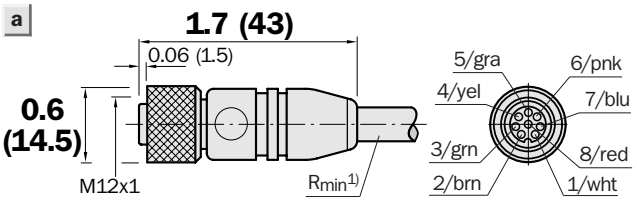
a

Type	Part no.	Notes
KD8-SIM122	7 024 488	Cable, DC, 8-wire M12, straight female, 2 m
KD8-SIM125	7 022 334	Cable, DC, 8-wire M12, straight female, 5 m
KD8-SIM1210	7 022 335	Cable, DC, 8-wire M12, straight female, 10 m

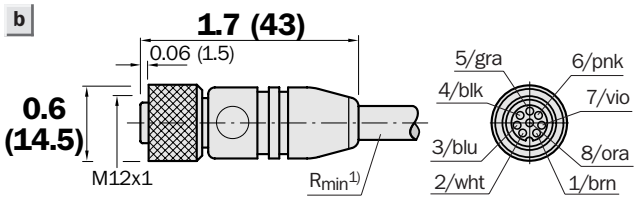
b

Type	Part no.	Notes
KD8-SIM122S	6 020 663	Cable, DC, 8-wire M12, straight female, 2 m (for OD)
KD8-SIM125S	6 020 664	Cable, DC, 8-wire M12, straight female, 5 m (for OD)

a



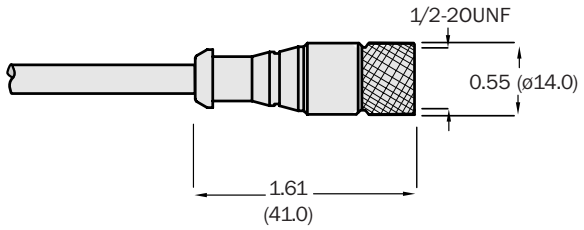
b

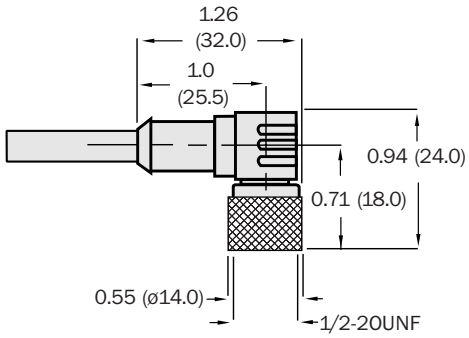


Dimensions in inches (mm)

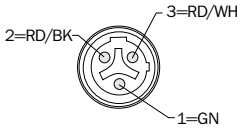
Micro 3-pin Cables (1/2-20 thread)

Type	Part no.	Notes
KA23-SIF22	7 023 593	Cable, 3-pin Micro, straight, 2m
KA23-RIF22	7 023 594	Cable, 3-pin Micro, right angle, 2m





Female Pin-Out

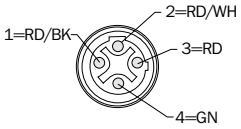


Dimensions in inches (mm)

Micro 4-pin Cables (1/2-20 thread)

Type	Part no.	Notes
KA24-SIF22	7 023 591	Cable, 4-pin Micro, straight, 2m
KA24-RIF22	7 023 592	Cable, 4-pin Micro, right angle, 2m

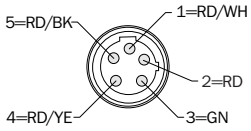
Female Pin-Out



Micro 5-pin Cables (1/2-20 thread)

Type	Part no.	Notes
KA25-SIF22	7 020 014	Cable, 5-pin Micro, straight female, 2 m
KA25-SIF25	7 020 024	Cable, 5-pin Micro, straight female, 5 m
KA25-RIF22	7 020 016	Cable, 5-pin Micro, right-angle female, 2 m
KA25-RIF25	7 020 026	Cable, 5-pin Micro, right angle female, 5m

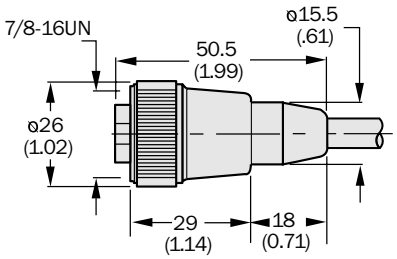
Female Pin-Out



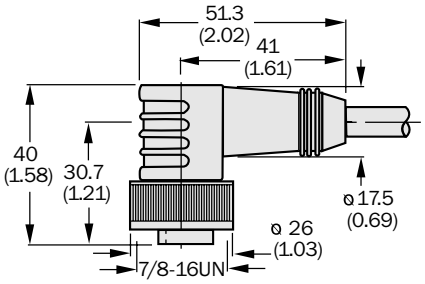
Mini 3-pin Cables

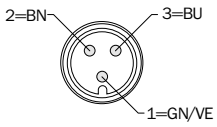
Type	Part no.	Notes
KA13-SYF86F	7 021 941	Cable, 3-pin Mini, straight, 6 ft

Mini, Straight



Mini, Right-angle



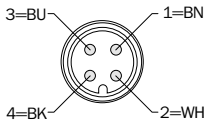


Dimensions in inches (mm)

Mini 4-pin Cables

Type	Part no.	Notes
KA14-SGF82	7 023 595	Cable, 4-pin Mini, straight, 2m
KA14-RGF82	7 023 596	Cable, 4-pin Mini, right angle, 2m
KA15-SGF85	7 023 788	Cable, 5-wire Mini, straight female, 5 m
KA15-RGF85	7 023 789	Cable, 5-wire Mini, right-angle female, 5 m

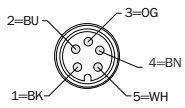
Female Pin-Out



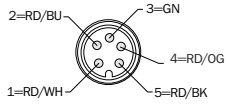
Mini 5-pin Cables

Type	Part no.	Notes
RA15-SF8	7 023 284	Receptacle, 5-pin Mini, straight female, field wireable
KA15-SGF82	7 023 786	Cable, 5-wire Mini, straight female, 2 m
KA15-SGF85	7 023 788	Cable, 5-wire Mini, straight female, 5 m
KA15-RGF82	7 023 787	Cable, 5-wire Mini, right-angle female, 2 m
KA15-RGF85	7 023 789	Cable, 5-wire Mini, right-angle female, 5 m
KA15-SDF82	7 020 015	Cable, 5-wire Mini, straight female, 2 m, automotive standard colors
KA15-SDF85	7 020 025	Cable, 5-wire Mini, straight female, 5 m, automotive standard colors
KA15-RDF81	7 021 095	Cable, 5-wire Mini, right-angle female, 1 m, automotive standard colors
KA15-RDF82	7 020 017	Cable, 5-wire Mini, right-angle female, 2 m, automotive standard colors
KA15-RDF85	7 020 027	Cable, 5-wire Mini, right-angle female, 5 m, automotive standard colors

Female Pin-Out



Female Pin-Out (automotive)



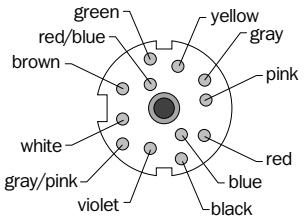
SICK

Accessories

Cables and Connectors - Dimensional Drawings and Order Information

DME Cables

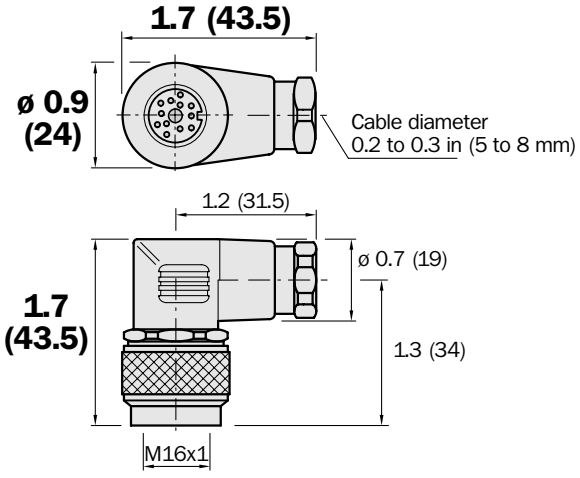
Type	Part no.	Notes
DME-KS5M	2 013 353	Cable, DME 2000, straight, 5 m
RD12-S723	6 007 092	Receptacle, DME, 12-pin, straight, female
RD12-R723	6 007 988	Receptacle, DME, 12-pin, right-angle, female
KB10-8596	6 008 596	Bulk cable, 10 conductor, DME 3000, priced per meter
KB12-9219	6 009 219	Bulk cable, 12 conductor for DME 2000, priced per meter

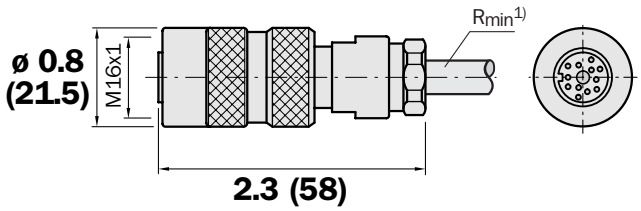


DME-KS10M	7 021 834	Cable, DME 2000, straight, 10 m
DME-KR5M	7 021 835	Cable, DME 2000, right-angle, 5 m
DME-KR10M	7 021 622	Cable, DME 2000, right-angle, 10 m
DME-KR20M	7 023 559	Cable, DME 2000, right-angle, 20 m
DME3-KS5M	2 017 568	Cable, DME 3000, straight, 5 m
DME3-KS10M	7 023 694	Cable, DME 3000, straight, 10 m
DME3-KS25M	7 023 564	Cable, DME 3000, straight, 25 m

KT/NT Cables

Type	Part no.	Notes
KD4-SIM122-AMP	2 015 687	Cable, 7-pin Amphenol-Tuchel plug to 4-pin M12, 2 m (adapt KT 5 to NT 6/8)
KD4-SIM125-AMP	2 015 688	Cable, 7-pin Amphenol-Tuchel plug to 4-pin M12, 5 m (adapt KT 5 to NT 6/8)
KD5-SIM122-AMP	7 024 015	Cable, 7-pin Amphenol-Tuchel plug to 5-pin M12, 5 m (adapt KT 5 to NT 6)
RU7-SC16M	6 004 193	Connector, 7-pin Amphenol-Tuchel plug, male field wireable (NT 6/8)
RU7-SC16	6 004 194	Connector, 7-pin Amphenol-Tuchel plug, female field wireable (NT 6/8)
RU7-SOSFC16	6 004 196	Receptacle, panel mount, female, for NT 6 or NT 8 with connector
KB4-1801	6 001 801	Raw cable, 4 conductor, NT 6/NT 8, priced per meter
KB5-0616	6 000 616	Raw cable, 5 conductor, for NT 8, for 8 m or less, priced per meter
KB5-0628	7 020 628	Raw cable, 5 conductor, for NT 8, for 8 m or more, priced per meter
KP-S05506-2	7 020 506	Extension cable for NT 6/NT 8, with 6004194 and bare leads, 2 m
KP-S05401-2	7 020 514	Extension cable for NT 6/NT 8, with 6004194 and bare leads, 2 m
KP-S05401-5	7 021 864	Extension cable for NT 6/NT 8, with 6004194 and bare leads, 5 m
KP-S05506-2.0E	2 002 264	Extension cable for NT 6/NT 8, with 6004194 and 6004193, 2 m
KP-S05506-4.0E	2 005 909	Extension cable for NT 6/NT 8, with 6004194 and 6004193, 4 m
KP-S05506-6.0E	2 006 810	Extension cable for NT 6/NT 8, with 6004194 and 6004193, 6 m

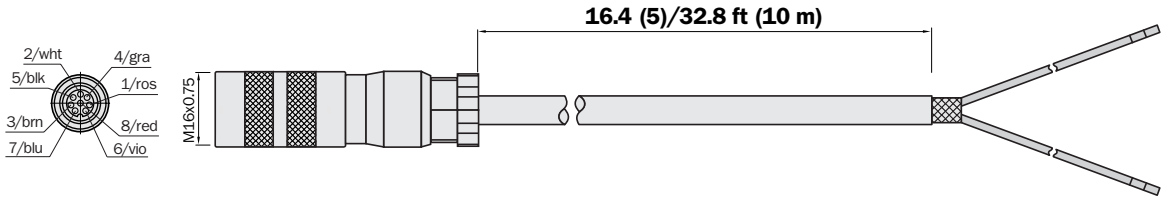




Dimensions in inches (mm)

DME 5000 Cables

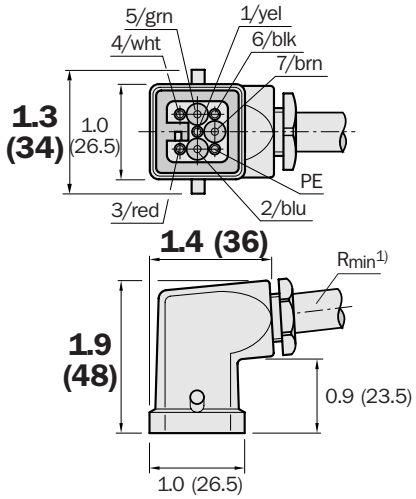
Type	Part no.	Notes
DOL-1608-G05MA	2 026 742	Cable for DME 5000, 5 m, M16 cable receptacle, 8-pin, straight
DOL-1608-G10MA	2 027 193	Cable for DME 5000, 10 m, M16 cable receptacle, 8-pin, straight



Dimensions in inches (mm)

LUT 1-4 Cables

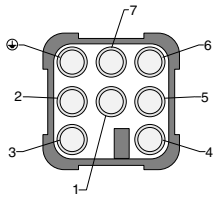
Type	Part no.	Notes
LUT1-4-KR02	2 006 545	Cable for LUT 1-4, 2 m
LUT1-4-KR04	2 006 859	Cable for LUT 1-4, 4 m
LUT1-4-KR06	2 006 860	Cable for LUT 1-4, 6 m
LUT1-4-KR08	2 006 861	Cable for LUT 1-4, 8 m
LUT1-4-KR10	2 007 595	Cable for LUT 1-4, 10 m
LUT1-4-KR20	2 007 243	Cable for LUT 1-4, 20 m
RU7-QC146	2 007 901	Receptacle, LUT 1-5, 7-pin
KB7-0607	6 000 607	Raw cable, 7 conductor, LUT 1-4, priced per meter



Dimensions in inches (mm)

LUT 1-5 Cables

Type	Part no.	Notes
LUT1-5-KR02	2 008 423	Cable for LUT 1-5, 2 m
LUT1-5-KR04	2 008 424	Cable for LUT 1-5, 4 m
LUT1-5-KR06	2 008 425	Cable for LUT 1-5, 6 m
LUT1-5-KR08	2 008 426	Cable for LUT 1-5, 8 m
LUT1-5-KR10	2 008 427	Cable for LUT 1-5, 10 m
LUT1-5-KR20	2 008 428	Cable for LUT 1-5, 20 m
RU7-QC146	2 007 901	Receptacle, LUT 1-5, 7-pin
KB7-6501	6 006 501	Raw cable, 7 conductor, LUT 1-5, priced per meter



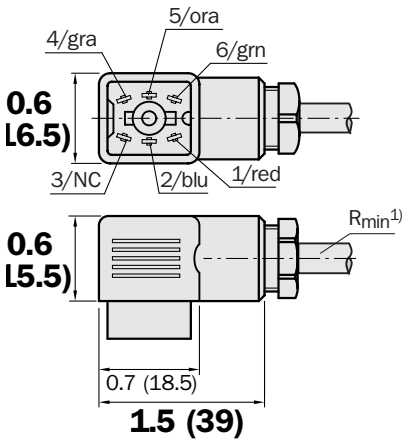
SICK

Accessories

Cables and Connectors - Dimensional Drawings and Order Information

6-pin Square DC Cables

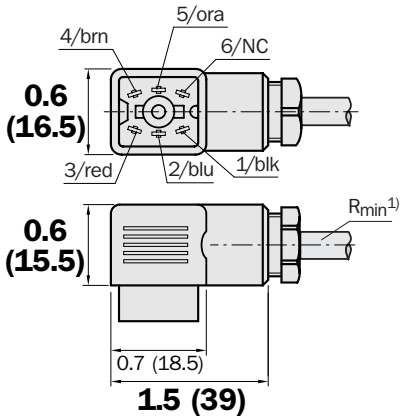
Type	Part no.	Notes
KP-Q02502-2	2 009 477	Cable, DC, 6-pin Square plug 6006710, right-angle female, 2 m
KP-Q02502-3	2 009 478	Cable, DC, 6-pin Square plug 6006710, right-angle female, 3 m
KP-Q02502-5.5	2 009 479	Cable, DC, 6-pin Square plug 6006710, right-angle female, 5.5 m
KP-Q02502-10	2 009 480	Cable, DC, 6-pin Square plug 6006710, right-angle female, 10 m



Dimensions in inches (mm)

6-pin Square AC Cables

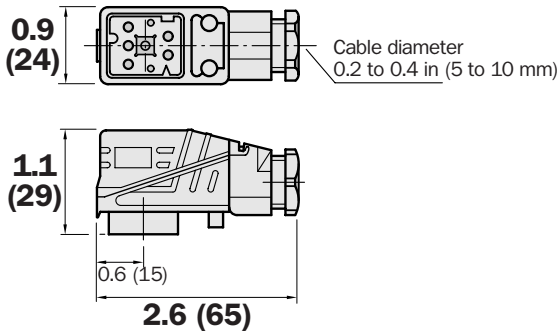
Type	Part no.	Notes
KP-Q01501-2	2 009 116	Cable, AC, 6-pin Square plug 6006685, right-angle female, 2 m
KP-Q01501-3	2 009 117	Cable, AC, 6-pin Square plug 6006685, right-angle female, 3 m
KP-Q01501-5.5	2 009 118	Cable, AC, 6-pin Square plug 6006685, right-angle female, 5.5 m
KP-Q01501-10	2 009 119	Cable, AC, 6-pin Square plug 6006685, right-angle female, 10 m



Dimensions in inches (mm)

7-pin Square DC Cables

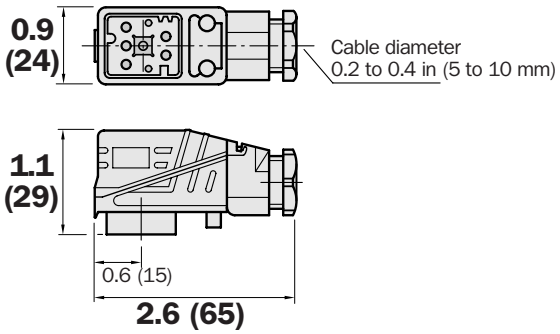
Type	Part no.	Notes
KP-Q04502-2	7 020 484	Cable, DC, 7-pin Square plug 6006823, right-angle female, 2 m
KP-Q04502-3	7 020 242	Cable, DC, 7-pin Square plug 6006823, right-angle female, 3 m



Dimensions in inches (mm)

7-pin Square AC Cables

Type	Part no.	Notes
KP-Q03501-2	7 020 485	Cable, AC, 7-pin Square plug 6006821, right-angle female, 2 m

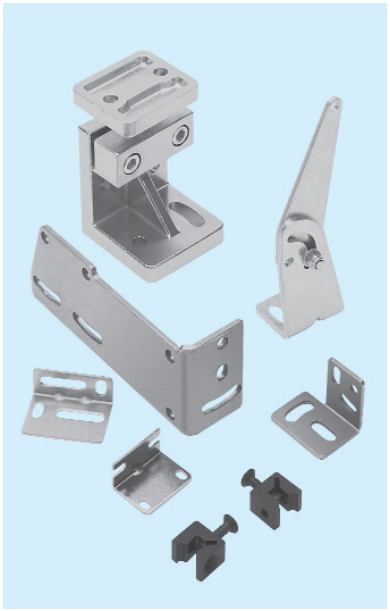


Dimensions in inches (mm)

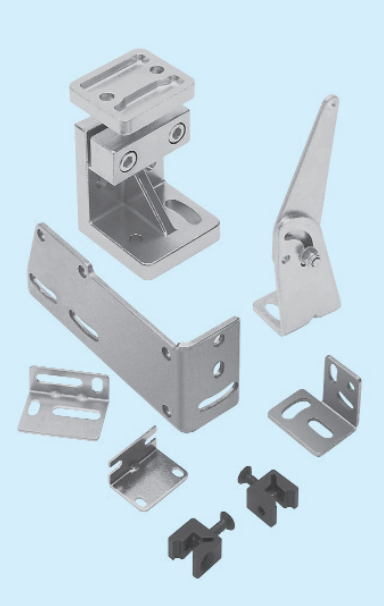
Accessories

Selection Table for Mounting Brackets, Clamps and Articulated Mountings

Sensor	Description	Type	Part no.	Page
ST 130-S13, -S19, -S23, -S29	Mounting bracket	BEF-130-SM	5 306 246	918
ST 130-S33	Mounting bracket	BEF-130-SP	5 306 245	918
SS/SE 130-S33	Mounting bracket	BEF-130-ST	5 306 244	918
SI 130	Mounting bracket	BEF-WLL160	5 305 400	918
W 150	Mounting bracket, horizontal*)	BEF-W150-A	5 306 217	919
W 150	Mounting bracket, vertical*)	BEF-W150-B	5 306 279	919
W 160	Mounting bracket	BEF-W160	5 305 197	919
WLL 160	Mounting bracket	BEF-WLL160	5 305 400	918
W 170	Mounting bracket	BEF-W170	5 305 686	919
WLL 170	Mounting bracket	BEF-WLL170	5 306 574	921
WT2, W 9-2, W9L, KT3, CSM	Mounting bracket	BEF-WN-W9-2	4 033 146	921
W 12-2, W 12L-2	Dovetail clamp	BEF-KH-W12	2 013 285	921
W 12-2, W 12L-2	Double Dovetail clamp	BEF-DKH-W12	2 013 947	921
W 12-2, W 12L-2	Clamp for top-hat rail	BEF-HPS-W12	2 018 060	922
W 12-2, W 12L-2	Mounting bracket, large	BEF-WG-W12	2 013 942	922
W 12-2, W 12L-2	Mounting bracket, small	BEF-WK-W12	2 012 938	922
W 14, W 18-2	Mounting bracket	BEF-WN-W14	2 019 084	922
W 14, W 18-2	Mounting bracket	BEF-WN-W18	2 009 317	923
W 23, W 27	Mounting bracket	BEF-WN-W23	2 019 085	923
W 23, W 27	Mounting bracket	BEF-WN-W27	2 009 122	924
W 24-2, W 24 Exi, W 34	Mounting bracket, large	BEF-WG-W24	4 026 324	923
W 24-2, W 24 Exi, W 34	Mounting bracket, small	BEF-WK-W24	4 027 532	923
W 250	Mounting bracket	BEF-W250	5 305 850	924
W 260	Mounting bracket	BEF-W260	5 304 819	924
W 27-2, W 27L-2	Mounting bracket	BEF-WN-W27	2 009 122	924
W 27-2, W 27L-2	Mounting bracket	BEF-WN-W23	2 019 085	923
W 30, W 32, W 36	Mounting bracket	BEF-WN-W32	2 005 806	924
W 45	Universal joint, complete	BEF-KK-W45	2 011 436	935
W 45	Mounting bracket	BEF-WN-W45	2 011 480	935
V 12, IM 12	Mounting bracket	BEF-WN-M 12	5 308 447	925
V 18, IM 18	Mounting bracket	BEF-WN-M 18	5 308 446	925
V 18 L, V 18, W 1000, ELF	Mounting bracket	BEF-WN-M18-ST02	5 312 973	926
WTR	Mounting bracket	BEF-WN-WTR	2 017 417	927
WLG 12	Mounting bracket	BEF-WN-WLG12	2 017 567	927
KT 2	Clamp	BEF-KH-W12	2 013 285	921
KT 2	Double clamp	BEF-DKH-W12	2 013 947	921
KT 2	Clamp for top-hat rail	BEF-HPS-W12	2 018 060	922
KT 2	Mounting bracket, large	BEF-WG-W12	2 013 942	922
KT 2	Mounting bracket, small	BEF-WK-W12	2 012 938	922
DS 60	Mounting bracket	BEF-WN-DS60	4 032 937	928
WTA 24	Mounting bracket, large	BEF-WG-W24	4 026 324	923
DME 2000/3000	Articulated mounting	BEF-GH-DME	2 015 229	934
DME 5000	Alignment bracket	BEF-AH-DME5	2 027 721	934
DMH/DMP	Articulated mounting	BEF-GH-DMH2	2 020 796	928
ISD 230/260/280/300	Three-point mounting	MB-ISD-2	5 306 369	928



*) Including mounting material



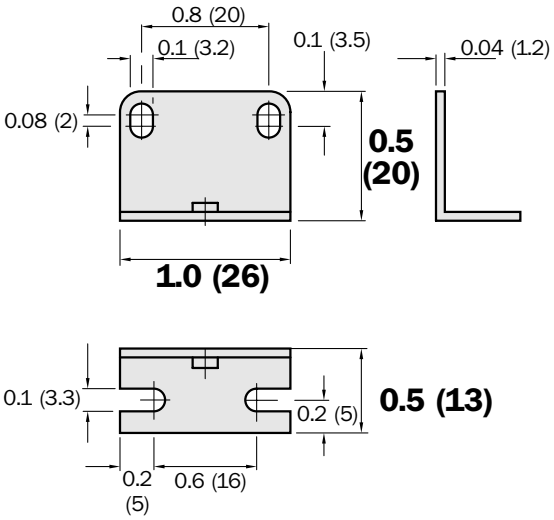
Selection Table for Mounting Brackets, Clamps and Articulated Mountings				
Sensor	**Description**	**Type**	**Part no.**	**Page**
W 140-2	Mounting bracket, vertical	BEF-W 140-A	5 308 098	920
W 140-2	Mounting bracket, horizontal	BEF-W 140-B	5 308 519	920
W 1000, V 18, ELF, IM 18	Mounting bracket	MB-W1000	7 023 800	925
W 1000, V 18, ELF	Mounting bracket	B	7 028 403	926
W 2000	Mounting bracket, ball swivel	MB-W2000B	7 022 976	927
W 2000, IM 30	Mounting bracket, stainless steel	MB-W2000	7 022 981	927
DMT/DML	Mounting bracket	BEF-GH-DMT	5 309 130	934
W 160	Mounting bracket	BEF-W 160	5 305 197	929
DMD	Mounting bracket for lens reflector	BEF-PL 140L	5 308 917	930
DMD	Mounting bracket	BEF-WN-DMD	5 308 915	930
W 24, W 34, LUT 2	Mounting bracket, large	BEF-WG-W24	2 015 248	931
W 24, W 34, LUT 2	Mounting bracket, small	BEF-WK-W24	4 027 532	931
MH, W 4, W 2	Bracket, ball joint	BEF-GH-Mini01	2 023 160	932
MH	Snap holder	BEF-SH-MH-A50	2 021 351	932
W 9	Adapter set	BEF-AP-W9	2 022 734	933
W 9-2, W 9L, KT 3, CSM	Mounting bracket	BEF-WN-W9-2	2 022 855	933
V 18, IM 30	Mounting bracket	BEF-WN-M 30	5 308 445	926
MLG	Mounting kit 1, swivel mount	Mounting Set 1	2 019 649	929
MLG	Mounting kit 4, T-nuts, side mounting	BEF-NUT-MLG	2 023 696	929
	Bar clamps			
W 23, W 27-2	Universal clamp/plate A	BEF-KHS-A01	2 022 458	935
P 250, PL 30 A, PL 40 A, PL 50 A, PL 80 A, P 975	Universal clamp/plate B	BEF-KHS-B01	2 022 459	935
W 14, W 18-2	Universal clamp/plate C	BEF-KHS-C01	2 022 460	935
W 12-2, W 12 L-2, KT 2	Universal clamp/plate D	BEF-KHS-D01	2 022 461	935
W 30, W 32, W 36	Universal clamp/plate E	BEF-KHS-E01	2 022 462	935
W 260, PL 20 A, P 250	Universal clamp/plate F	BEF-KHS-F01	2 022 463	935
W 24-2, W 24 Exi, WTA 24, KT 5, KT 10, CS 1/3, LUT 3	Universal clamp/plate G	BEF-KHS-G01	2 022 464	935
V 18, W 4-2	Universal clamp/plate H	BEF-KHS-H01	2 022 465	935

Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for ST 130-S13, -S19, -S23, -S29*)

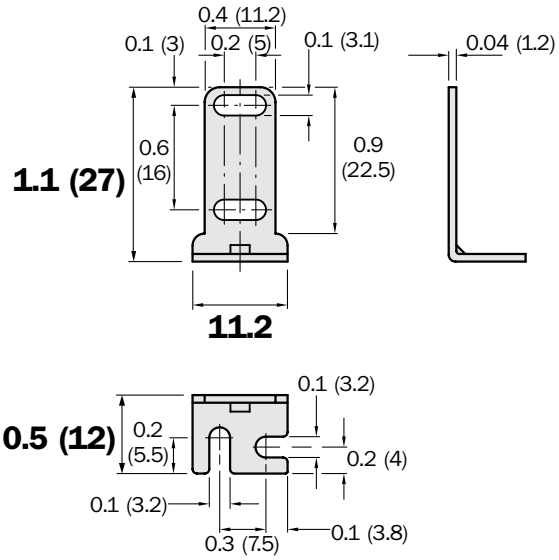
Type	Part no.
BEF-130-SM	5 306 246



Dimensions in inches (mm)

Mounting Bracket for ST 130-S33*)

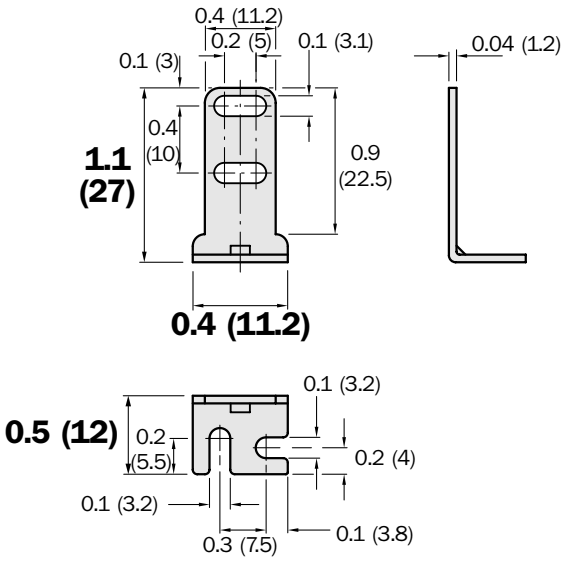
Type	Part no.
BEF-130-SP	5 306 245



Dimensions in inches (mm)

Mounting Bracket for SS/SE 130-S33*)

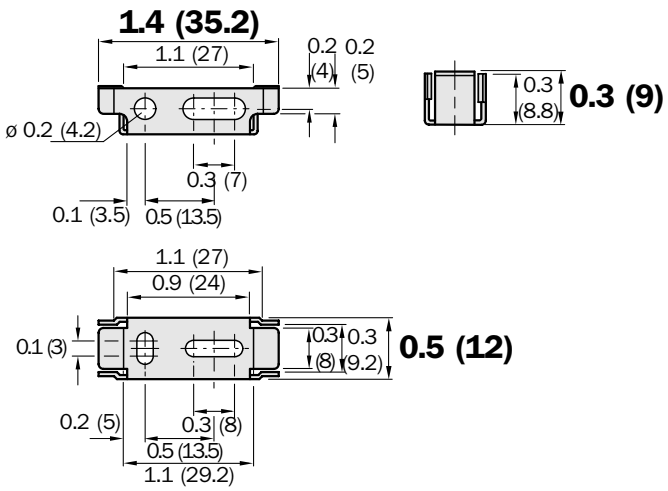
Type	Part no.
BEF-130-ST	5 306 244



Dimensions in inches (mm)

Mounting Bracket for SI 130*) and WLL 160*)

Type	Part no.
BEF-WLL 160	5 305 400

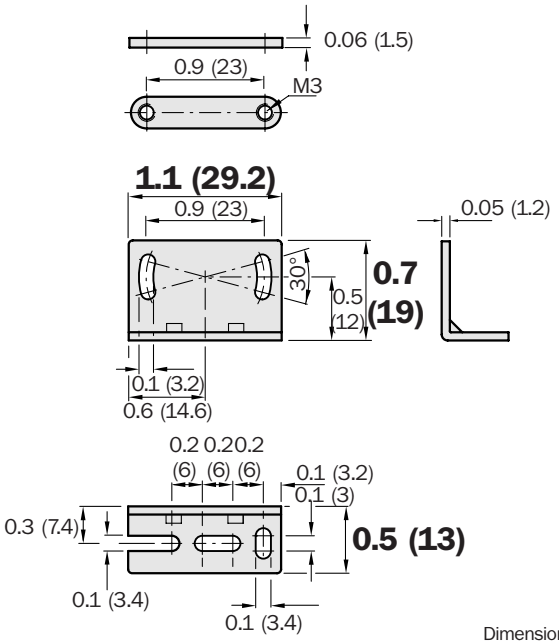


Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket, Horizontal for W 150*)

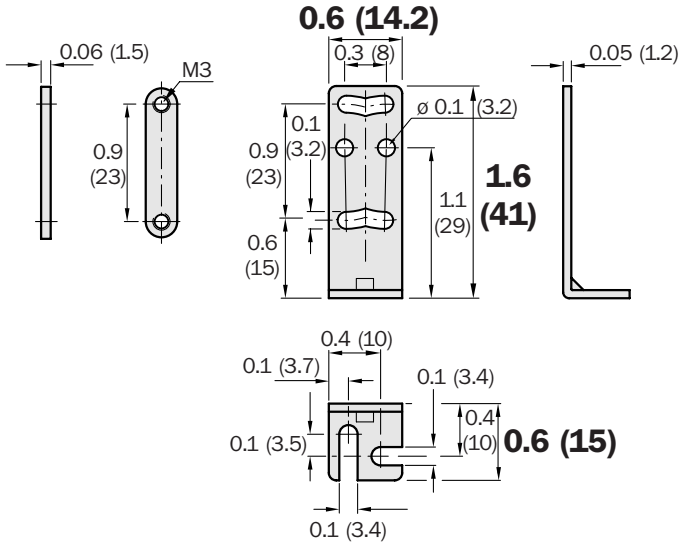
Type	Part no.
BEF-W150-A	5 306 217



Dimensions in inches (mm)

Mounting Bracket, Vertical for W 150

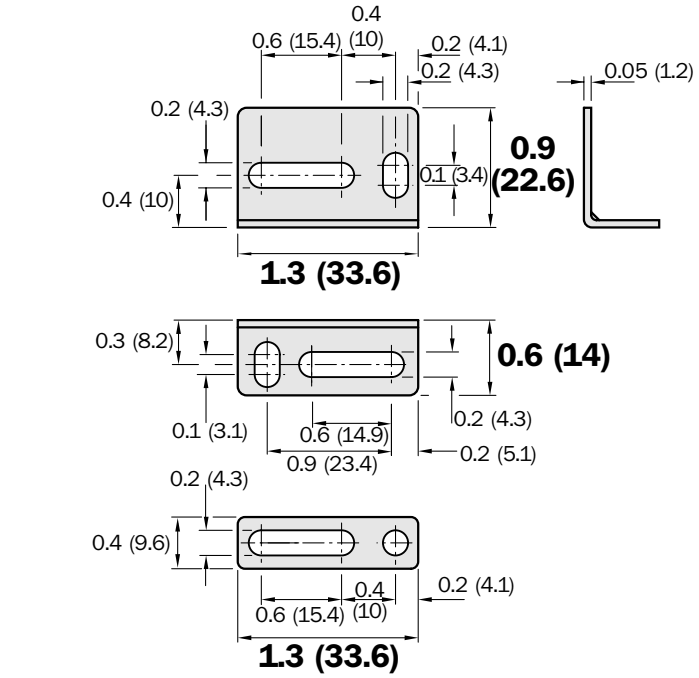
Type	Part no.
BEF-W150-B	5 306 279



Dimensions in inches (mm)

Mounting Bracket for W 160*)

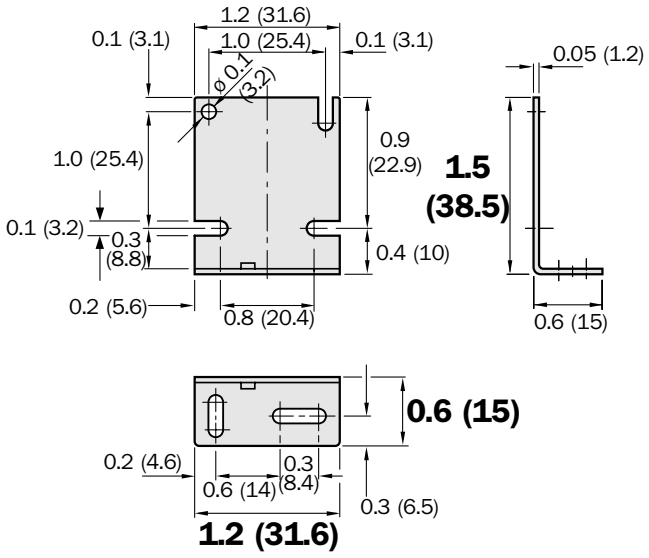
Type	Part no.
BEF-W160	5 305 197



Dimensions in inches (mm)

Mounting Bracket for W 170*)

Type	Part no.
BEF-W170	5 305 686



Dimensions in inches (mm)

SICK

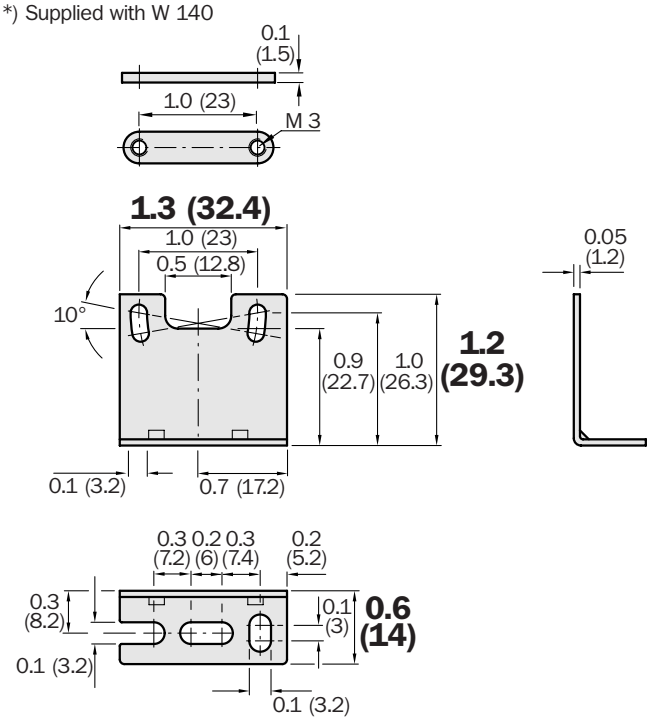
Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket, Horizontal for W 140 *)

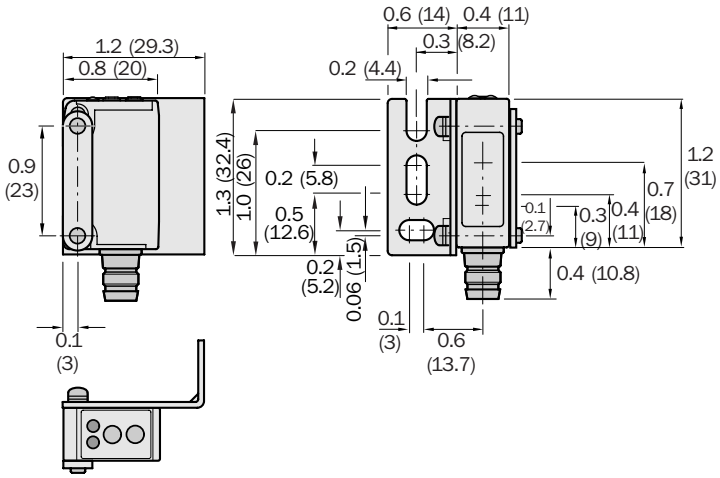
Type	Order no.
BEF-W 140-A	5 308 098

*) Supplied with W 140



Dimensions in inches (mm)

Mounting

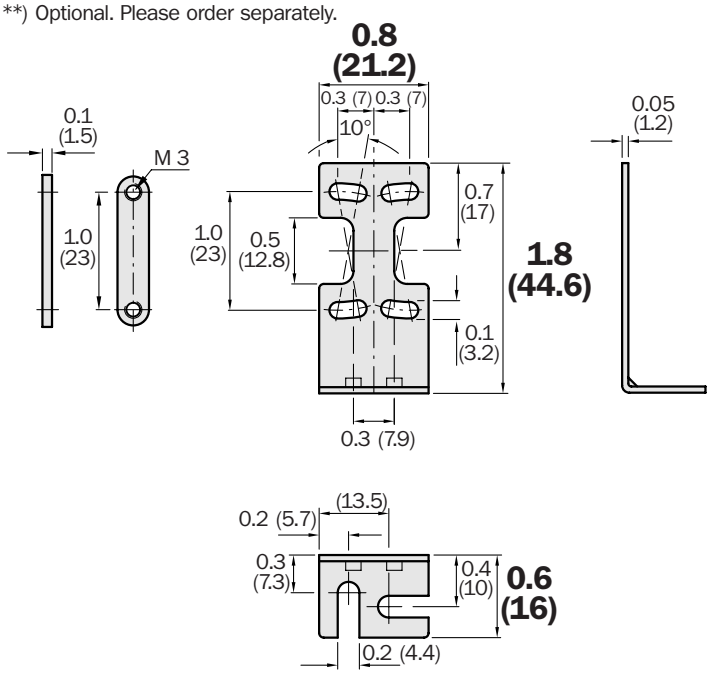


Dimensions in inches (mm)

Mounting Bracket, Vertical for W 140 **)

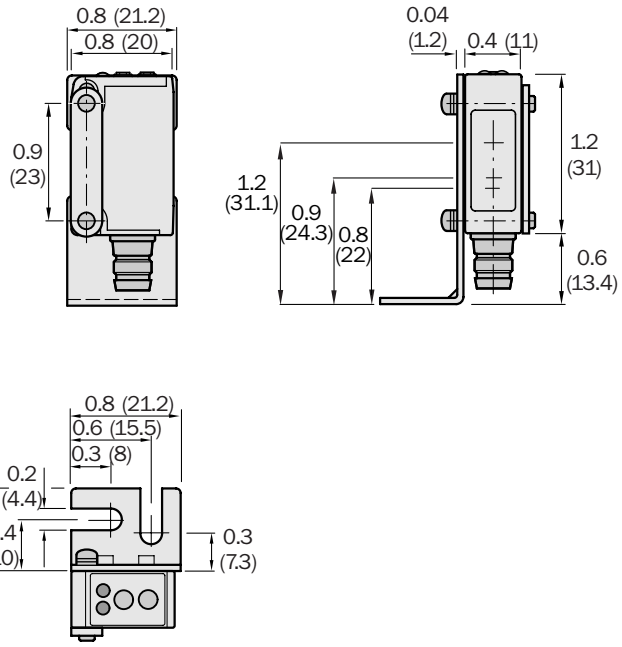
Type	Order no.
BEF-W 140-B	5 308 519

**) Optional. Please order separately.



Dimensions in inches (mm)

Mounting



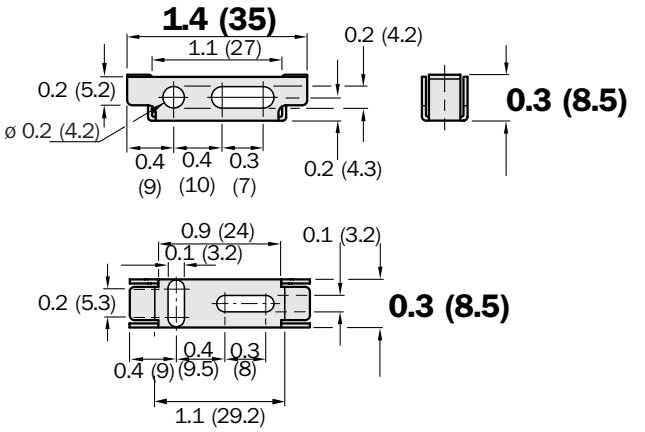
Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for WLL 170*)

Type	Part no.
BEF-WLL170	5 306 574

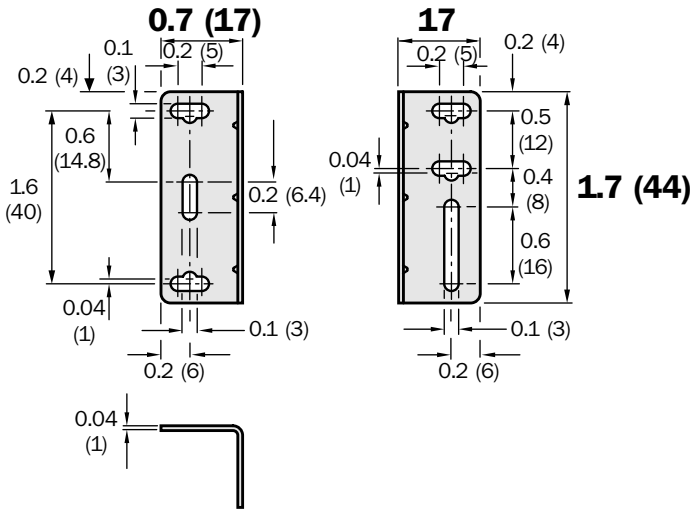
*) Included with delivery



Dimensions in inches (mm)

Mounting Bracket for W 9-2

Type	Part no.
BEF-WN-W9-2	4 033 146

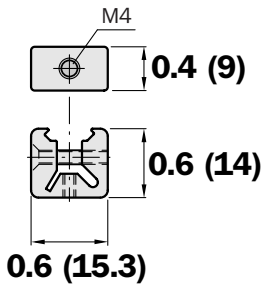


Dimensions in inches (mm)

Clamp for W 12-2, W 12L-2, KT 2

Type	Part no.
BEF-KH-W12	2 013 285

Countersunk screw M 4 x 15 mm included with delivery

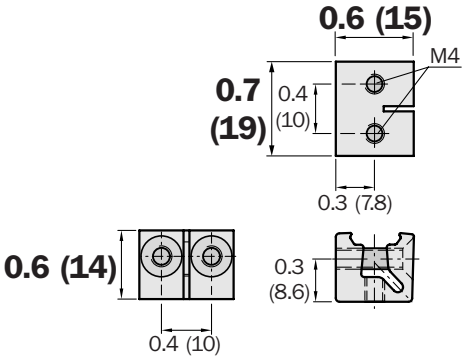


Dimensions in inches (mm)

Double Clamp for W 12-2, W 12L-2, KT 2

Type	Part no.
BEF-DKH-W12	2 013 947

2 countersunk screws M 4 x 15 mm included with delivery



Dimensions in inches (mm)

SICK

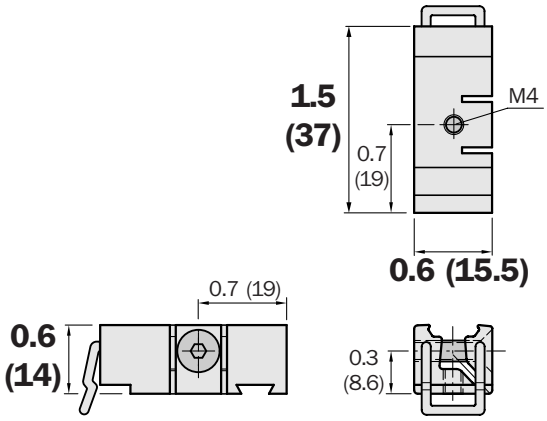
Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Clamp for Top-hat Rail*) W 12-2, W 12L-2, KT 2

Type	Part no.
BEF-HPS-W12	2 018 060

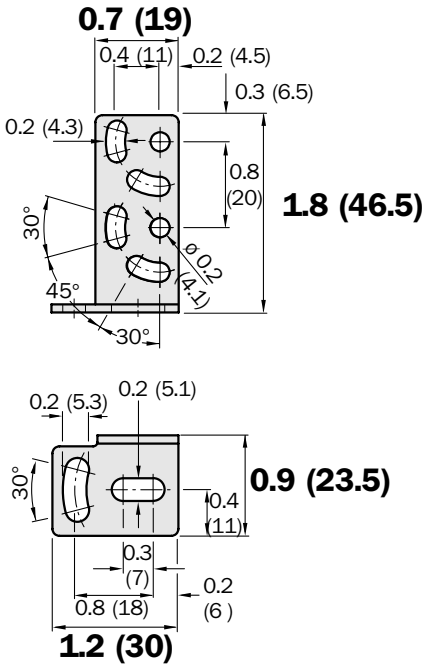
*) TS 32 acc. to EN 50022



Dimensions in inches (mm)

Mounting Bracket, Large (stainless steel) for W 12-2, W 12L-2, KT 2

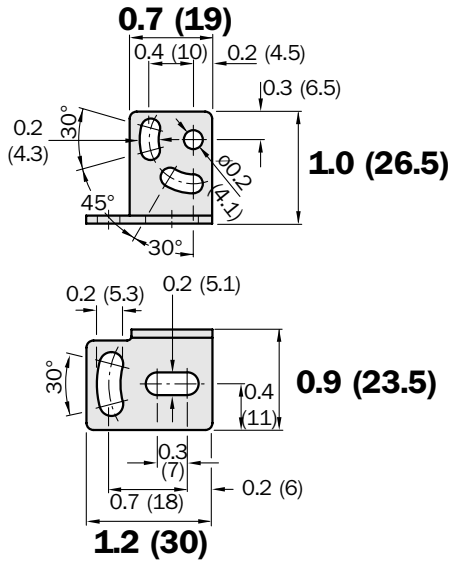
Type	Part no.
BEF-WG-W12	2 013 942



Dimensions in inches (mm)

Mounting Bracket, Small (stainless steel) for W 12-2, W 12L-2, KT 2

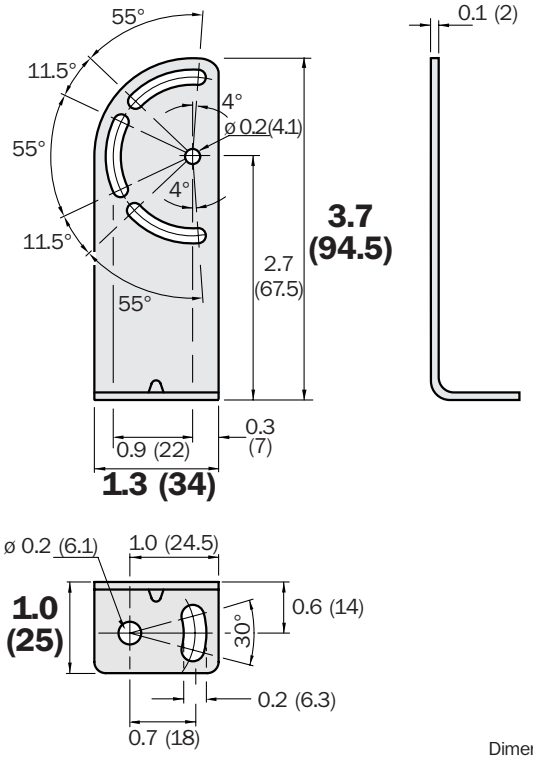
Type	Part no.
BEF-WK-W12	2 012 938



Dimensions in inches (mm)

Mounting Bracket for W 14, W 18-2

Type	Part no.
BEF-WN-W14	2 019 084

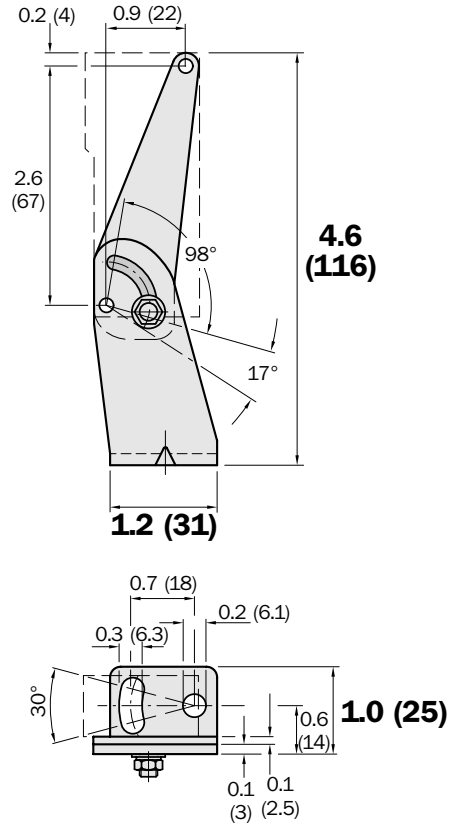


Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for W 18-2, W 14

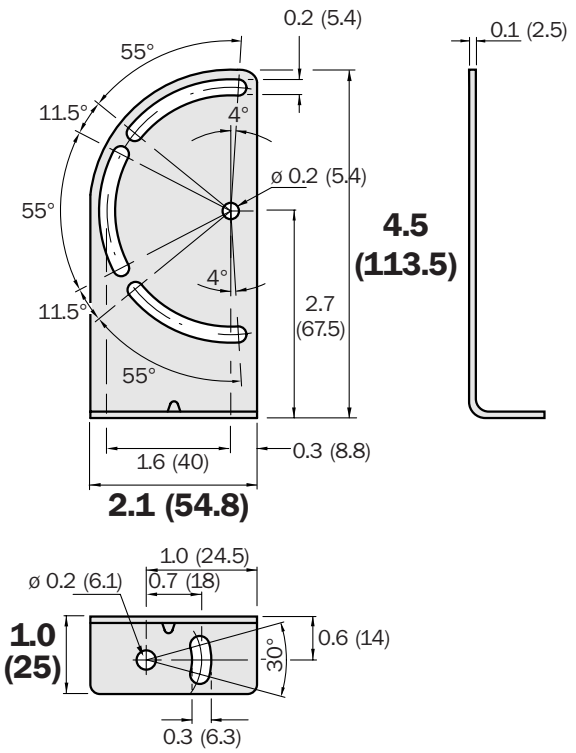
Type	Part no.
BEF-WN-W18	2 009 317



Dimensions in inches (mm)

Mounting Bracket for W 23, W 27-2

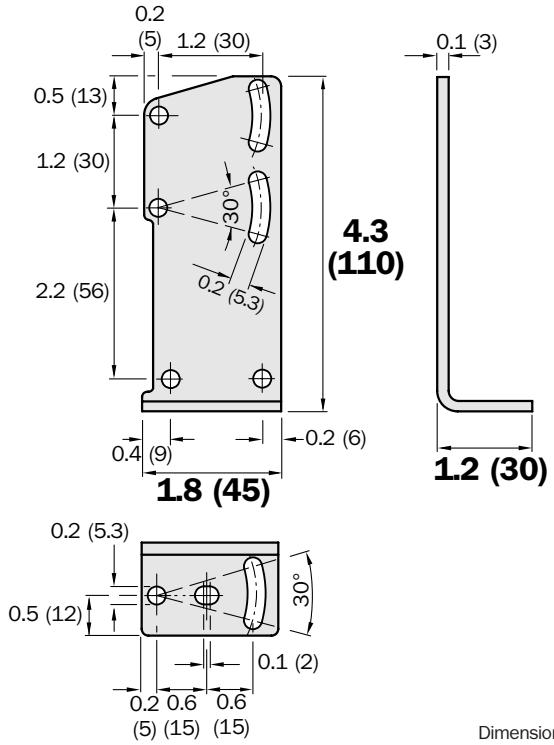
Type	Part no.
BEF-WN-W23	2 019 085



Dimensions in inches (mm)

Mounting Bracket, Large (stainless steel) for W 24-2, W 24 Exi, WTA 24

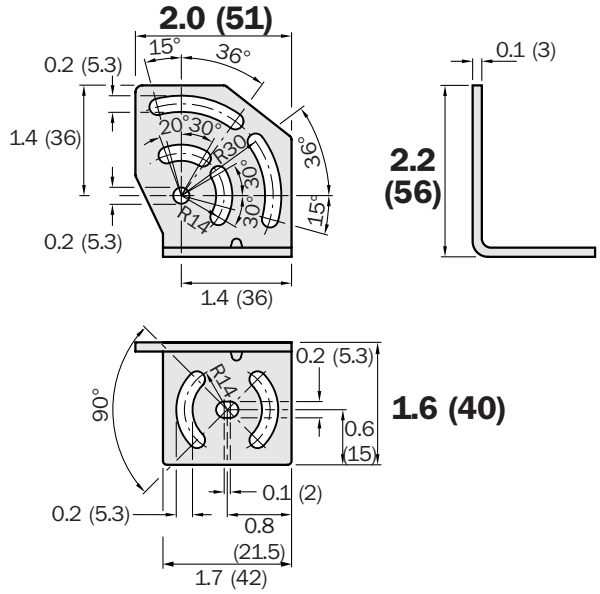
Type	Part no.
BEF-WG-W24	4 026 324



Dimensions in inches (mm)

Mounting Bracket, Small (stainless steel) for W 24-2, W 24 Exi, WTA 24

Type	Part no.
BEF-WK-W24	4 027 532



Dimensions in inches (mm)

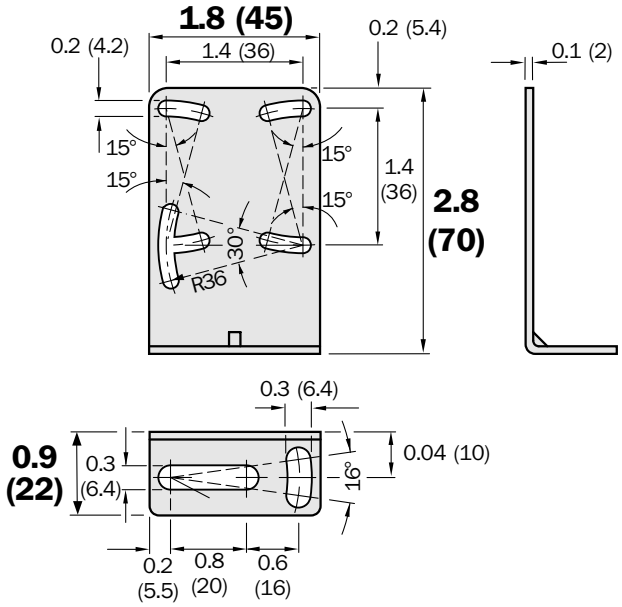
SICK

Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for W 250*)

Type	Part no.
BEF-W250	5 305 850

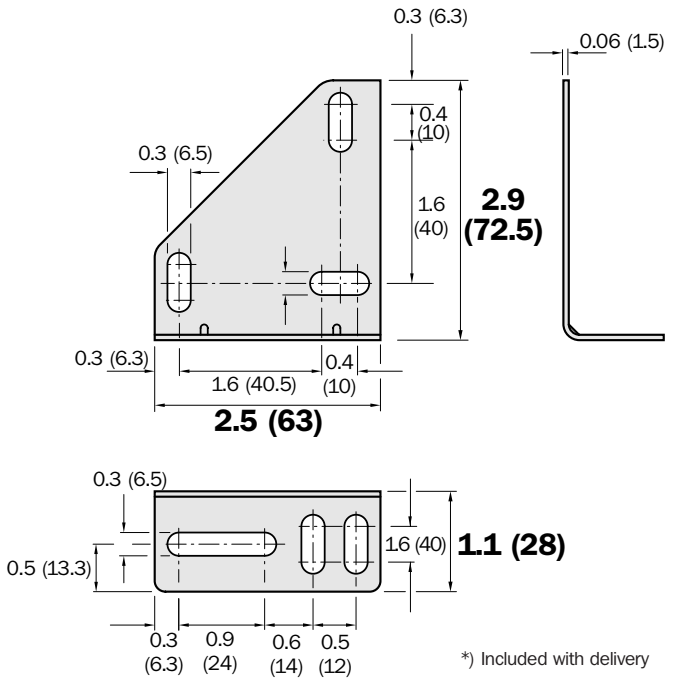


*) Included with delivery

Dimensions in inches (mm)

Mounting Bracket for W 260*)

Type	Part no.
BEF-W260	5 304 819

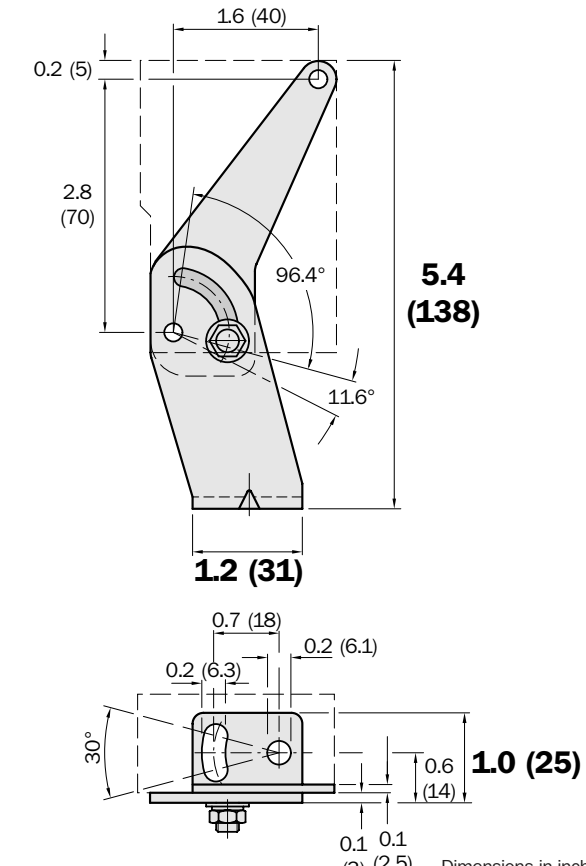


*) Included with delivery

Dimensions in inches (mm)

Mounting Bracket for W 27-2, W 23

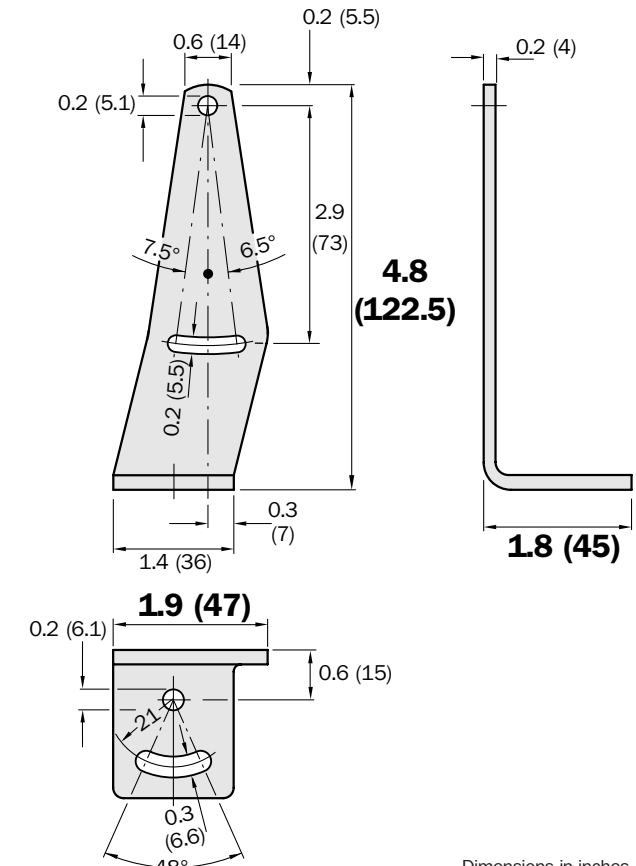
Type	Part no.
BEF-WN-W27	2 009 122



Dimensions in inches (mm)

Mounting Bracket for WT 30, WT 32, W 36

Type	Part no.
BEF-WN-W32	2 005 806

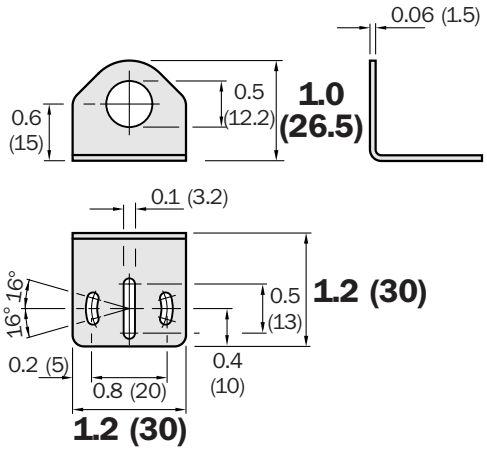


Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for V 12

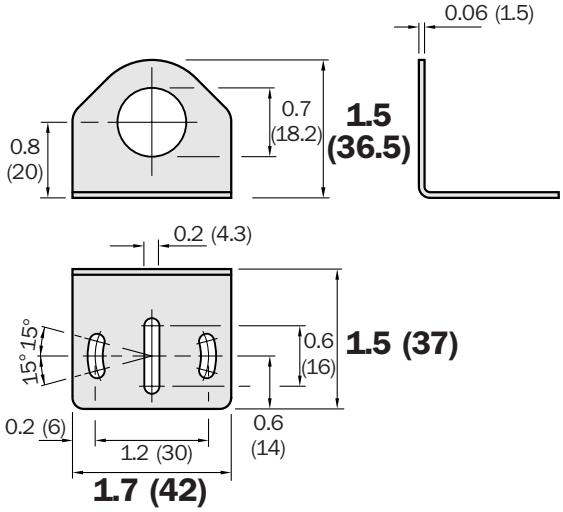
Type	Part no.
BEF-WN-M 12	5 308 447



Dimensions in inches (mm)

Mounting Bracket for M18

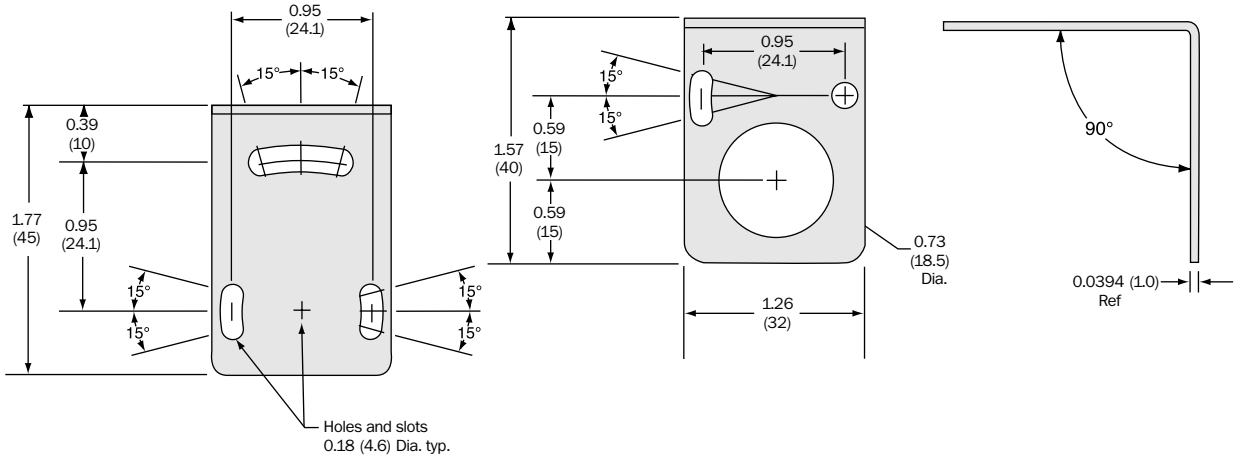
Type	Part no.
BEF-WN-M 18	5 308 446



Dimensions in inches (mm)

Mounting Bracket for W.1000

Type	Part no.
MB-W1000	7 023 800



Dimensions in inches (mm)

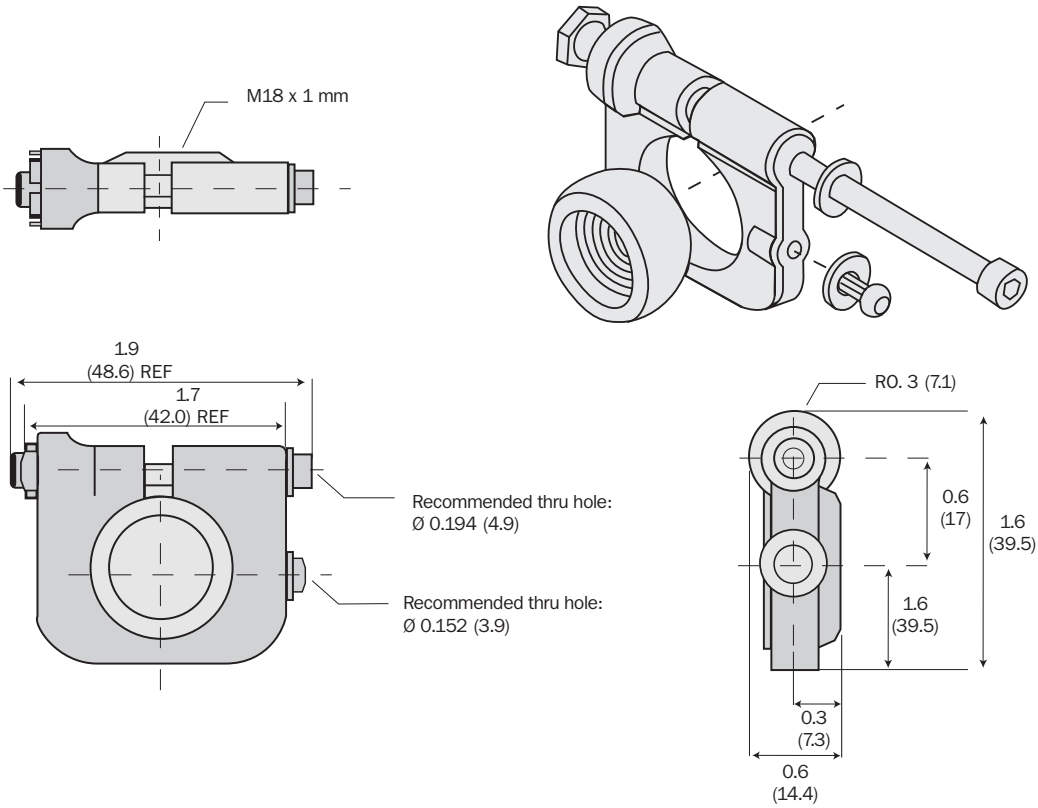
SICK

Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for 18 mm threaded sensors

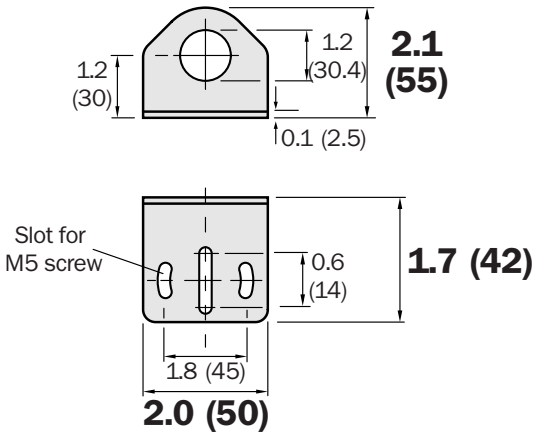
Type	Part no.
MB-BS18MM	7 028 403



Dimensions in inches (mm)

Mounting Bracket M30

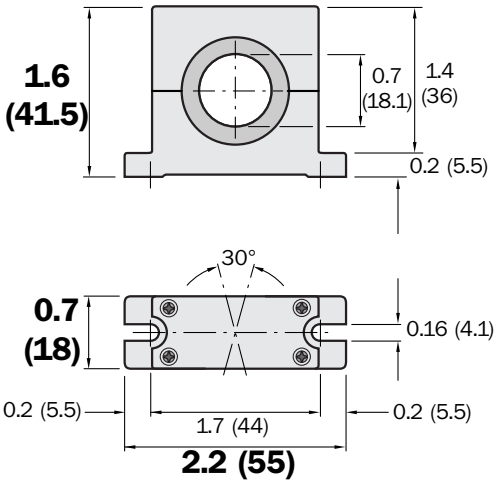
Type	Part no.
BEF-WN-M 30	5 308 445



Dimensions in inches (mm)

Mounting Bracket with Ball Joint for 18 mm sensors

Type	Part no.
BEF-WN-M18-ST02	5 312 973

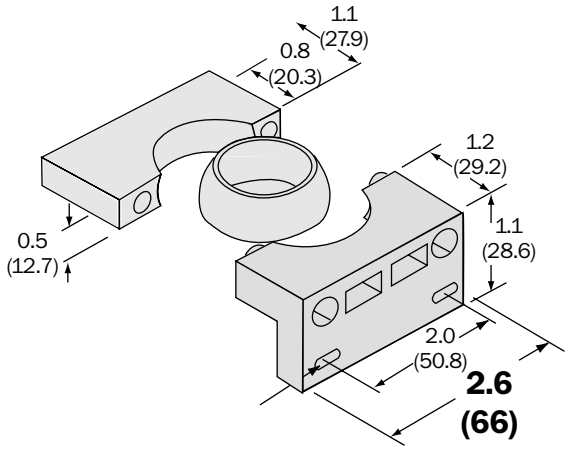


Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket, W.2000, Ball swivel

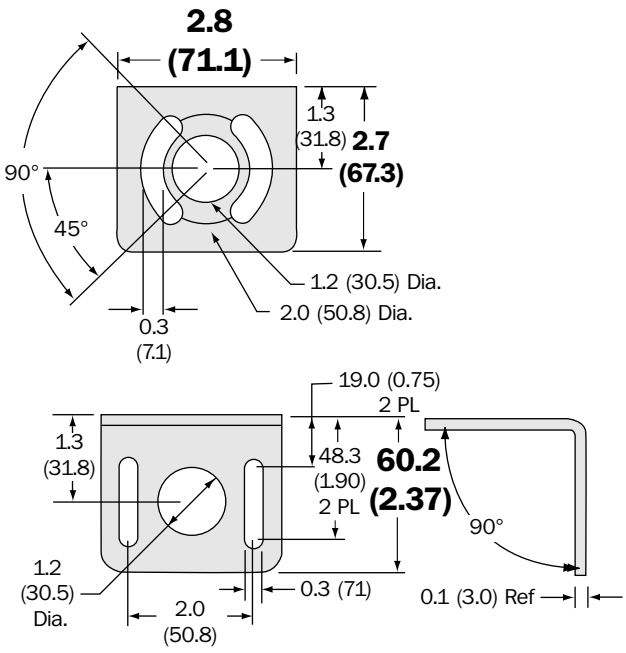
Type	Part no.
MB-W2000B	7 022 976



Dimensions in inches (mm)

Mounting Bracket W.2000, Stainless Steel

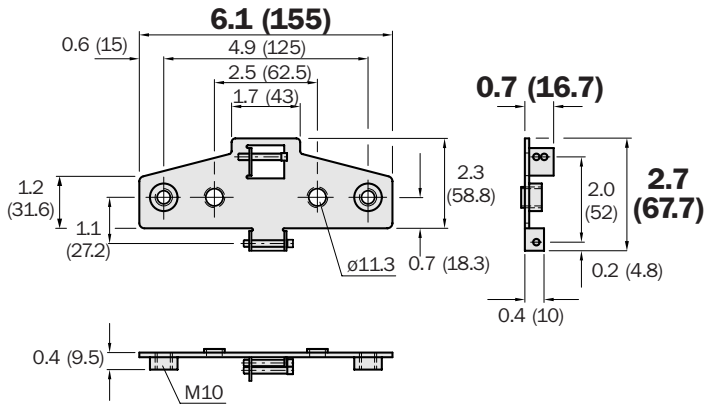
Type	Part no.
MB-W2000	7 022 981



Dimensions in inches (mm)

Mounting Bracket for WTR

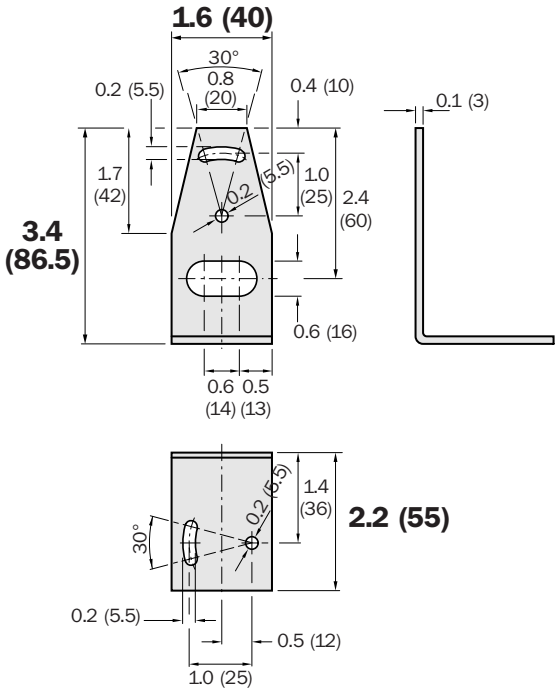
Type	Part no.
BEF-WN-WTR	2 017 417



Dimensions in inches (mm)

Mounting Bracket for WLG 12

Type	Part no.
BEF-WN-WLG12	2 017 567



Dimensions in inches (mm)

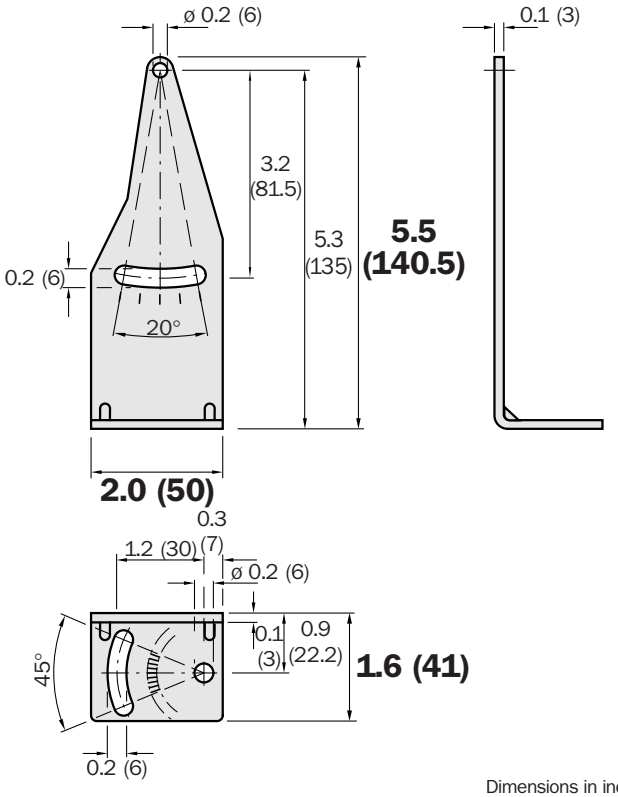
SICK

Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for DS 60

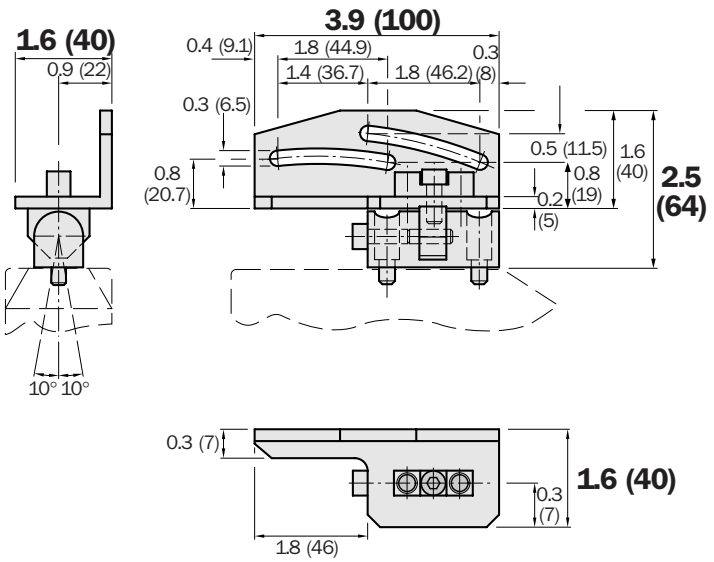
Type	Part no.
BEF-WN-DS60	4 032 937



Dimensions in inches (mm)

Articulated Mounting for DMH/DMP

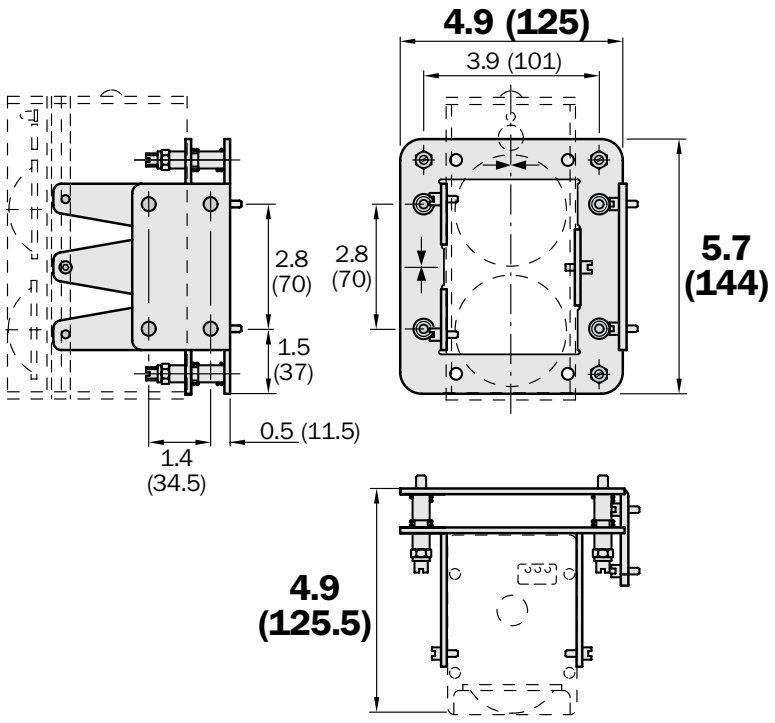
Type	Part no.
BEF-GH-DMH2	2 020 796



Dimensions in inches (mm)

Three-point Mounting for ISD 230, 260, 280

Type	Part no.
MB-ISD-2	5 306 369



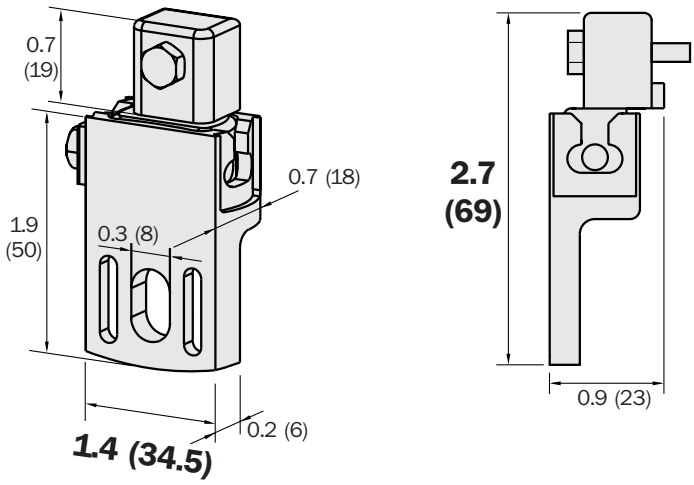
Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

MLG Mounting Kit 4 – T-nuts with Shifting Nuts

Side Mounting w/Shift Nuts for all Heights (for high vibration & shock exposure)

Type	Part no.
BEF-NUT-MLG	2 023 696

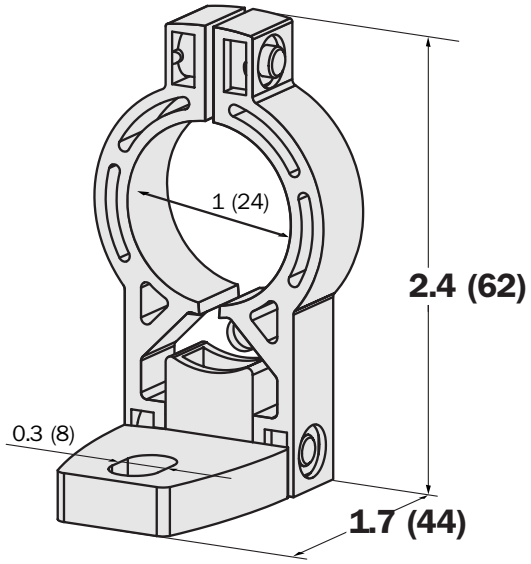


Dimensions in inches (mm)

Mounting Kit 1 – Swivel Mount

For MLG S and MLG E, Recommended for Detection Heights up to 1600 mm

Type	Part no.
Mounting Set 1	2 019 649

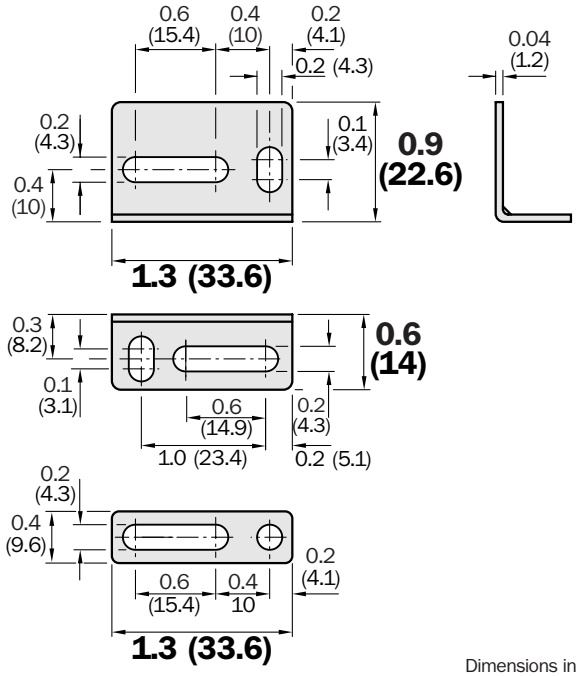


Dimensions in inches (mm)

Mounting Brackets for W 160

Type	Order no.
BEF-W 160	5 305 197

Supplied with WL 160T, WTB 160T BGS, WTE 160T, WTF 160T and WTM 160T Mark.



Dimensions in inches (mm)

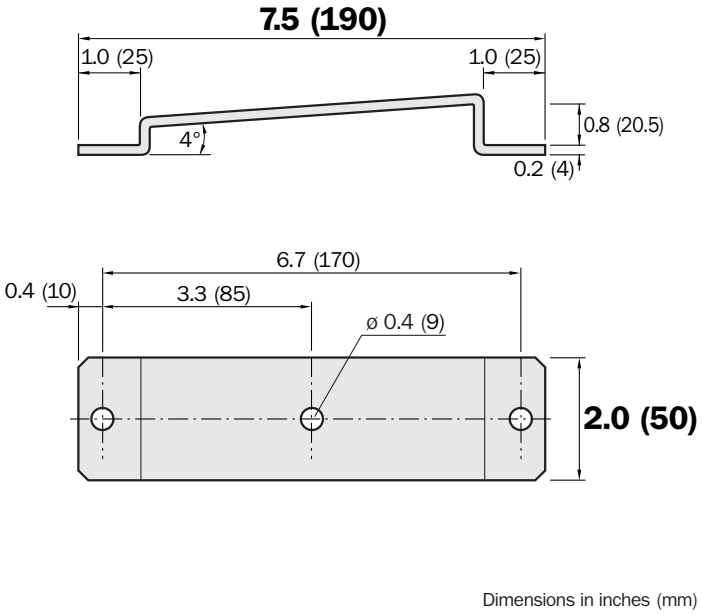
SICK

Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket for Lens Reflector for DMD

Type	Part no.
BEF-PL 140L	5 308 917

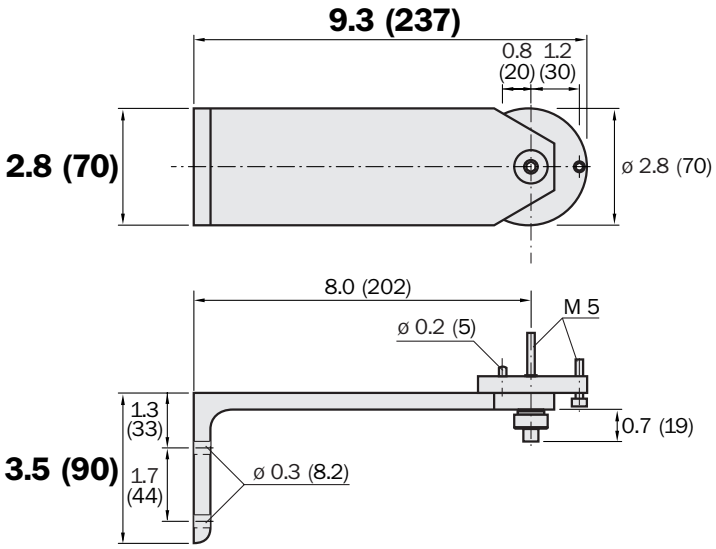


Dimensions in inches (mm)

Mounting Bracket for DMD

Type	Part no.
BEF-WN-DMD	5 308 915

Included with DMD

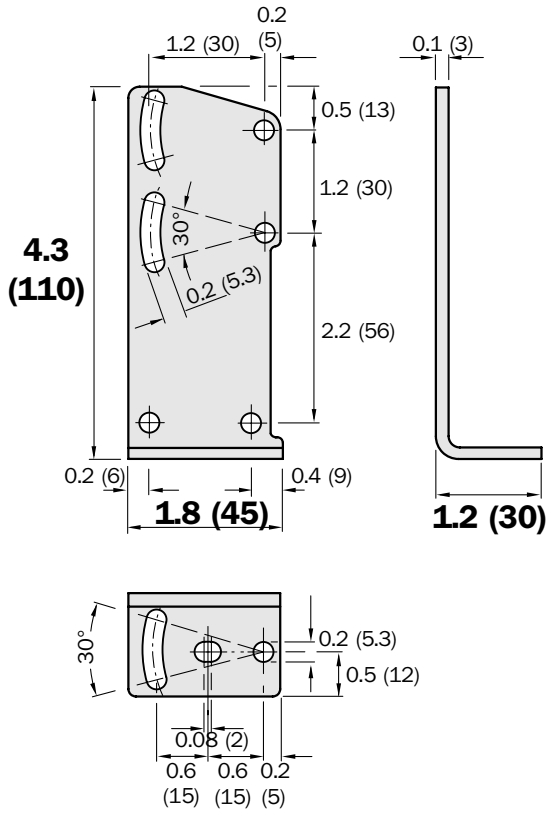


Dimensions in inches (mm)

Mounting Brackets - Dimensional Drawings and Order Information

Mounting Bracket, Large, for W.24, W.34, LUT 2

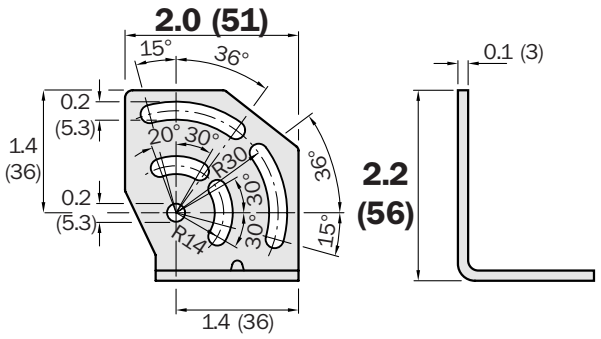
Type	Order no.
BEF-WG-W24	2 015 248

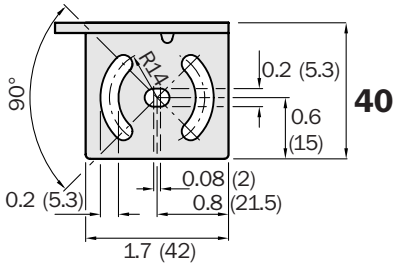


Dimensions in inches (mm)

Mounting Bracket, Small, for W.24, W.34, LUT 2

Type	Order no.
BEF-WK-W24	4 027 532





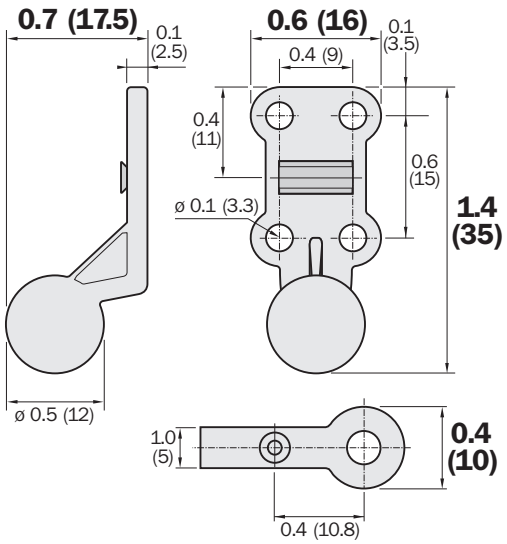
Dimensions in inches (mm)

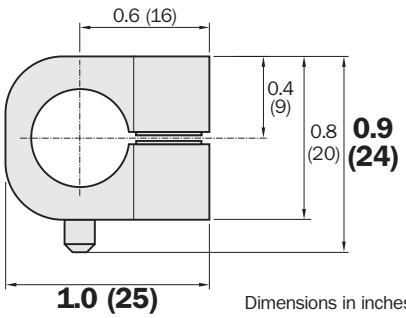
Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Ball Joint Bracket with Self-grooving Screw ø 4 mm for MH/W.2/W.4

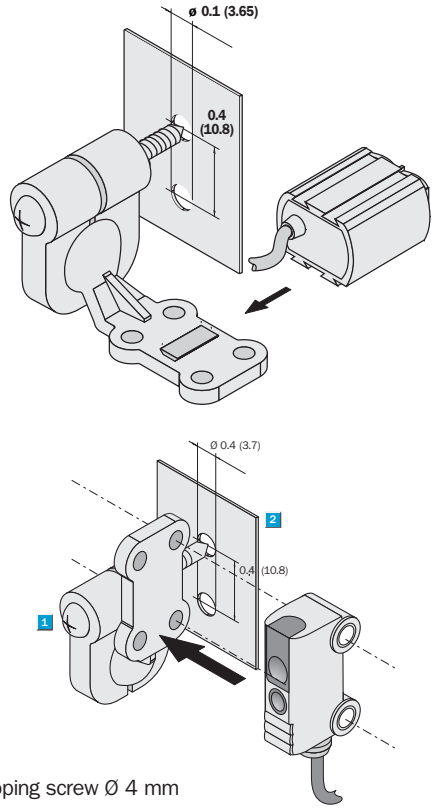
Type	Part no.
BEF-GH-Mini01	2 023 160





Dimensions in inches (mm)

Mounting



1 Self tapping screw Ø 4 mm included with delivery

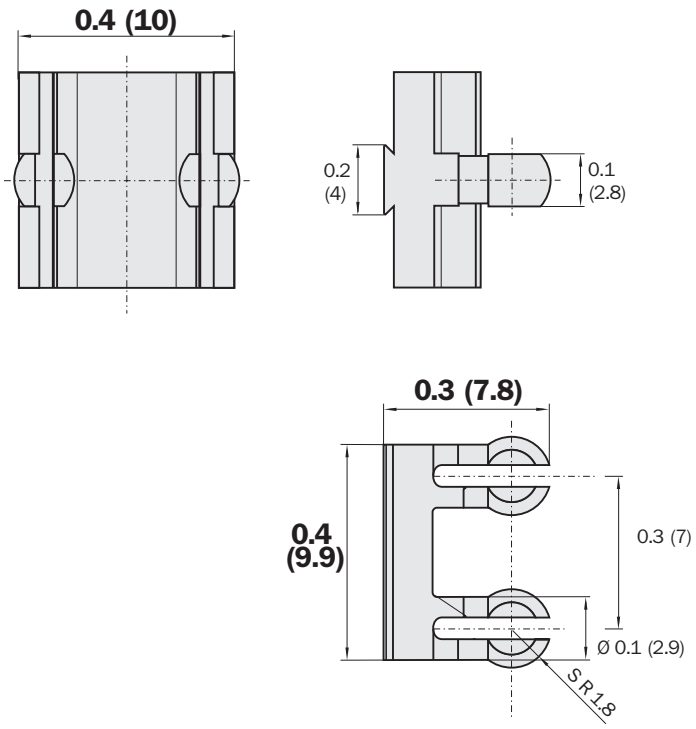
2 Equipment or machine part
Screw M3 x 16 mm included with delivery

Dimensions in inches (mm)

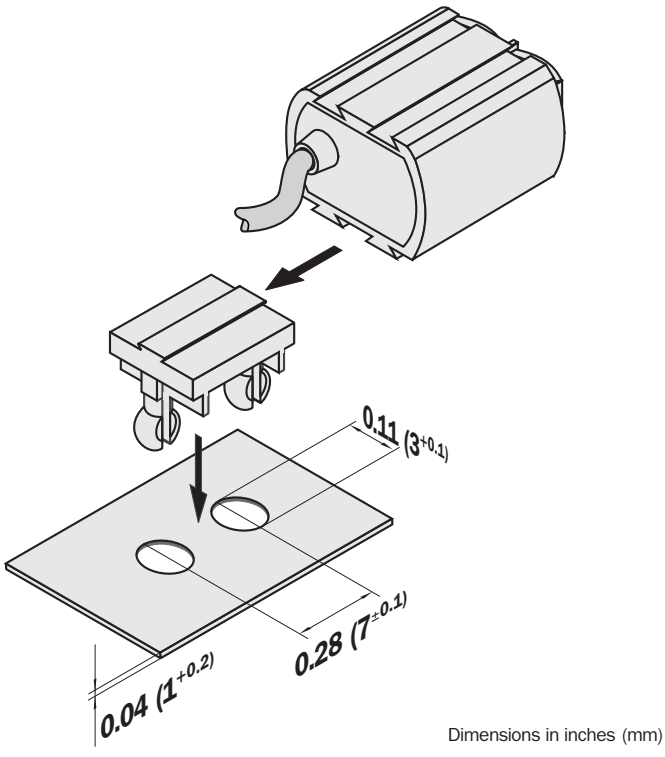
Snap holder for MH

Pluggable for Wall Depth 1 to 1.2 mm

Type	Part no.	Pieces
BEF-SH-MH-A50	2 021 351	50



Mounting

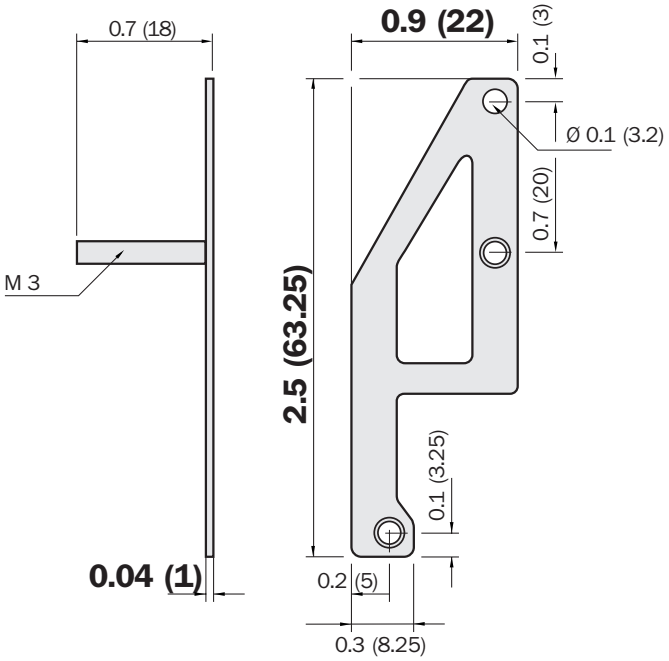


Dimensions in inches (mm)

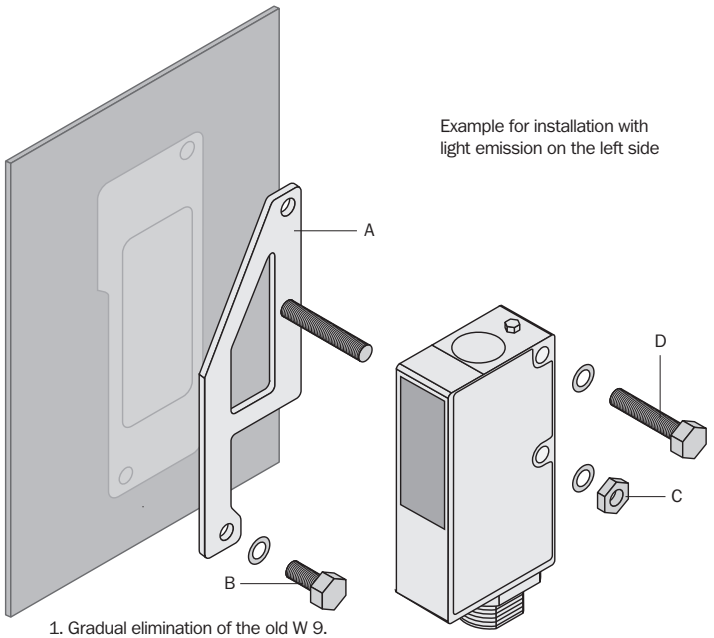
Mounting Brackets - Dimensional Drawings and Order Information

Adapter Set for W.9

Type	Order no.
BEF-AP-W9	2 022 734



Adapter plate for light emission on the left side



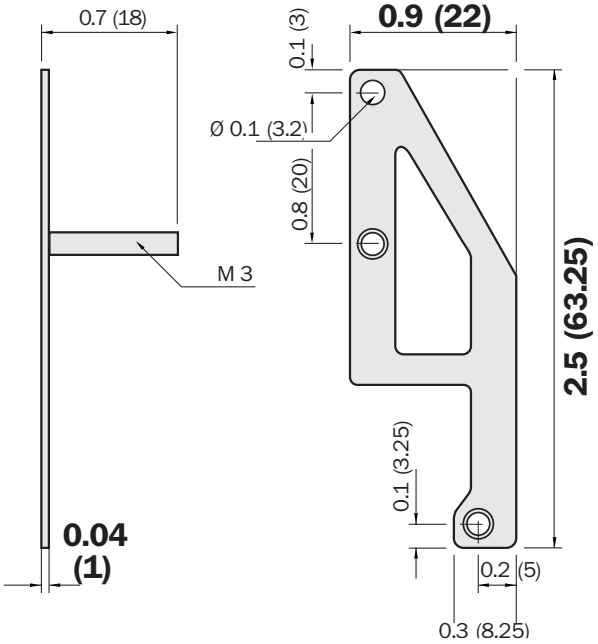
Example for installation with light emission on the left side

1. Gradual elimination of the old W 9.
2. Choose relevant adapter plate.
3. Align adapter angle "A" to existing hole pattern and attach angle attachment with screw "B".
4. Attach W 9-2 onto pre-mounted adapter angle.
5. Complete mounting of the W 9-2 with screw "D" and counter-nut "C".

If a device is going to be replaced we recommend using a W 9-2 with a pigtail or cable.

Attachment material is supplied with the adpater bracket.

Dimensions in inches (mm)

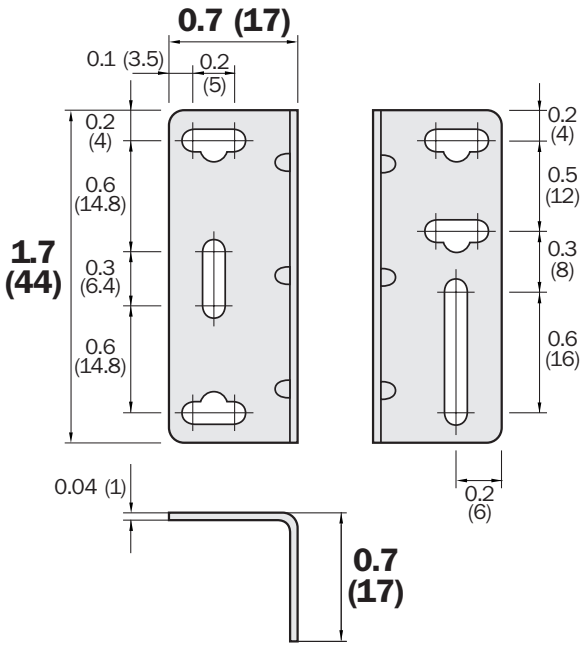


Adapter plate for light emission on the right side

Dimensions in inches (mm)

Mounting Bracket for W.9

Type	Part no.
BEF-WN-W9-2	2 022 855



Dimensions in inches (mm)

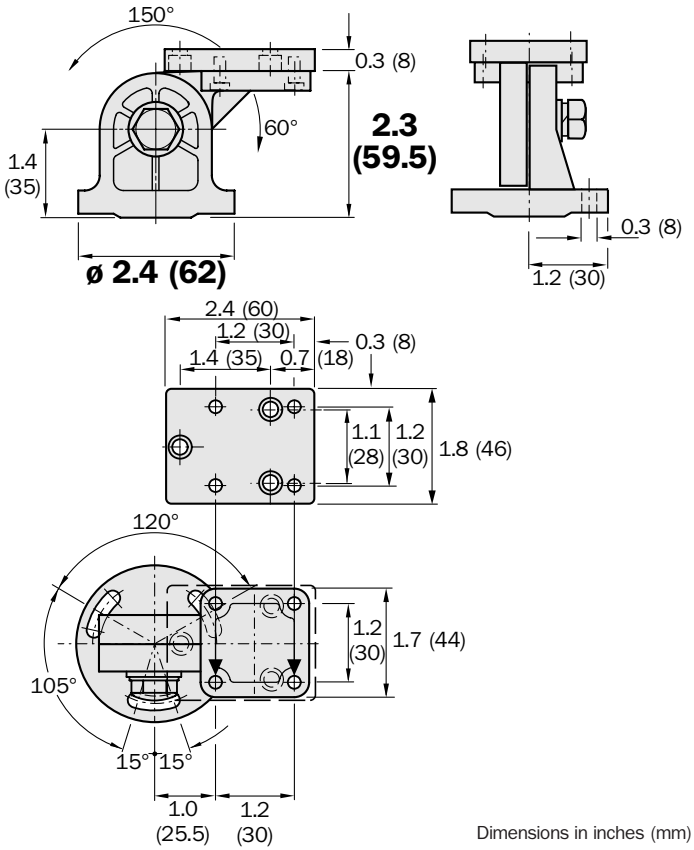
SICK

Accessories

Mounting Brackets - Dimensional Drawings and Order Information

Articulated Mounting for DME 2000/3000

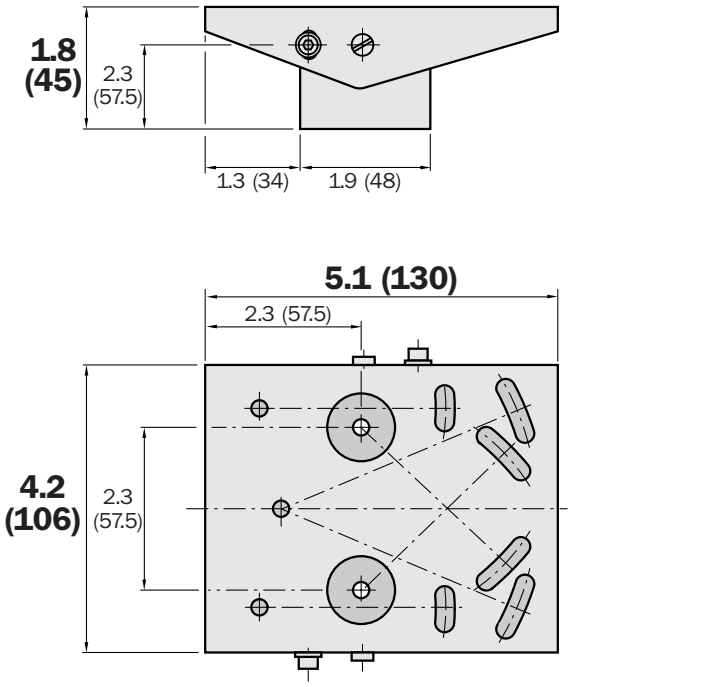
Type	Part no.
BEF-GH-DME	2 015 229



Dimensions in inches (mm)

Articulated Mounting for DMT/DML

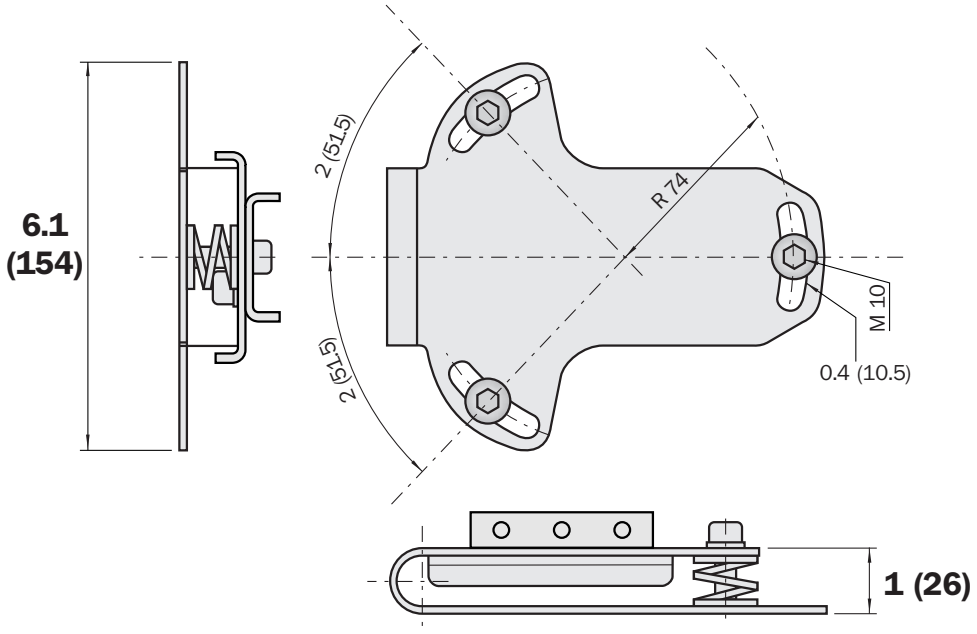
Type	Part no.
BEF-GH-DMT	5 309 130



Dimensions in inches (mm)

Alignment Bracket for DME 5000

Type	Part no.
BEF-AH-DME5	2 027 721



Dimensions in inches (mm)

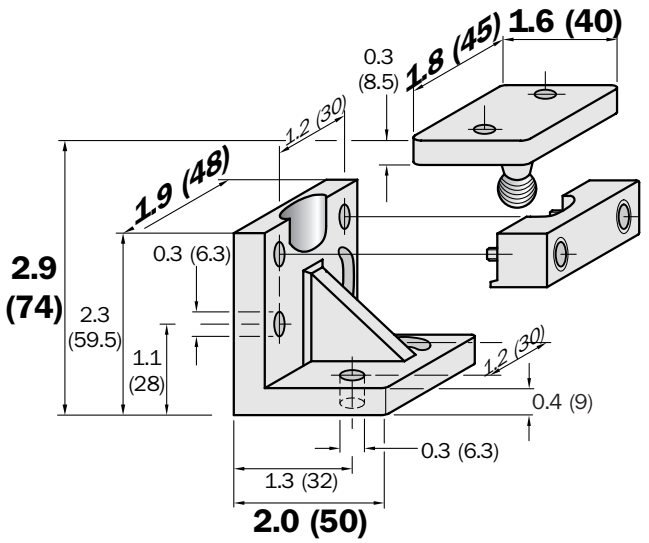
Mounting Brackets - Dimensional Drawings and Order Information

Universal Joint, Complete, for W 45

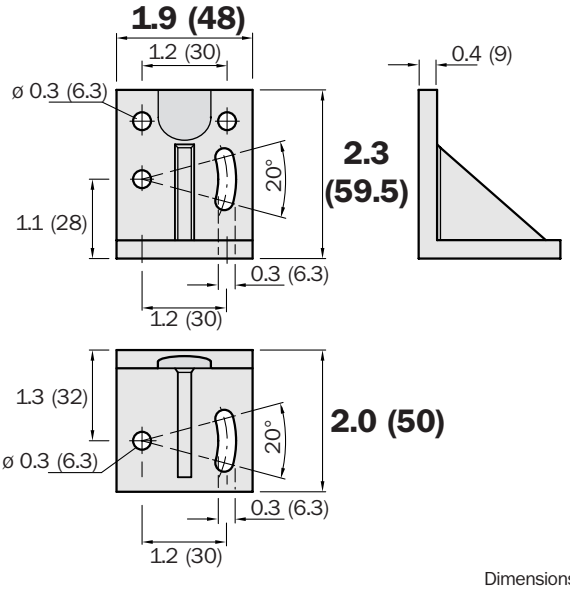
Type	Part no.
BEF-KK-W45	2 011 436

Mounting Bracket for W 45

Type	Part no.
BEF-WN-W45	2 011 480

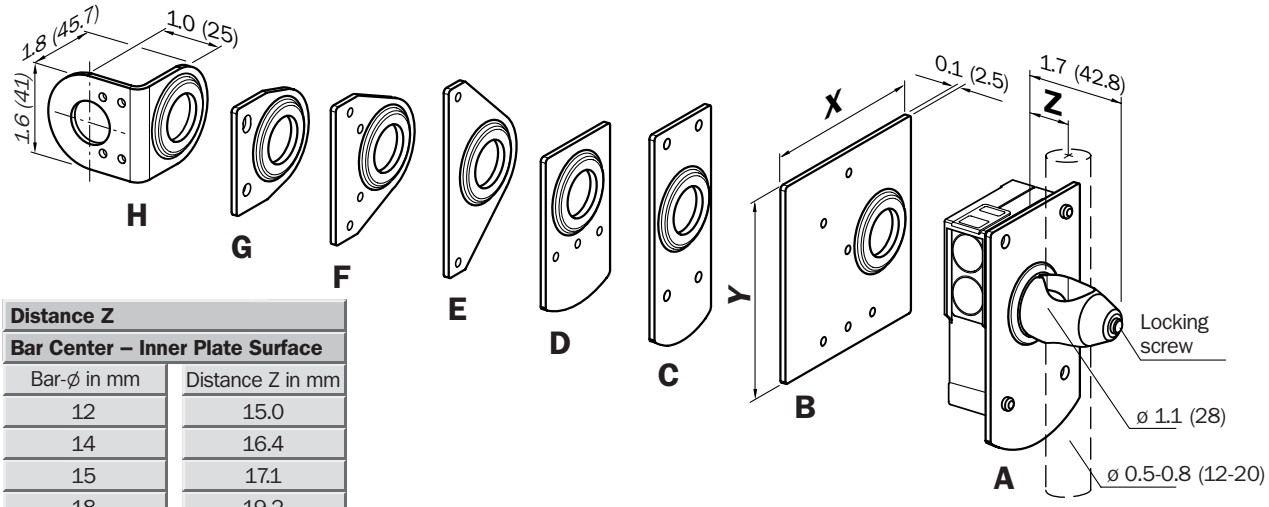


Dimensions in inches (mm)



Dimensions in inches (mm)

Universal Bar Clamps for Sensors and Reflectors



Dimensions in inches (mm)

Distance Z	
Bar Center – Inner Plate Surface	
Bar-ø in mm	Distance Z in mm
12	15.0
14	16.4
15	17.1
18	19.2
20	20.7

Mounting Plates*	Type	Part no.**	For Device/Reflector Type	Width X inches (mm)	Height Y inches (mm)
A	BEF-KHS-A01	2 022 458	W 23, W 27-2	2.4 (61)	4.0 (101)
B	BEF-KHS-B01	2 022 459	P 250, PL 30 A, PL 40 A, PL 50 A, PL 80 A, C 110	3.4 (87)	3.4 (87)
C	BEF-KHS-C01	2 022 460	W 14, W 18-2	1.5 (39)	3.8 (97)
D	BEF-KHS-D01	2 022 461	W 12-2, W 12L-2, KT 2	1.7 (44.4)	2.8 (72)
E	BEF-KHS-E01	2 022 462	W 30, W 32, W 36	1.9 (47)	3.3 (83)
F	BEF-KHS-F01	2 022 463	W 260, PL 20 A, P 250	2.2 (55)	2.4 (61)
G	BEF-KHS-G01	2 022 464	W 24-2, W 24 Exi, WTA 24, KT 5, KT 10, CS 1/3, LUT 3	2.0 (50.3)	1.9 (47)
H	BEF-KHS-H01	2 022 465	V 18, W 4-2	1.8 (45.7)	1.6 (41)

* Further plates available on request

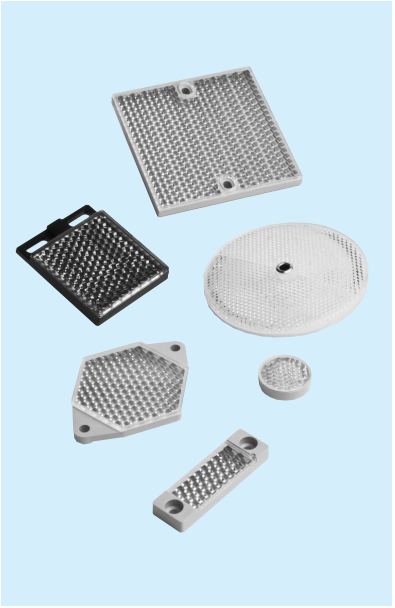
** Part no. includes bar support and mounting material

SICK

Accessories

Selection Table, Reflectors

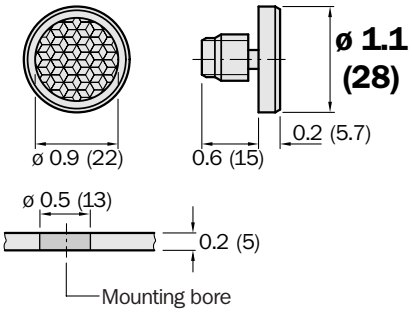
Description	Type	Part no.	Page
Plastic Reflectors for Temperatures up to 65 °C			
Reflector, 22 mm diameter, plug-in	PL 22-1	1 003 546	937
Reflector, 22 mm diameter, self-adhesive	PL 22-2	1 003 621	937
Reflector, 22 mm diameter, plug-in, for sheet metal	PL 22-3	1 004 488	937
Reflector, 23 mm diameter, self-adhesive	PL 26	1 001 440	937
Reflector, 20 x 40 mm	PL 20 A	1 012 719	937
Reflector, 20 x 40 mm, self-adhesive	PL 21 A	1 015 172	937
Reflector, 30 x 50 mm	PL 30 A	1 002 314	937
Reflector, 30 x 50 mm, self-adhesive	PL 31 A	1 002 315	937
Reflector, 40 x 60 mm	PL 40 A	1 012 720	937
Reflector, 6-sided, width across flats 48 mm	PL 50 A	1 000 132	938
Reflector, 6-sided, width across flats 48 mm, self-adhesive	PL 51 A	1 001 628	938
Reflector, 47 x 47 mm	P 250	5 304 812	938
Reflector, 70 x 51 mm, with mounting bolt M 6	PL 72	5 304 145	938
Reflector, 80 x 80 mm	PL 80 A	1 003 865	938
Reflector, 83 mm diameter, center hole mounting	C 110	5 304 549	938
Special Reflectors			
Reflector, 6-sided, width across flats 48 mm, oil-tight	PL 53 A	1 000 382	939
Reflector, 105 x 110 mm, with glass sealing disc	PN 105-1	1 004 082	939
Reflector, 40 x 180 mm	PL 180 E01	1 013 289	939
Combi-reflector 3 x 3 PL 80 A, reflective foil center, for DME	PL 240 F	1 013 784	940
Reflector, 280 x 280 mm, diamond grade, for DME	PL 240 DG	1 017 910	940
Reflector, 280 x 280 mm, high grain, for DME	PL 240-7610	1 019 012	940
Combi reflector 7 x 7 PL 80 A, reflective foil center, for DME	PL 560 F	1 013 785	940
Reflector, 605 x 605 mm, diamond grade, for DME	PL 560 DG	1 016 806	940
Combi-reflector, 11 x 11 PL 80 A, center reflectivity reduced, for DME	PL 880 F	1 013 786	941
Reflector, 914 x 914 mm, diamond grade, for DME	PL 880 DG	1 018 975	941
Reflector, 928 x 928 mm, 11 x 11 PL 80 A,	PL 880 FS01	1 017 865	941
Triple reflector, glass, 60 mm diameter, f = ∞	OP 60-∞	1 000 141	941
Triple reflector, glass, 60 mm diameter, f = 10 m	OP 60-10	1 000 138	941
Triple reflector, glass, 60 mm diameter, f = 20 m	OP 60-20	1 000 136	941
Reflector 32.8 x 8.4 mm	P 45	5 308 002	942
Reflector 30 x 50 mm, self-adhesive	PL 31 A	1 002 315	942
Reflector 47 x 47 mm	P 250	5 304 812	942
Reflector Ø 83 mm, center hole mounting	P 975	7 020 558	942
Triple reflector, glass for DML	OP 55	5 309 131	942
Triple reflector, glass, with heating for DML	OP 55 H	5 309 132	942
Lens reflector for DMD	PL 140L	5 308 918	942
Deflecting reflector for DMD	USP-DMD	5 308 919	942
Reflectors With Heating, UC 24 V; 1.4 W			
Reflector, 6-sided, width 48 mm, continuous heating, AC/DC 24 V; 1.4 W	PL 50 HK	1 011 545	944
Reflector, 6-sided, width 48 mm, regulated heating, AC/DC 24 V; 1.4 W	PL 50 HS	1 009 871	944
Reflector 0.3 x 0.3 m^2 diamond grade, regulated heating AC 230 V/200 W	PL 240 DG-H	1 022 926	940
Reflector 0.6 x 0.6 m^2 diamond grade, regulated heating AC 230 V/200 W	PL 560 DG-H	1 023 888	940
Triple Reflectors, Glass, for Temperatures up to 300 °C			
Reflector, 50 mm diameter	SW 50	1 000 131	944
Triple reflector, glass, 60 mm dia., seals resistant to high temperatures	OP 61-∞	1 002 627	944
Self-adhesive Reflective Tape for Photoelectric Barriers	See page 945	See page 945	945



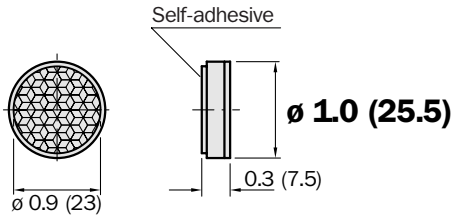
Dimensional Drawings and Order Information

Plastic Design for Temperatures up to 65 °C

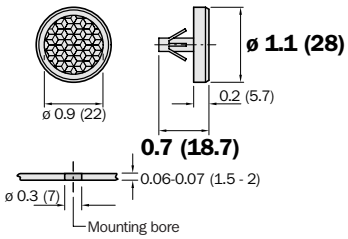
Reflector, ∅ 22 mm, Plug-in Style	
Type	**Part no.**
PL 22-1	1 003 546



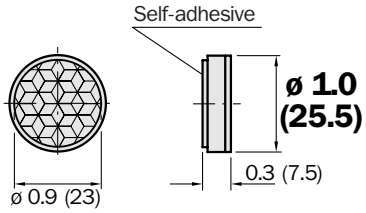
Reflector, ∅ 22 mm	
Self-adhesive	
Type	**Part no.**
PL 22-2	1 003 621



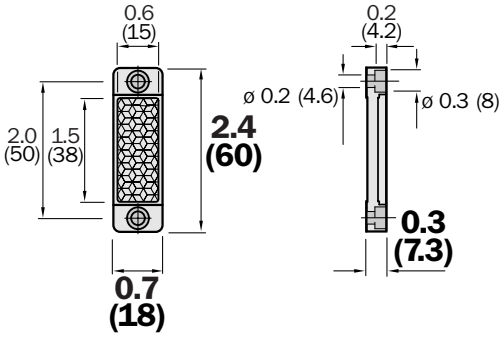
Reflector, ∅ 22 mm	
Plug-in Style, for Sheet Metal	
Type	**Part no.**
PL 22-3	1 004 488



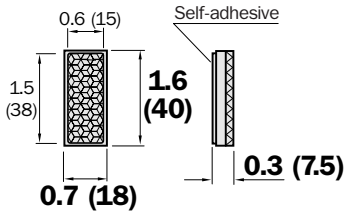
Reflector, ∅ 23 mm	
Self-adhesive	
Type	**Part no.**
PL 26	1 001 440



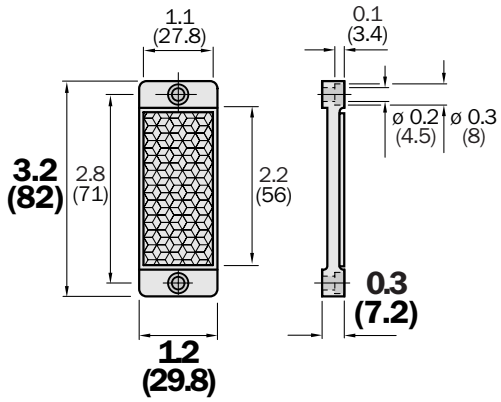
Reflector, 20 x 40 mm	
Type	**Part no.**
PL 20 A	1 012 719



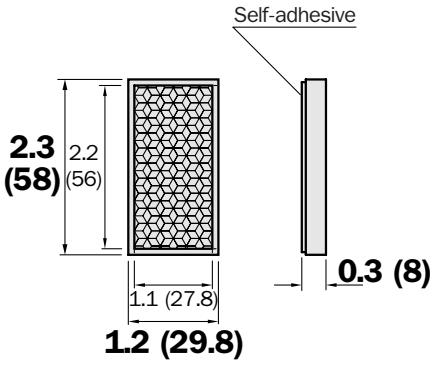
Reflector, 20 x 40 mm	
Self-adhesive	
Type	**Part no.**
PL 21 A	1 015 172



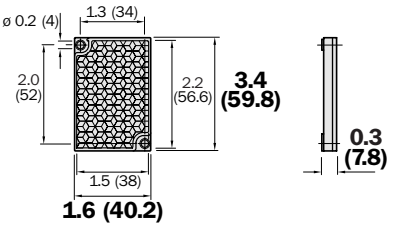
Reflector, 30 x 50 mm	
Type	**Part no.**
PL 30 A	1 002 314



Reflector, 30 x 50 mm	
Self-adhesive	
Type	**Part no.**
PL 31 A	1 002 315



Reflector, 40 x 60 mm	
Type	**Part no.**
PL 40 A	1 012 720



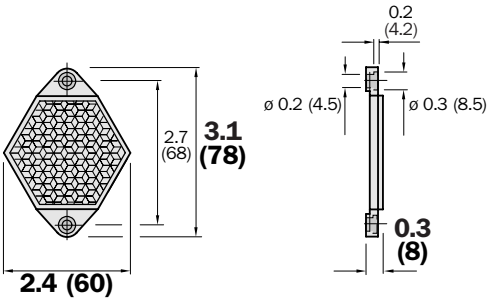
SICK

Accessories

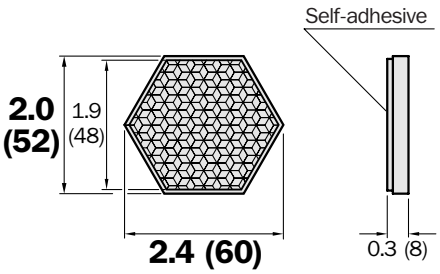
Dimensional Drawings and Order Information

Plastic Design for Temperatures up to 65 °C

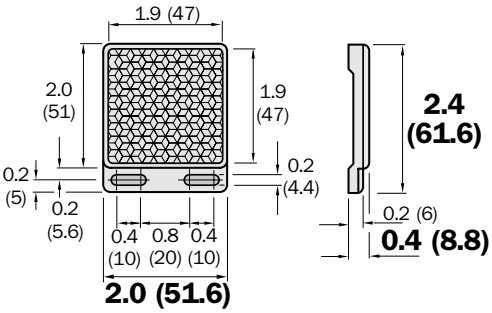
Reflector, 6-sided, Width Across Flats 48 mm	
Type	**Part no.**
PL 50 A	1 000 132



Reflector, 6-sided, Width Across Flats 48 mm, Self-adhesive	
Type	**Part no.**
PL 51 A	1 001 628



Reflector, 47 x 47 mm	
Type	**Part no.**
P 250	5 304 812

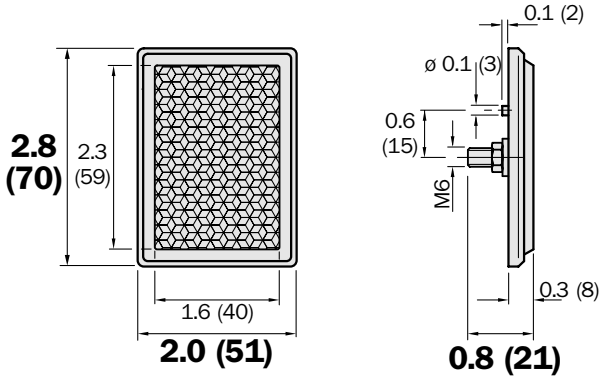


Also available in heated model:

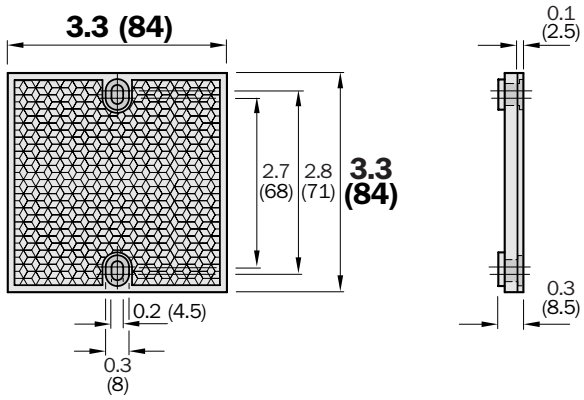
Continuous heating: PL 50HK, Order no. 1 011 545

Regulated heating: PL 50HS, Order no. 1 009 871

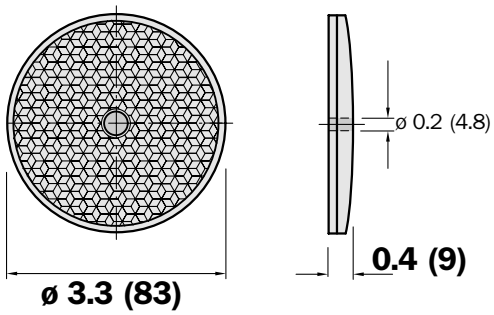
Reflector, 70 x 51 mm, with M 6 Mounting Bolt	
Type	**Part no.**
PL 72	5 304 145



Reflector, 80 x 80 mm	
Type	**Part no.**
PL 80 A	1 003 865



Reflector, ∅ 83 mm, Center Hole Mounting	
Type	**Part no.**
C 110	5 304 549

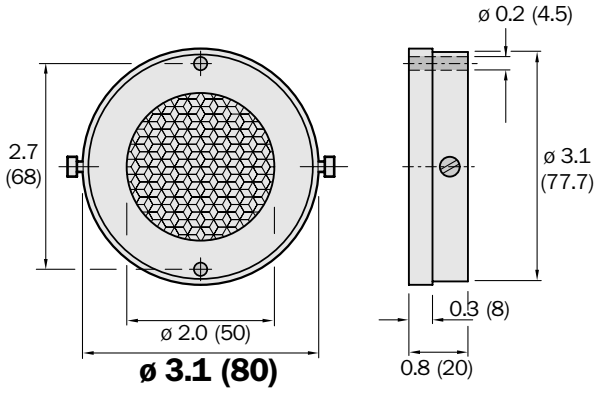


Dimensional Drawings and Order Information

Special Reflectors

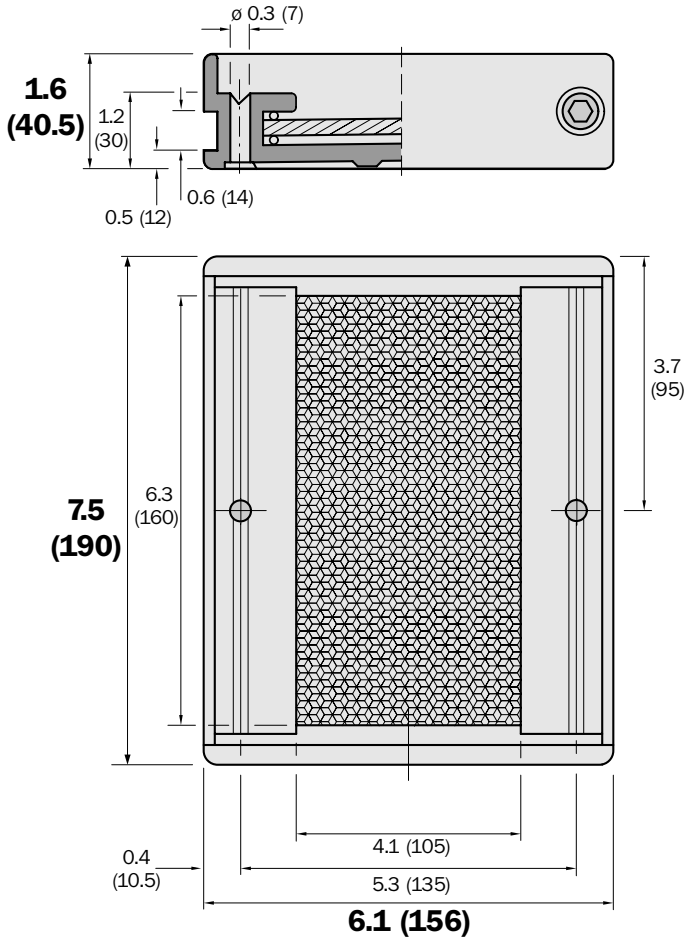
Reflector, 6-sided, Width Across Flats 48 mm, Oil-tight

Type	Part no.
PL 53 A	1 000 382



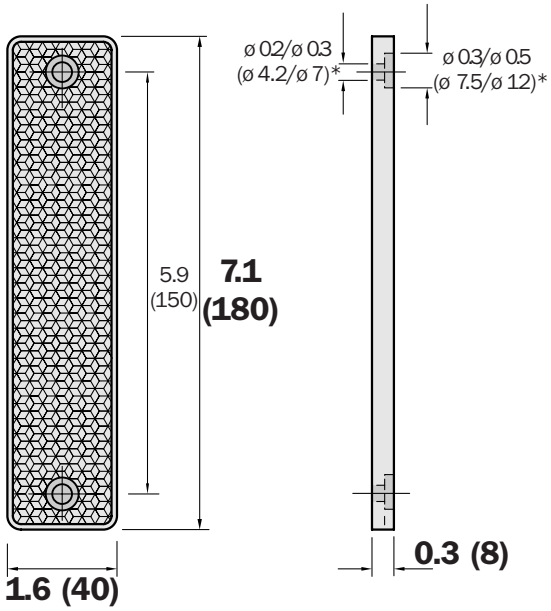
Reflector, 105 x 110 mm, With Glass Sealing Disc

Type	Part no.
PN 105-1	1 004 082



Reflector, 40 x 180 mm

Type	Part no.
PL 180 E01	1 013 289



* with/without reducing sleeve

SICK

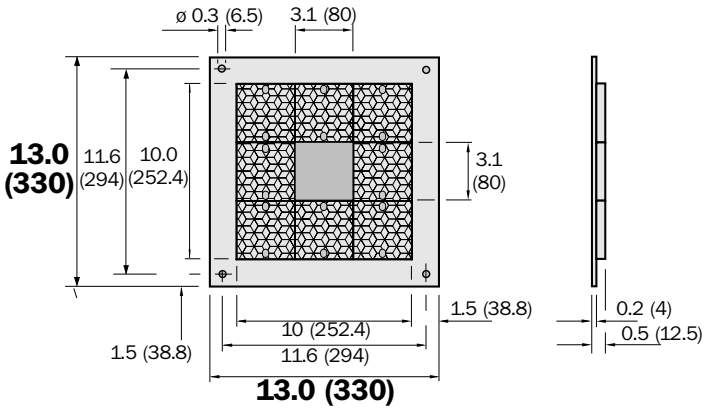
Accessories

Dimensional Drawings and Order Information

Special Reflectors

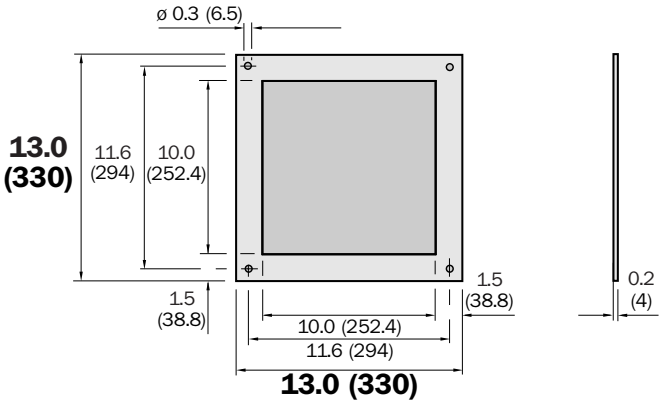
Combi-reflector, 3 x 3 PL 80 A, Reflective Foil Center, for DME

Type	Part no.
PL 240 F	1 013 784



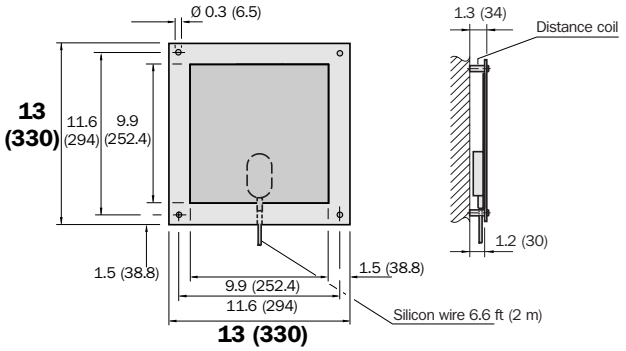
Reflector, 280 x 280 mm, for DME

Type	Part no.	Reflective Foil
PL 240 DG	1 017 910	Diamond Grade
PL 240-7610	1 019 012	High Grain



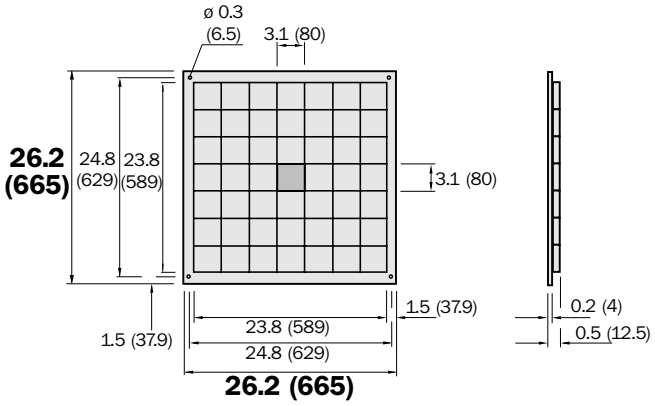
Reflector 0.3 x 0.3 m² Diamond Grade, Regulated Heating AC 230 V/200W

Type	Part no.
PL 240 DG-H	1 022 926



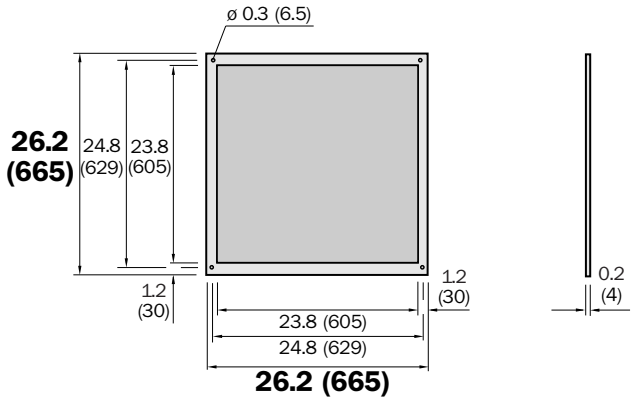
Combi-reflector, 7 x 7 PL 80 A, Reflective Foil Center, for DME

Type	Part no.
PL 560 F	1 013 785



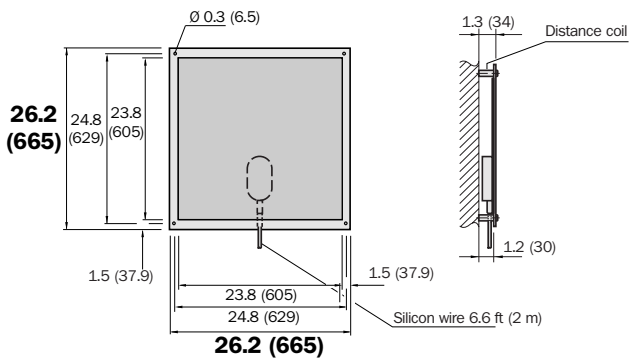
Reflector, 605 x 605 mm, Diamond Grade, for DME

Type	Part no.
PL 560 DG	1 016 806



Reflector 0.6 x 0.6 m² Diamond Grade, Regulated Heating AC 230 V/200W

Type	Part no.
PL 560 DG-H	1 023 888

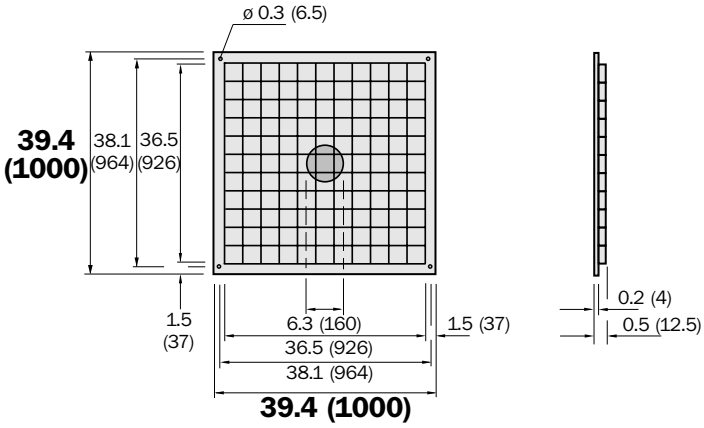


Dimensional Drawings and Order Information

Special Reflectors

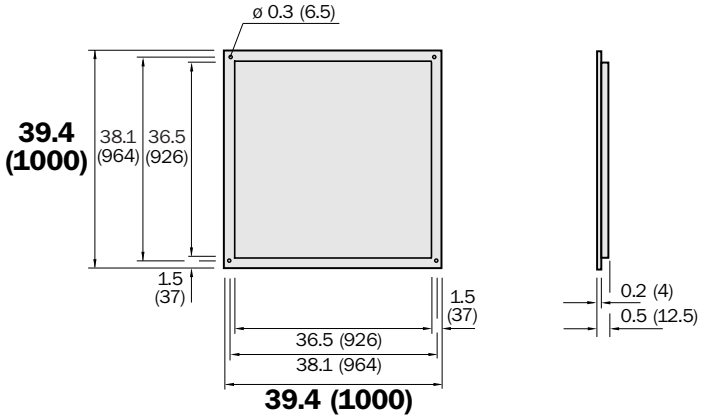
Combi-reflector, 11 x 11 PL 80 A, Center Reflectivity Reduced, for DME

Type	Part no.
PL 880 F	1 013 786



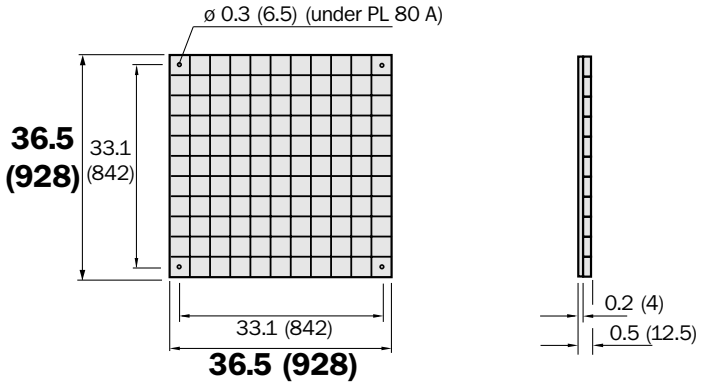
Reflector, 914 x 914 mm, Diamond Grade, for DME

Type	Part no.
PL 880 DG	1 018 975



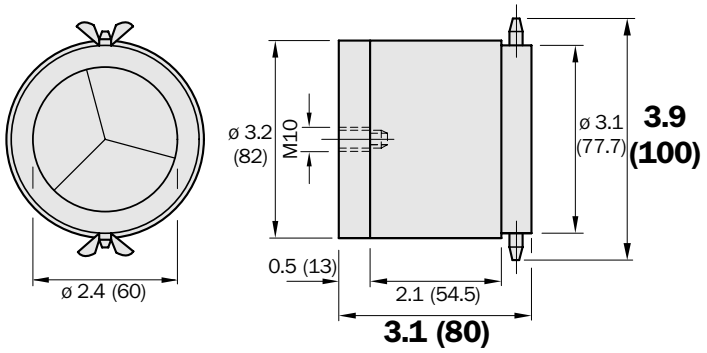
Reflector, 11 x 11 PL 80 A, Can be Linked in a Row, for DME

Type	Part no.
PL 880 FS01	1 017 865



Triple Reflector, Glass, ∅ 60 mm

Type	Part no.	Remarks
OP 60-∞	1 000 141	f = ∞
OP 60-10	1 000 138	f = 10 m
OP 60-20	1 000 136	f = 20 m



SICK

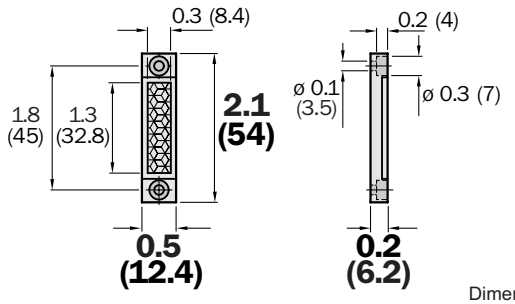
Accessories

Dimensional Drawings and Order Information

Special Reflectors

Reflector 32.8 x 8.4 mm *)

Type	Order no.
P 45	5 308 002



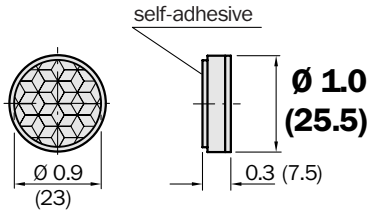
Dimensions in inches (mm)

*) Supplied with WL 140

Reflector 30 x 50 mm

Self-adhesive

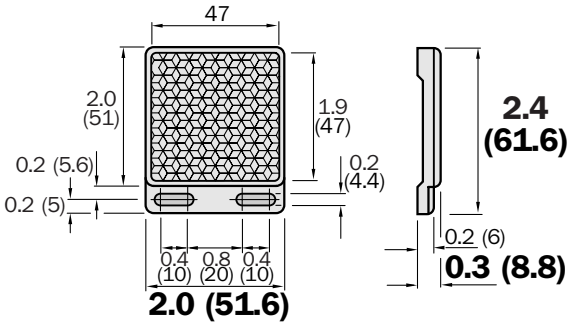
Type	Order no.
PL 31 A	1 002 315



Dimensions in inches (mm)

Reflector 47 x 47 mm *)

Type	Order no.
P 250	5 304 812

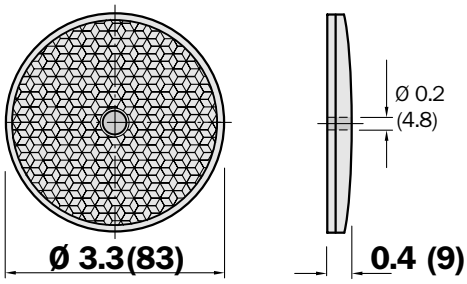


*)Supplied with WL 160T

Dimensions in inches (mm)

Reflector Ø 83 mm, Center Hole Mounting

Type	Order no.
P 975	7 020 558



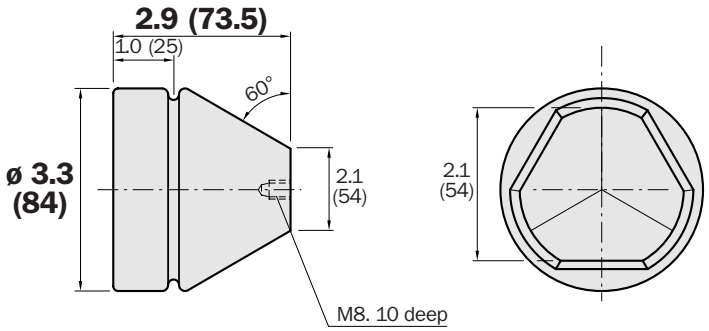
Dimensions in inches (mm)

Dimensional Drawings and Order Information

Special Reflectors

Triple Reflector, Glass for DML

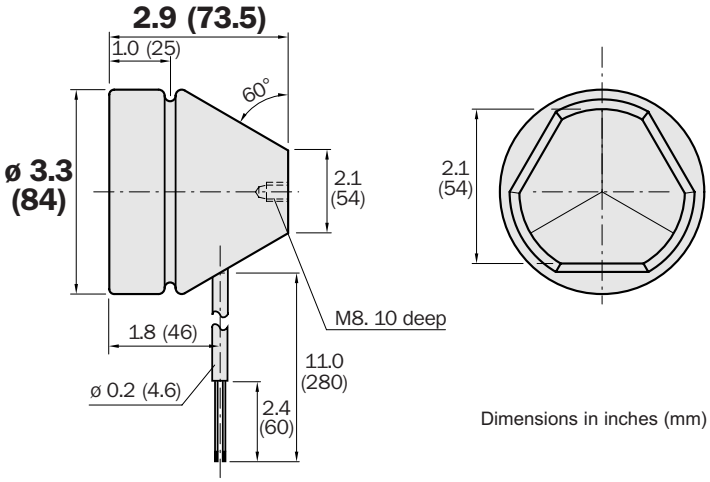
Type	Part no.
OP 55	5 309 131



Dimensions in inches (mm)

Triple Reflector, Glass, with Heating for DML

Type	Part no.
OP 55 H	5 309 132

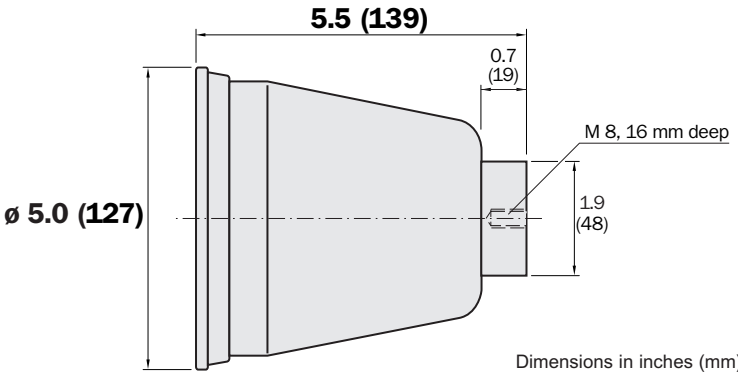


Dimensions in inches (mm)

Reflectors

Lens Reflector for DMD

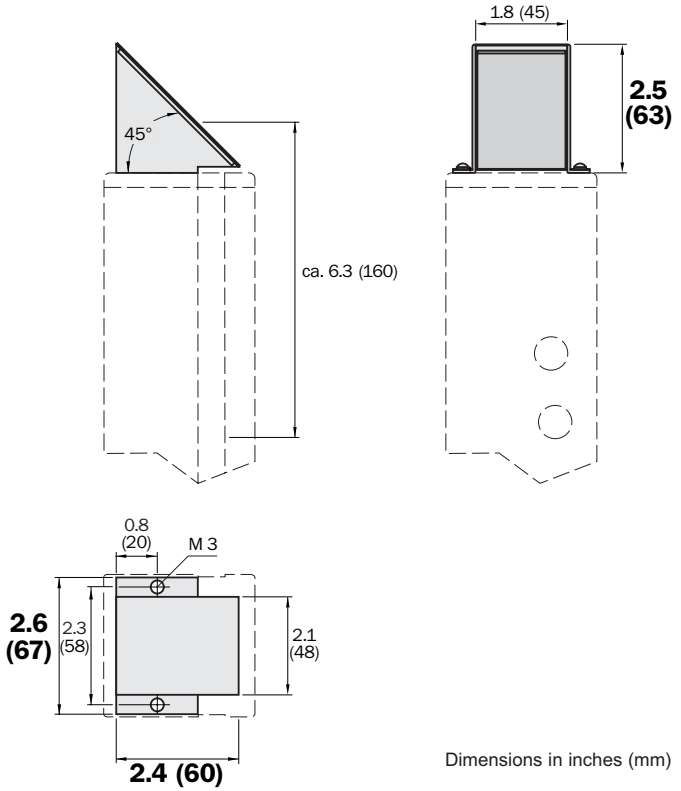
Type	Part no.
PL 140L	5 308 918



Dimensions in inches (mm)

Deflecting Reflector for DMD

Type	Part no.
USP-DMD	5 308 919



Dimensions in inches (mm)

SICK

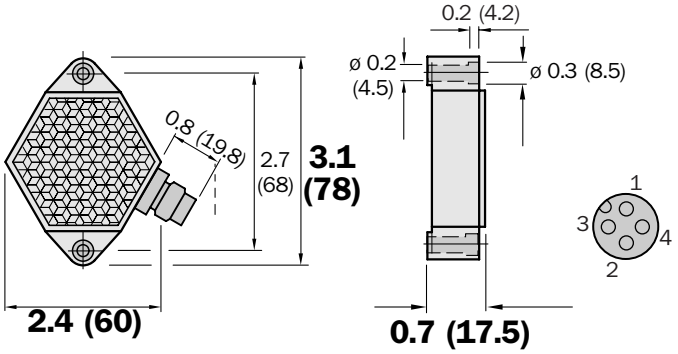
Accessories

Dimensional Drawings and Order Information

Reflectors with Heating, UC = 24 V, 1.4 W

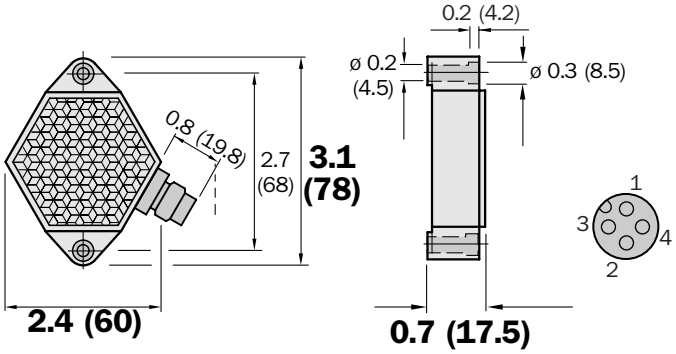
Reflector, 6-sided, Width Across Flats 48 mm, with Continuous Heating

Type	Part no.
PL 50 HK	1 011 545



Reflector, 6-sided, Width Across Flats 48 mm, with Regulated Heating

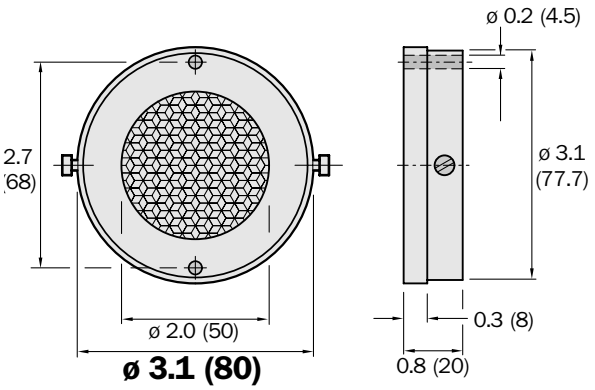
Type	Part no.
PL 50 HS	1 009 871



Triple Reflectors, Glass, for Temperatures up to 300 °C

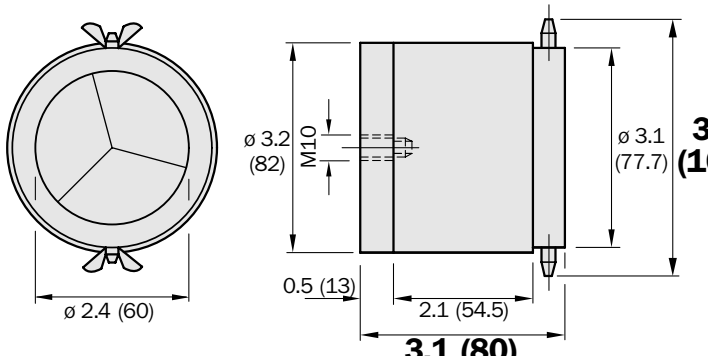
Reflector, ∅ 50 mm

Type	Part no.
SW 50	1 000 131



Triple Reflector, Glass, ∅ 60 mm, Seals Resistant to High Temperatures

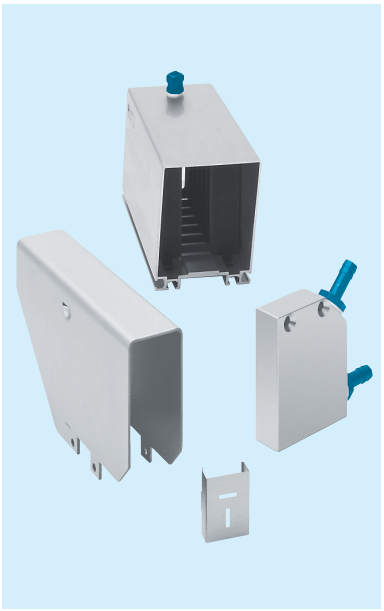
Type	Part no.
OP 61-∞	1 002 627



Type	Part no.	Notes
REF-APM	4 025 097	Reflective tape APM, sheet 225 x 225 mm
RT3290 3-F	7 023 340	Reflective tape, width 91.4 cm, roll length 4.57 m, cut to size
RT3290 3-15R	7 023 341	Reflective tape, width 91.4 cm, roll length 4.57 m, cut to size
RT7610 2-F	7 023 338	Reflective tape, width 61 cm, roll length 4.57 m
RT7610 2-15R	7 023 339	Reflective tape, width 61 cm, roll length 4.57 m
RTC 1-Y	7 020 540	Roll, 1 inch by desired length in yards (specify when ordering)
RTC 2-Y	7 020 542	Roll, 2 inches by desired length in yards (specify when ordering)
RTC 3-Y	7 020 541	Roll, 3 inches by desired length in yards (specify when ordering)
RTC 1-50C	7 020 570	Roll, 1 inch by 50 yard case (two 25 yard rolls)
RTC 2-25C	7 020 571	Roll, 2 inches by 25 yard case
RTC 3-25C	7 020 572	Roll, 3 inches by 25 yard case
RTC 3-3C	7 020 573	Sheet, 3 x 3 inch case (100 pieces)
RTC 4-4C	7 020 574	Sheet, 4 x 4 inch case (50 pieces)
RTC 3-3P	7 020 578	Sheet, 3 x 3 inch pack (10 pieces)
RTC 4-4P	7 020 575	Sheet, 4 x 4 inch pack (10 pieces)
RTC 8-11S	7 020 579	Sheet, 8.5 x 11 inch sheet
RTC 8-11P	7 020 580	Sheet, 8.5 x 11 inch pack (5 pieces)
RTC 8-11C	7 020 576	Sheet, 8.5 x 11 inch case (20 pieces)
RTC 18-36S	7 020 581	Sheet 18 x 36 inch sheet
RTC 18-36C	7 020577	Sheet, 18 x 36 inch case (5 pieces)

Special Accessories

Selection Table, Special Accessories				
For Equipment	**Description**	**Type**	**Part no.**	**Page**
Masks				
WS/WE 140	Slotted masks, width X: 0.5/1/2 mm	BL-140-10	5 308 458	950
WS/WE 9-2	Slotted masks, width X: 0.5/1/2 mm	BL-9-2	4 033 253	950
SS/SE 130	Slotted masks, each 2 x 0.5 mm/	BL-130S-SK	5 306 325	951
	1.0 mm/2.0 mm wide			
WS/WE 150	Slotted masks, each 2 x 0.5 mm/	BL-150-10	5 306 216	951
	1.0 mm/2.0 mm wide			
WS/WE 160	Slotted masks, 1.0 mm wide	BL-160-10	5 306 196	951
WS/WE 170	Slotted masks, 1.0 mm wide	BL-170-10	5 305 687	951
WS/WE 260	Slotted masks, 1.0 mm wide	BL-100	5 304 809	951
WS/WE 260	Slotted masks, 2.0 mm wide	BL-200	5 304 810	951
WS/WE 260	Slotted masks, 5.0 mm wide	BL-500	5 304 811	951
WS/WE 12-2	Mask card, 0.5/1.0/1.5/2.0 mm wide,	BL 12-SKN	4 031 815	950
	self-adhesive			
Polarization Filter				
WS/WE 170	Front lenses with polarizing filter	BL-170-POLF	5 305 688	951
	2 x X and 2 x Y-polarization filters			
W 140	Polarizing filter, vertical	BL-140-POLF	5 308 457	950
Lenses				
NT 6/KT 5-2	Lens, sensing distance = 10 mm	OBJ-211	1 004 936	952
NT 6	Lens, sensing distance = 12.5 mm	OBJ-208	2 011 778	952
NT 6/KT 5-2	Lens, sensing distance = 18 mm	OBJ-213	2 009 266	952
NT 6/KT 5-2	Lens, sensing distance = 20 mm	OBJ-212	1 011 506	952
NT 6/KT 5-2	Lens, sensing distance = 40 mm	OBJ-210	2 010 945	952
NT 6	Lens, sensing distance = 50 mm	OBJ-214	1 004 968	952
NT 8	Lens, sensing distance = 9 mm	OBJ-024	1 001 324	952
NT 8	Lens, sensing distance = 18 mm	OBJ-025	1 001 325	953
NT 8	Lens, sensing distance = 50 mm	OBJ-026	1 001 326	953
NT 8	Lens, sensing distance = 120 mm	OBJ-027	1 001 327	953
NT 8	Lens, sensing distance = 3000 mm	OBJ-019	1 000 019	953
LUT 1-4	Lens, sensing distance = 10 mm	OBJ-131	1 001 681	953
LUT 1-4	Lens, sensing distance = 20 mm	OBJ-132	1 001 682	953
LUT 1-4	Lens, sensing distance = 50 mm	OBJ-133	1 001 683	953
LUT 1-4	Lens, sensing distance = 125 mm	OBJ-134	1 001 684	953
LUT 1-4	Lens, sensing distance = 300 mm	OBJ-135	1 001 685	953
LUT 3	Lens, sensing distance = 10 mm	OBJ-LUT 3-10	2 016 348	953
LUT 3	Lens, sensing distance = 20 mm	OBJ-LUT 3-20	2 016 349	953
LUT 3	Lens, sensing distance = 50 mm	OBJ-LUT 3-50	2 016 350	953
LUT 3	Adapter ring for lenses with	AD-OBJ-01	2 017 097	953
	thread M 20 x 0.75			
Color Filters				
Filter, 570 – 750 nm	LUT 1-4	OBF-OG570-4	4 005 810	954
Filter , 610 – 750 nm	LUT 1-4	OBF-RG610-4	4 012 735	954
Filter , 630 – 750 nm	LUT 1-4	OBF-RG630-4	4 014 153	954
Filter , 665 – 750 nm	LUT 1-4	OBF-RG665-4	4 014 154	954
Corner Mirror				
Corner mirror	DME 2000/3000	USP-DME	2 016 330	954
Corner mirror	DME 5000	USP-DME5	2 027 710	954



Selection Table, Special Accessories				
For Equipment	**Description**	**Type**	**Part no.**	**Page**
Equipment Protection, Cooling and Heating Devices				
W 24-2, W 24 Exi, WTA 24	Dust protection tube, air-purged	OBS-W 24	2 015 069	955
W 24-2, WTA 24	Weather protection hood	OBW-W 24	2 015 070	955
W 24-2, W 30, W 32, W 36, DS 60	Weather hood housing (bar attachment)	WSG1-01	1 018 470	957
W 45	Dust protection tube, 150 m	OBS-W 45	2 011 432	955
W 45	Weather protection hood, 100 mm	OBW-W 45	2 011 431	955
DME 2000/3000	Dust protection tube	OBS-DME	2 014 458	956
DME 5000	Weather hood	WSG-DME5	2 027 800	957
PL 50 A	Front flange for dust protection tube and front air-purged	FLV-PL50	1 000 130	956
PL 50 A	Front air-purged (front flange needed)	SLV-PL50	1 000 309	956
PL 50 A	Dust protection tube, 90 mm long (front flange needed)	SST DO 80-090	1 000 252	956
PL 50 A	Dust protection tube, 184 mm long (front flange needed)	SST DO 80-184	1 000 134	956
PL 50 A	Dust protection tube, 314 mm long (front flange needed)	SST DO 80-314	1 000 133	956
W 24-2, WTA 24	Cooling plate for water cooling, 2 units recommended per piece of equipment	BEF-KP-W 24	2 015 071	958
W 45	Cooling plate for water cooling	BEF-KP-W 45	2 011 435	958
DME 2000/3000	Cooling plate assembly kit for water cooling (complete)	BEF-KPM-DME	2 014 457	958
DME 2000/3000	Peltier cooling unit with lid	BEF-KE-DME	2 019 912	959
W 36	Heatable front glass	OBH-W 36-S	1 009 875	959
DME 2000/3000	Heating unit with lid	BEF-HE-DME	2 021 269	959
Alignment Aids				
MLG	Laser alignment aid	AR 60	1 015 741	952
MLG	Alignment aid, adapter for MLG housing	AR 60	4 032 462	952
DME 2000/3000	Targeting telescope	OBZ-DME	2 014 194	959
DME 2000/3000	Adjustment device for targeting telescope	OBZ-DME-J	2 014 191	959
DME 5000	Alignment bracket	BEF-AH-DME5	2 027 721	934
Diverter Plate				
UM 30	30 to 1300 mm operating sensing range	USP-UM30	5 312 916	952
Power Supplies				
All types	High speed logic controller and power supply	EN 2	6 009 654	960
	High speed logic controller and power supply	EN 2T	6 010 342	960
All types	Dual voltage power supply	EN 3	6 009 692	964
NAMUR sensors	Power supply for NAMUR sensors	EN2 EX-1	6 010 459	966
	Power supply for NAMUR sensors	EN2 EX-2	6 010 460	966
	Power supply for NAMUR sensors	EN2 EX-3	6 010 944	966
NT 6, NT 8	Power supply	MVE 1-150	1 008 964	968
	Power supply	MVE 1-250	1 010 494	968
	Power supply	BEF-FL-MVE	6 000 353	968
All types	Power supply	PS 24-25	7 025 584	970
Magnets				
Magnetic Proximity Sensors	Magnet (M1.0), Samarium-cobalt	MAG-1003-S	7 901 782	978
Magnetic Proximity Sensors	Magnet (M2.0), AlNiCo	MAG-0625-A	7 901 783	978
Magnetic Proximity Sensors	Magnet (M3.0), Barium ferrite	MAG-2006-B	7 901 784	978
Magnetic Proximity Sensors	Magnet (M4.0), Barium ferrite	MAG-3010-B	7 901 785	978
Magnetic Proximity Sensors	Magnet (M5.0), Barium ferrite	MAG-3015-B	7 901 786	979
Magnetic Proximity Sensors	Magnet (M5.1), Barium ferrite with plastic jacket	MAG-3515-B	7 902 086	979
Other Accessories				
MLG	MLG Programming Cable	PC to MLG	2 023 695	952
MLG	Analog Converter for MLG	LGE-A	7 001 107	952

About ASI Networking

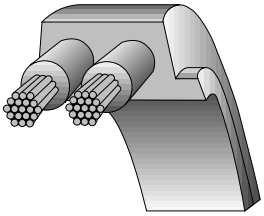


Fig. 1 ASI cable

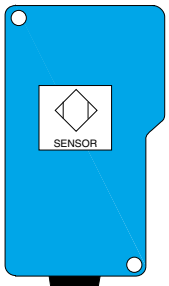


Fig. 2 Conventional sensor connected to an ASI module

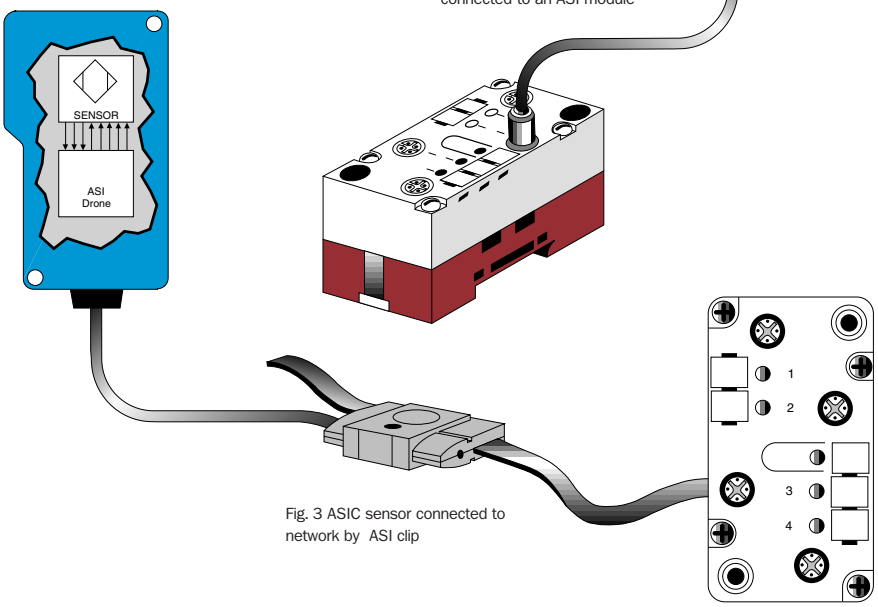


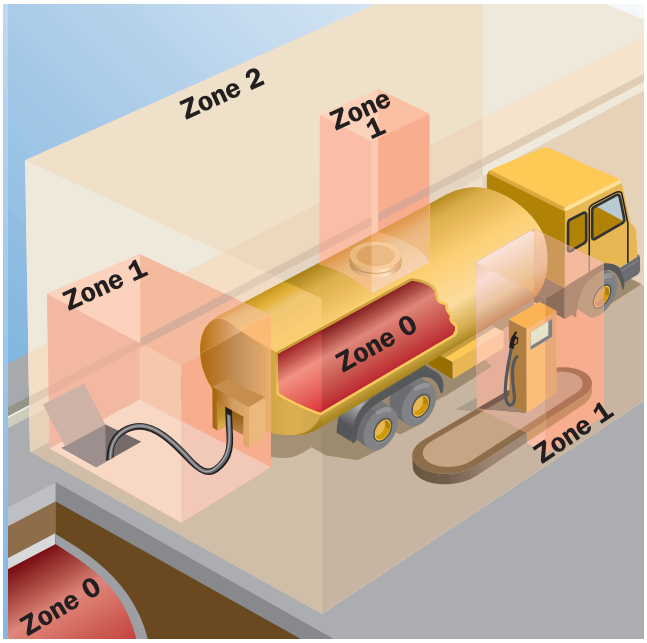
Fig. 3 ASIC sensor connected to network by ASI clip

The Actuator-Sensor Interface (ASI) is a bus system for transmitting data at the lowest, binary field level, without each individual actuator or sensor having to be directly cabled to the controller. With ASI, no individual cabling is required. Instead, an ASI cable is connected to the control unit and the sensors and actuators branch off from that central line. One central line can accommodate up to 31 slaves, with each slave able to connect with four sensors.

The ASI cable (Fig. 1) is a special 2 x 1.5 mm2 flat conductor cable. The cable's special stair-step profile prevents reversal of polarity in installation. The defined position of the wires allows easy installation of additional slaves using a clip. The cable also provides power to the sensors.

There are two types of sensors available for use with ASI: conventional sensors not yet adapted to ASI, and sensors with an integrated ASI chip. Sensors without an ASIC can be connected to the cable by way of an ASI module (Fig. 2). The module itself contains the necessary ASIC and can be connected to up to four sensors. The module converts the sensor data before being passed along the ASI cable. The module also supplies power to the sensors.

A sensor with an ASIC can connect to the ASI cable via a SICK ASI clip (Fig. 3). SICK's clip can connect to the ASI cable at any point. After the sensor is connected to the clip, the clip is closed around the ASI cable and two pins pierce the cable to complete the connection. The cable is made of self-healing material, so that removal of a clip won't leave holes in the cable.



▲ Ex zones

Requirements for explosion protected electrical equipment

An explosive atmosphere may form wherever dust, combustible gases or inflammable liquids are produced, transported, processed or stored. An explosion occurs when all three of the following factors exist simultaneously:

- Combustible material: e.g. gas, vapor, mist, dust
- Sufficient oxygen: e.g. in the surrounding air
- Ignition source: e.g. sparks or hot surfaces

At gas stations, refineries, filling plants, printing machines or industrial systems the likelihood that an explosive atmosphere will form varies from case to case.
An explosive atmosphere may exist:
permanently, over long periods, frequently, (Zone 0)
occasionally (Zone 1)
or seldom and over short periods (Zone 2)

Electrical equipment intended for use in these areas (e.g. W 24 Exi) must be designed and labeled accordingly, and certified for Zones 0 and 1 (gas, vapor, mist) or Zones 20 and 21 (dust) by an independent testing authority (e.g. the Federal Physical-Technical Office in Braunschweig, Germany). A declaration from the manufacturer is sufficient for Zone 2, temperature class 4 (ignition temperature > 135°C) (e.g. W 12-2, W 18-2, W 23, W 27-2, WT 32, W 36).

The following guidelines form the basis for this:
EN 60 079-14 (VDE 0165 – Part 1) – Electrical equipment for hazardous areas, 94/9 EC ATEX 100 a – Harmonization of legal regulations of member states (devices and protective systems) EN 50 020 (DIN VDE 0170/0171 – Part 7) – Intrinsic safety type of protection "i".

Special Accessories

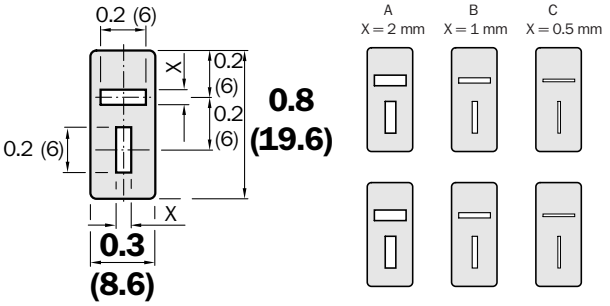
Special Accessories - Dimensional Drawings and Order Information

Slotted Masks for WS/WE 140 *)

Slot Width X: 0.5 mm/1.0 mm/2.0 mm

Type	Order no.
BL-140-10	5 308 458

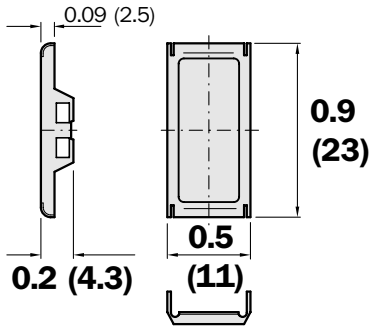
*) Two pieces each



Dimensions in inches (mm)

Polarizing Filter, Vertical for W 140

Type	Order no.	Model
BL-140-POLF	5 308 457	4 pieces, each 2x for X and Y polarizing



Dimensions in inches (mm)

3 pairs with slot widths A, B and C are supplied with equipment.

Mounting by self-adhesive back.

Stick mask on red optics body of WS 140 and WE 140.

For detecting smaller objects or increasing the switching accuracy.

Only for WS/WE 140.

Changed operating ranges:

A) Slot width 2.0 mm: SR = 4.0 m

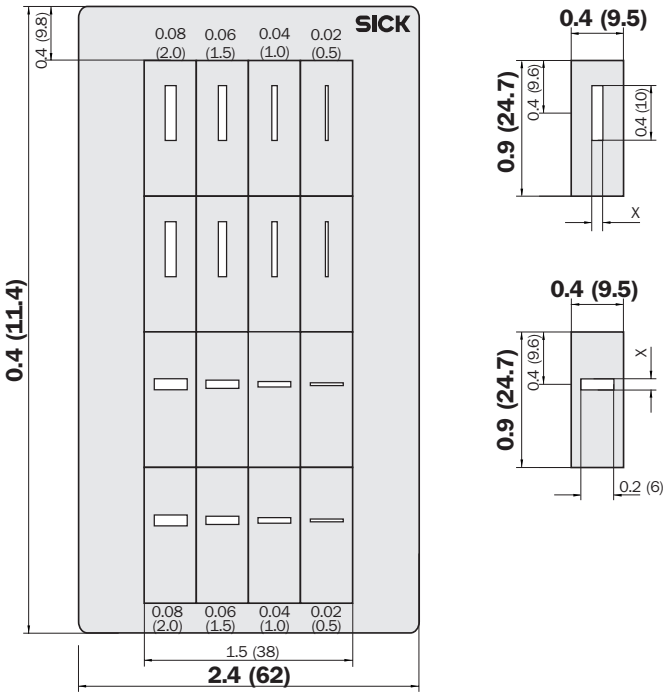
B) Slot width 1.0 mm: SR = 2.0 m

C) Slot width 0.5 mm: SR = 1.0 m

Slotted Mask Card for WS/WE 9-2

Slot Width X: 0.5 mm/1.0 mm/1.5 mm/2.0 mm

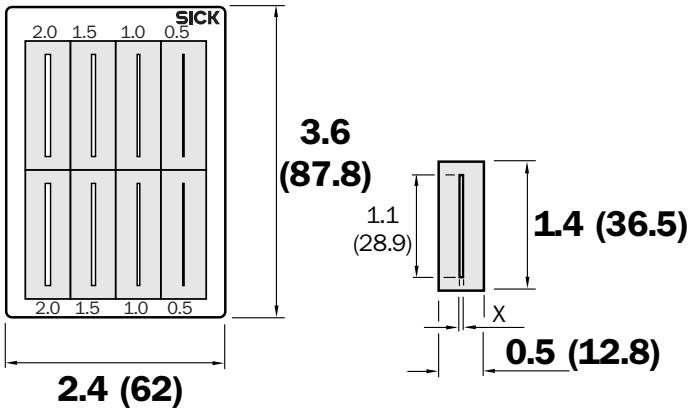
Type	Order no.
BL-9-2	4 033 253



Slotted Mask Card for WS/WE 12-2 - with 2 self-adhesive masks for each

Slot Width X: 0.5 mm/1.0 mm/1.5 mm/2.0 mm

Type	Order no.
BL 12-SKN	4 031 815



Dimensions in inches (mm)

Special Accessories - Dimensional Drawings and Order Information

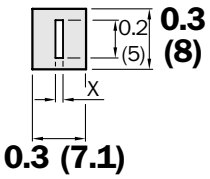
Masks

Slotted Masks* for SS/SE 130

Slot Width X: 0.5 mm/1.0 mm/2.0 mm

Type	Part no.
BL-130S-SK	5 306 325

* 2 units respectively

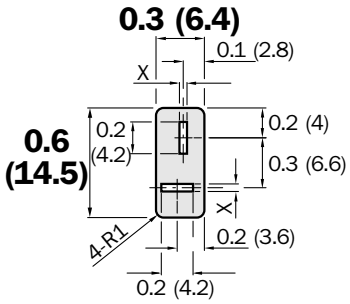


Slotted Masks* for WS/WE 150

Slot Width X: 0.5 mm/1.0 mm/2.0 mm

Type	Part no.
BL-150-10	5 306 216

* 2 units respectively

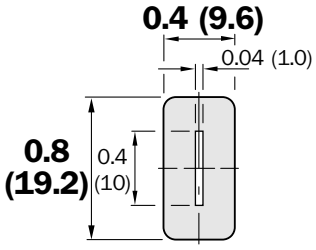


Slotted Masks* for WS/WE 160

Slot Width: 1.0 mm

Type	Part no.
BL-160-10	5 305 196

* 2 units respectively

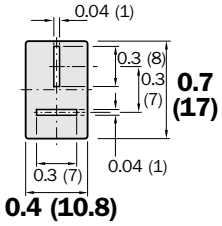


Masks/Polarization Filters

Slotted Masks* for WS/WE 170

Type	Part no.	Slot Width
BL-170-10	5 305 687	1.0 mm

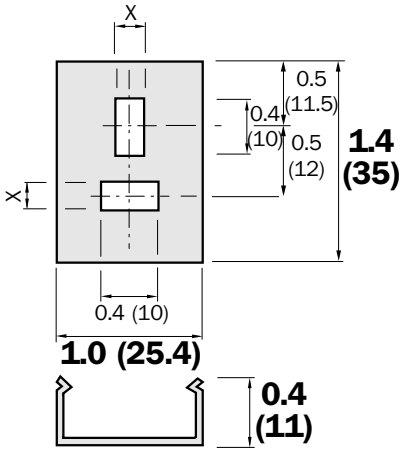
*2 units respectively



Slotted Masks* for WS/WE 260 (only for DC version)

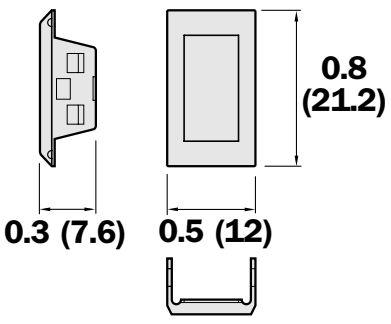
Type	Part no.	Slot Width X	Range
BL-100	5 304 809	1.0 mm	1.5 m
BL-200	5 304 810	2.0 mm	3 m
BL-500	5 304 811	5.0 mm	6 m

*2 units respectively



Front Polarization Filter for WS/WE 170

Type	Part no.	Design
BL-170-POLF	5 305 688	2 x X and Y polarization



SICK

Special Accessories

Special Accessories - Dimensional Drawings and Order Information

Alignment Aid for MLG

Laser Alignment Aid

Type	Part no.	Cable Length
AR 60	1 015 741	2 m

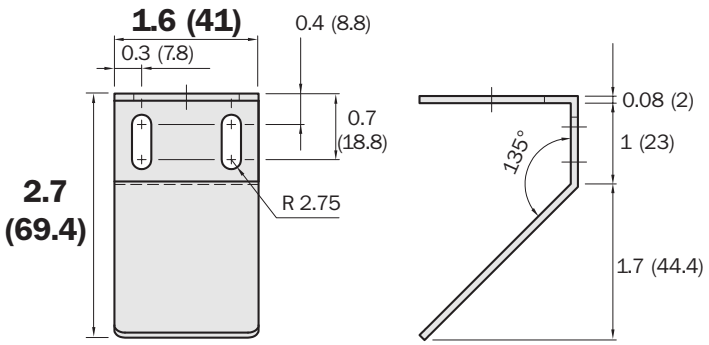
Alignment Aid for MLG

Adapter for MLG Housing

Type	Part no.
AR 60 bracket	4 032 462

Diverter Plate for UM 30 to 1300 mm Operating Sensing Range

Type	Part no.
USP-UM30	5 312 916



MLG Programming Cable

Type	Part no.
PC to MLG	2 023 695

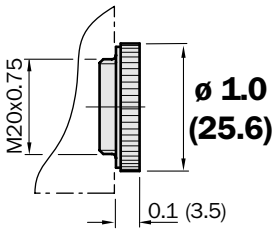
Analog Converter for MLG

Type	Part no.
LGE-A	7 001 107

Lenses (SD = Sensing Distance)

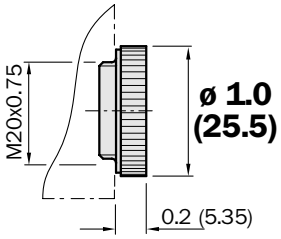
Lens, SD = 20 mm, for NT 6, KT 5-2

Type	Part no.
OBJ-212	1 011 506



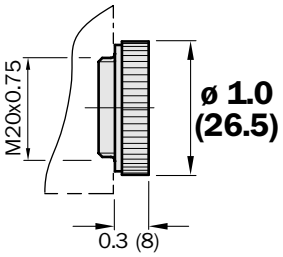
Lens, SD = 12.5/50 mm, for NT 6

Type	Part no.	SD
OBJ-208	2 011 778	12.5 mm
OBJ-214	1 004 968	50 mm



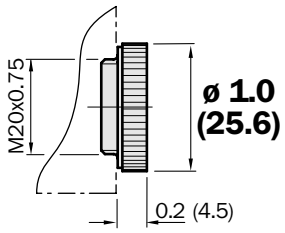
Lens, SD = 18 mm, for NT 6, KT 5-2

Type	Part no.
OBJ-213	2 009 266



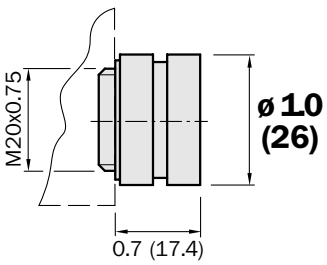
Lens, SD = 10 mm, for NT 6, KT 5-2

Type	Part no.
OBJ-211	1 004 936



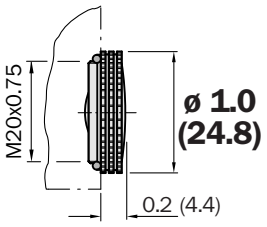
Lens, SD = 40 mm, for NT 6, KT 5G-2

Type	Part no.
OBJ-210	2 010 945



Lens, SD = 9 mm, for NT 8

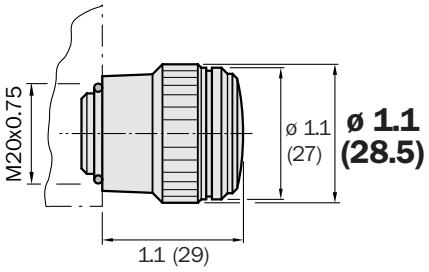
Type	Part no.
OBJ-024	1 001 324



Lenses (SD = Scanning Distance)

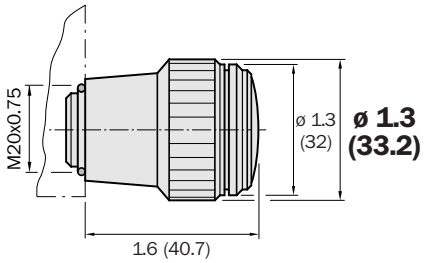
Lens, SD = 18 mm, for NT 8

Type	Part no.
OBJ-025	1 001 325



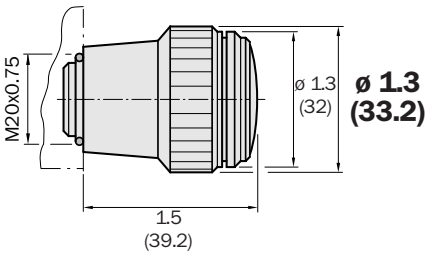
Lens, SD = 50/120 mm, for NT 8

Type	Part no.	SD
OBJ-026	1 001 326	50 mm
OBJ-027	1 001 327	120 mm



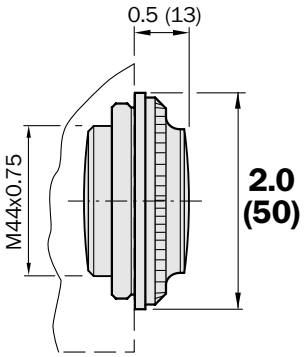
Lens, SD= 3000 mm on PL80A, for NT 8

Type	Part no.
OBJ-019	1 000 019



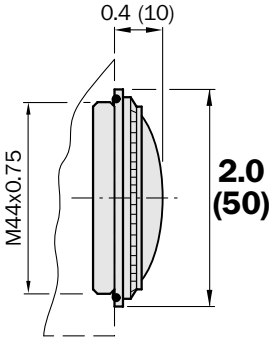
Lens, SD = 10/20 mm, for LUT 1-4

Type	Part no.	SD
OBJ-131	1 001 681	10 mm
OBJ-132	1 001 682	20 mm



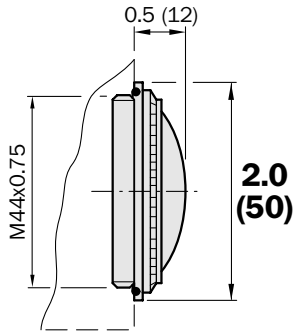
Lens, SD = 50/125 mm, for LUT 1-4

Type	Part no.	SD
OBJ-133	1 001 683	50 mm
OBJ-134	1 001 684	125 mm



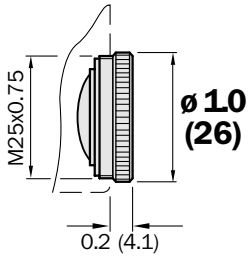
Lens, SD = 300 mm, for LUT 1-4

Type	Part no.
OBJ-135	1 001 685



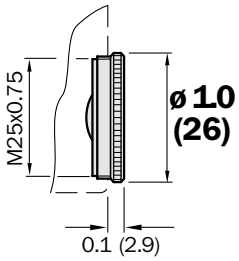
Lens, SD = 10/20 mm, for LUT 3

Type	Part no.	SD
OBJ-LUT 3-10	2 016 348	10 mm
OBJ-LUT 3-20	2 016 349	20 mm



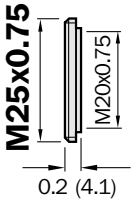
Lens, SD = 50 mm, for LUT 3

Type	Part no.
OBJ-LUT 3-50	2 016 350



Adapter Ring for Lenses with M20 Thread, for LUT 3

Type	Part no.
AD-OBJ-01	2 017 097



SICK

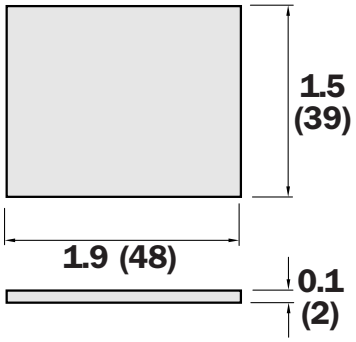
Special Accessories

Special Accessories - Dimensional Drawings and Order Information

Filters

Color Filter for LUT 1-4

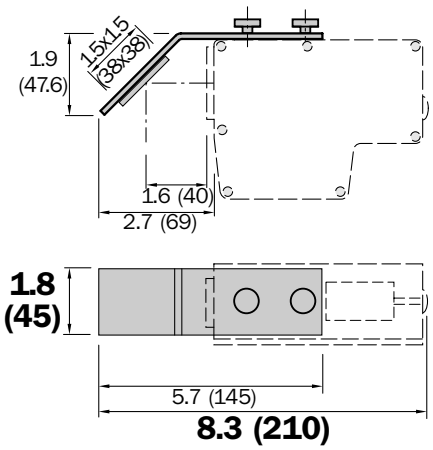
Type	Part no.	Filter Range
OBF-OG570-4	4 005 810	570 – 750 nm
OBF-RG610-4	4 012 735	610 – 750 nm
OBF-RG630-4	4 014 153	630 – 750 nm
OBF-RG665-4	4 014 154	665 – 750 nm



Corner Mirror

Corner Mirror for DME 2000/3000

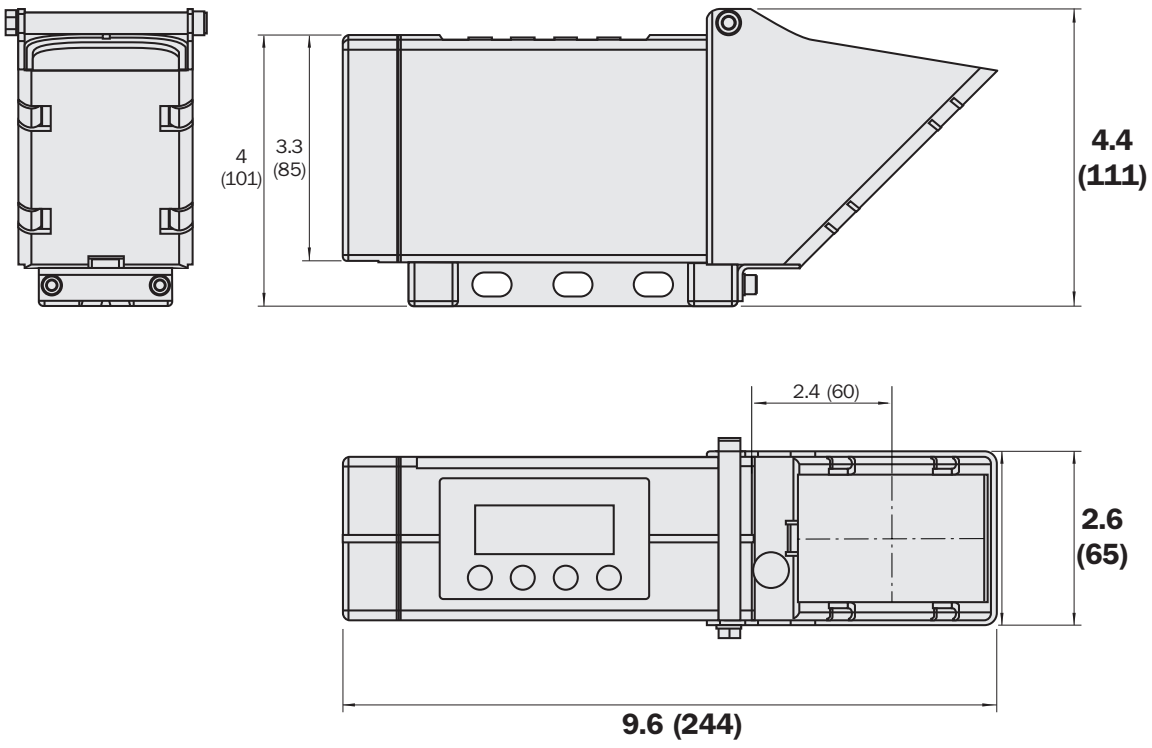
Type	Part no.
USP-DME	2 016 330



Corner Mirror

Corner Mirror for DME 5000, deflects light upward

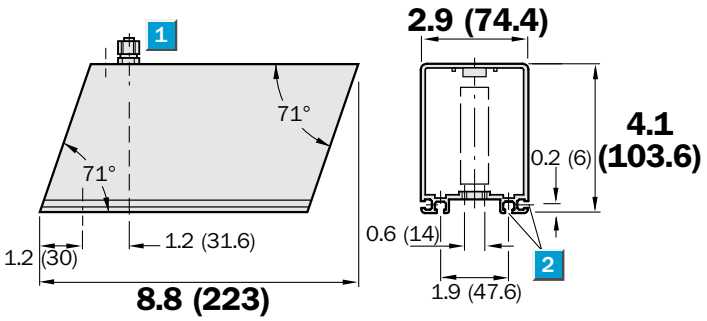
Type	Part no.
USP-DME5	2 027 710



Dust and Weather Protection Devices

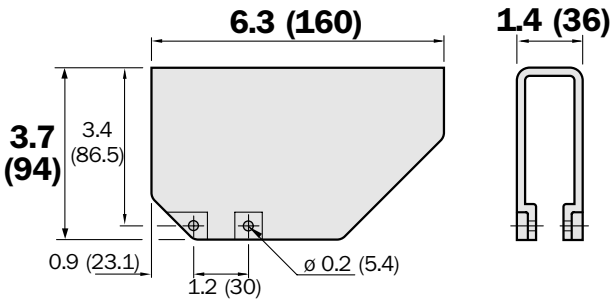
Dust Protection Tube, Air-purged, for W 24-2, W 24 Exi, WTA 24

Type	Part no.
OBS-W 24	2 015 069



Weather Protection Hood for W 24-2, WTA 24

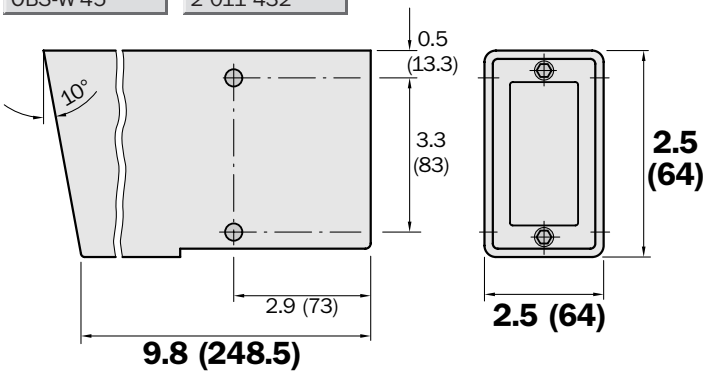
Type	Part no.
OBW-W 24	2 015 070



1 Fast action screw fitting for hose internal diameter 6 mm
2 Running nut channel for M 5 nut

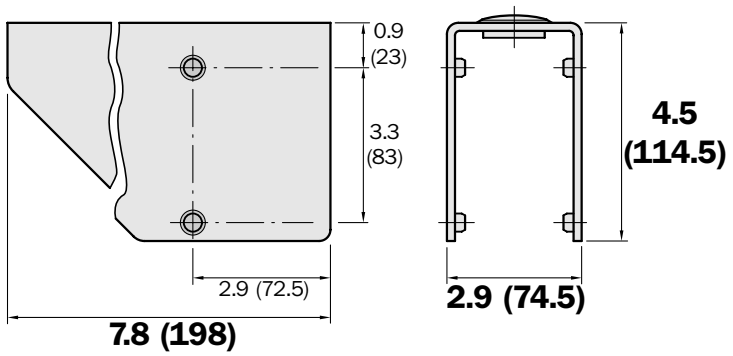
Dust Protection tube for W 45

Type	Part no.
OBS-W 45	2 011 432



Air Protection Hood for W 45

Type	Part no.
OBW-W 45	2 011 431



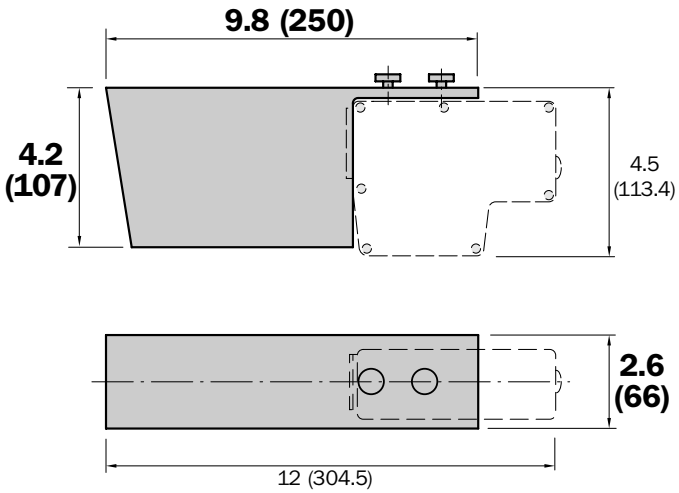
Special Accessories

Special Accessories - Dimensional Drawings and Order Information

Dust and Weather Protection Devices

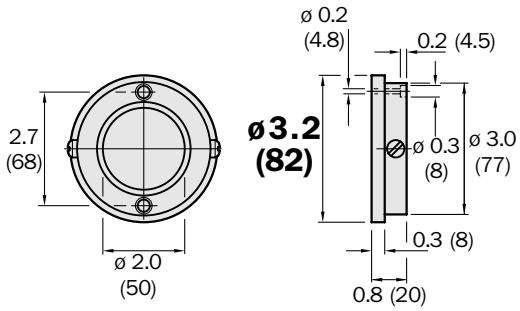
Dust Protection Tube for DME 2000/3000

Type	Part no.
OBS-DME	2 014 458



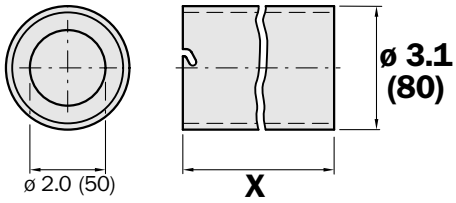
Front Flange for Dust Protection Tube, Weather Protection and Air-purging Unit for PL 50 A

Type	Part no.
FLV-PL 50	1 000 130



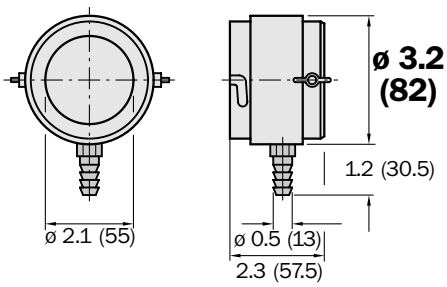
Dust Protection Tube for PL 50 A (with front flange 1 000 130), PL 53 A, SW 50

Type	Part no.	Length X
SST D0 80-090	1 000 252	90 mm
SST D0 80-184	1 000 134	184 mm
SST D0 80-314	1 000 133	314 mm



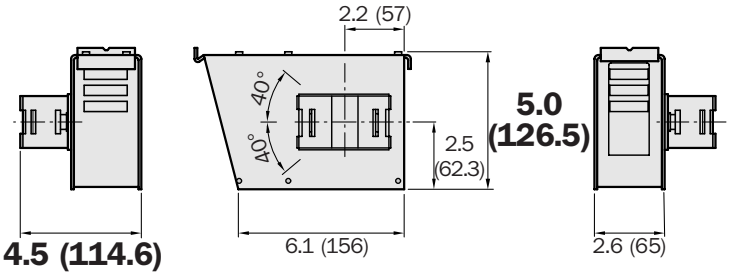
Front, Air-purged, for PL 50 A (only with front flange 1 000 130), PL 53 A, SW 50

Type	Part no.
SLV-PL 50	1 000 309

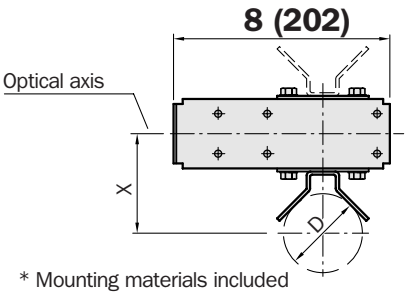


Weather Hood Housing for W 24-2, W 30, W 32, W 36, DS 60

Type	Part no.*
WSG1-01	1 018 470



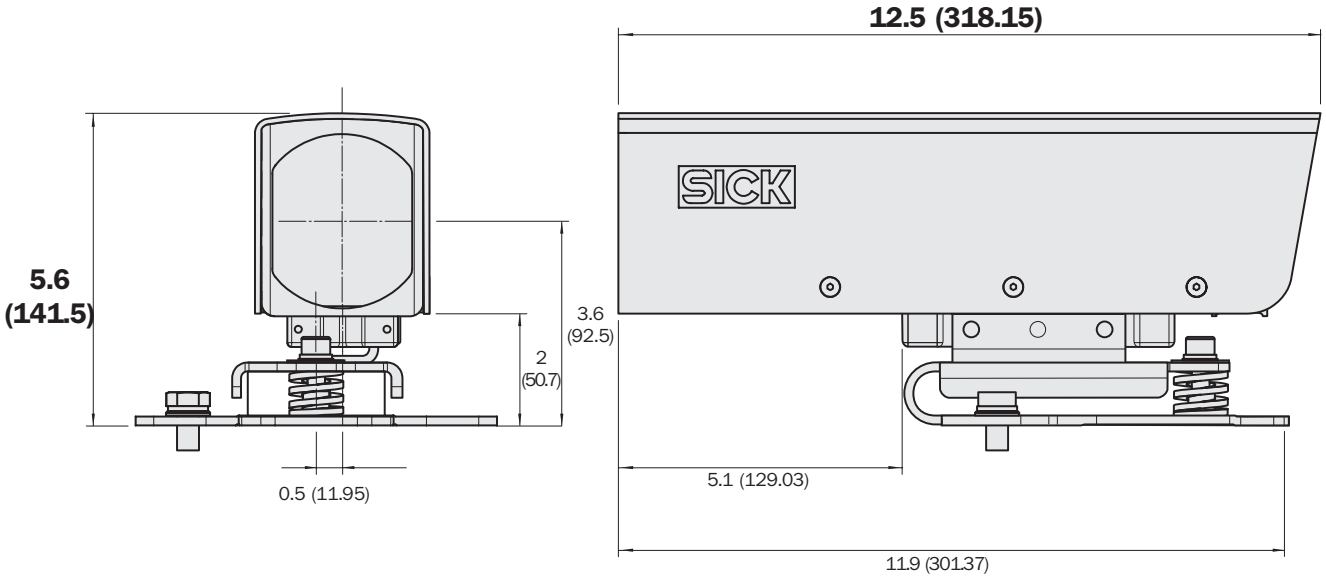
Bar-⌀ D	Distance X
48.0	74.2
60.3	82.9
76.1	94.1
88.9	103.1
108.0	116.6



* Mounting materials included

Weather Hood for DME 5000

Type	Part no.
WSG-DME5	2 027 800



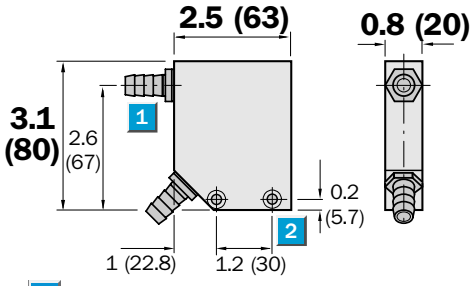
Special Accessories

Special Accessories - Dimensional Drawings and Order Information

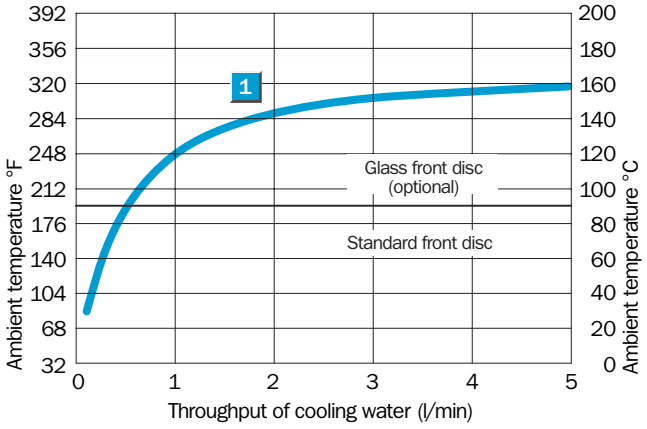
Equipment Cooling Devices

Cooling Plate for Water Cooling for W 24, WTA 24 (only with front flange 1 000 130)

Type	Part no.
BEF-KP-W 24	2 015 071



1 Hose nozzle R 1/4″
2 Tapped hole for countersunk screw M 5

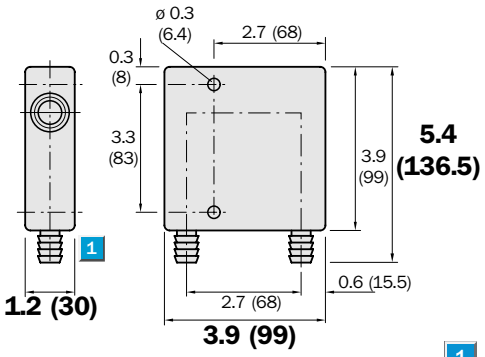


1 Temperature of cooling water 20 °C

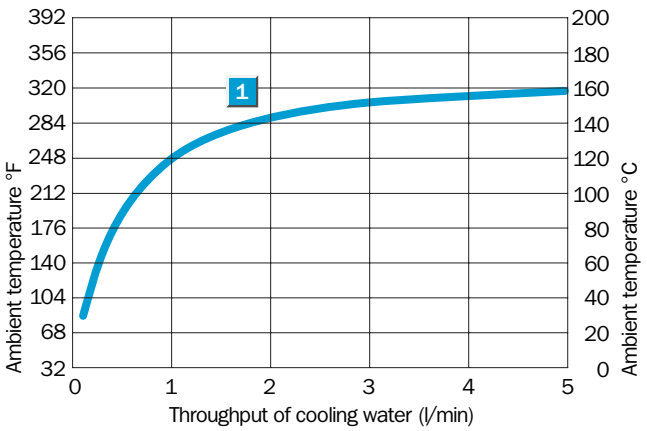
Cooling Plate for Water Cooling for W 45

Type	Part no.
BEF-KP-W 45	2 011 435*

* Including fixing screws



1 Hose nozzle R 1/2″

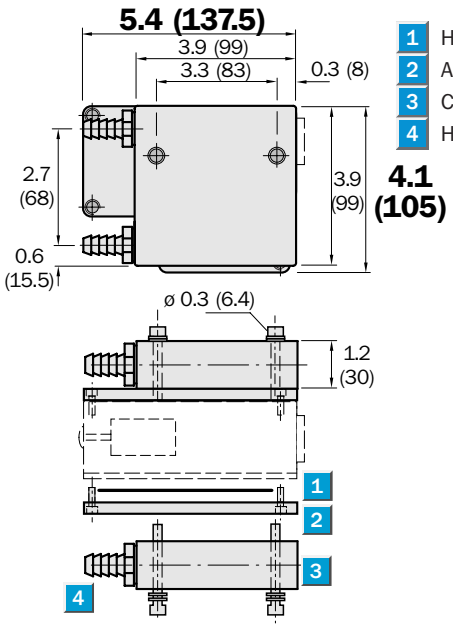


1 Temperature of cooling water 20 °C

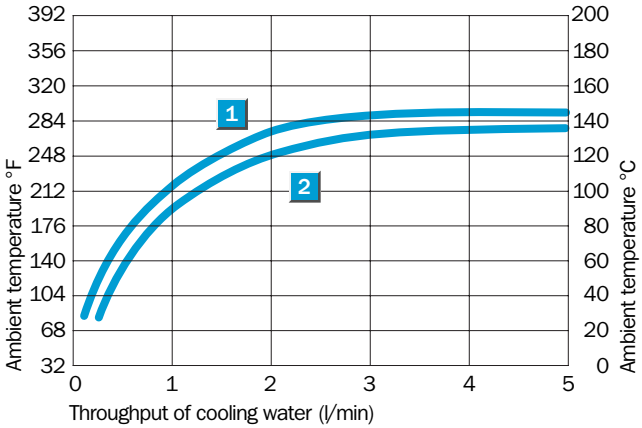
Cooling Plate Assembly Kit (complete*), for Water Cooling on Both Sides, for the DME

Type	Part no.
BEF-KPM-DME	2 014 457

* Including heat-conducting paste and fixing screws



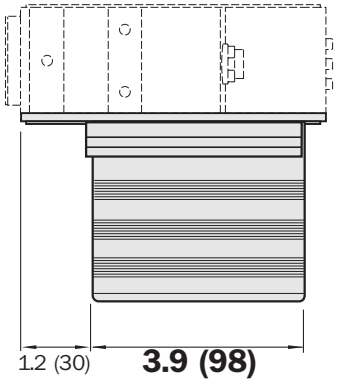
1 Heat-conducting cloth (2 x)
2 Adapter plate (2 x)
3 Cooling plate (2 x)
4 Hose nozzle R 1/2″



1 Temperature of cooling water 20 °C
2 Temperature of cooling water 30 °C

Peltier Cooling Unit with Lid for DME

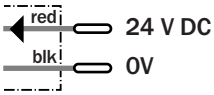
Type	Part no.
BEF-KE-DME	2 019 912

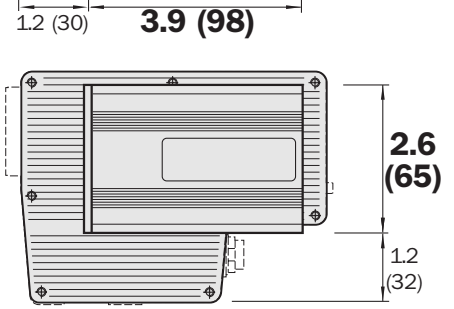


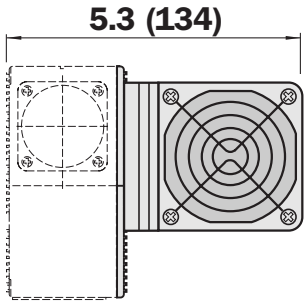
Technical Data

Supply voltage	24 V DC
Current rating	2 A
Ambient temperature	Operation: 131°F (55°C)
Connection type	Porcelain insulator

Connection Diagram

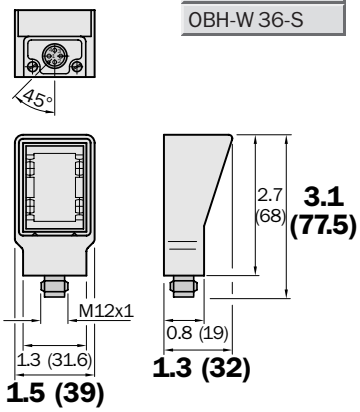






Heatable Front Glass for W 36

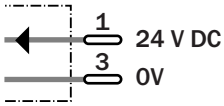
Type	Part no.
OBH-W 36-S	1 009 875



Technical Data

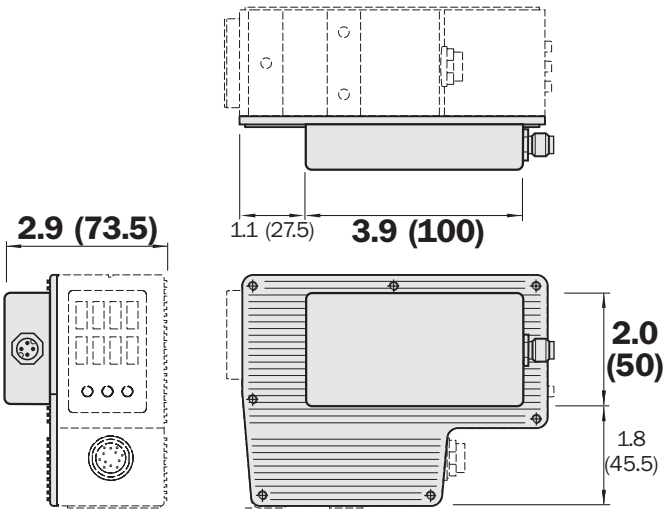
Supply voltage	24 V DC
Power consumption	1.4 W at 24 V
Connection type	M 12 plug and socket

Connection Diagram



Heating Element for DME

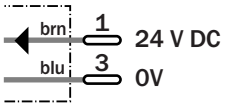
Type	Part no.
BEF-HE-DME	2 021 269



Technical Data

Supply voltage	24 V DC ± 20%
Current rating	< 400 mA
Ambient temperature	Operation: -18.4...104°F (-28…40°C)
Connection type	M12 plug and socket

Connection Diagram



Alignment Aid for DME 2000/3000

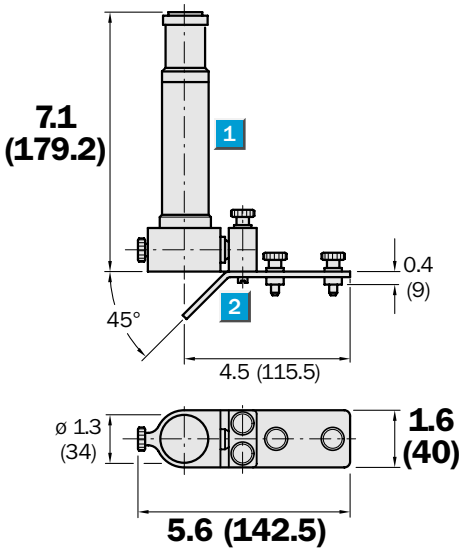
Consisting of:

1 Target Telescope

Type	Part no.
OBZ-DME	2 014 194

2 Adjustment Device for DME 2000/3000

Type	Part no.
OBZ-DME-J	2 014 191



EN 2

Special Accessories

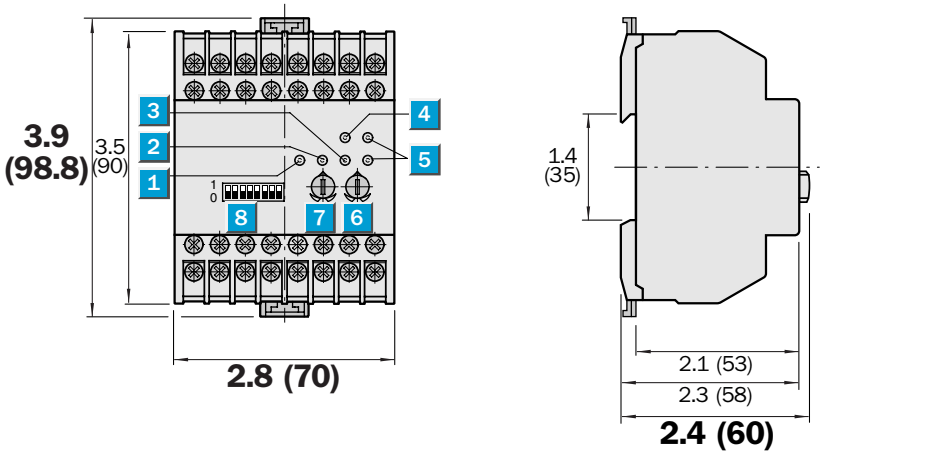
CE

Highlights

- Universal supply voltage
- Three inputs can be connected via DIP-switches
- Adjustable time stages
- Housing with snap fastening for support rail DIN 46277

EN 2-High Speed Logic Controller & Power Supply

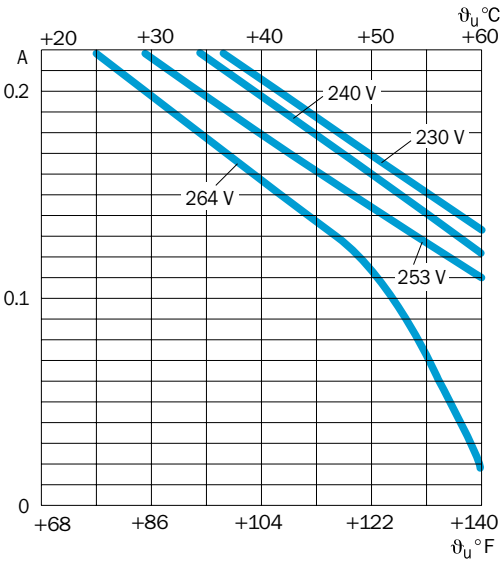
Dimensional Drawing



dimensions in inches (mm)

1	Display IN 1
2	Display IN 2
3	Display IN 3
4	Operating display
5	Display OUT (transistor/relay)
6	Time delay off t_2
7	Time delay on t_1
8	DIP switches F1 – F8

Load Curve - Output Current



Order Information

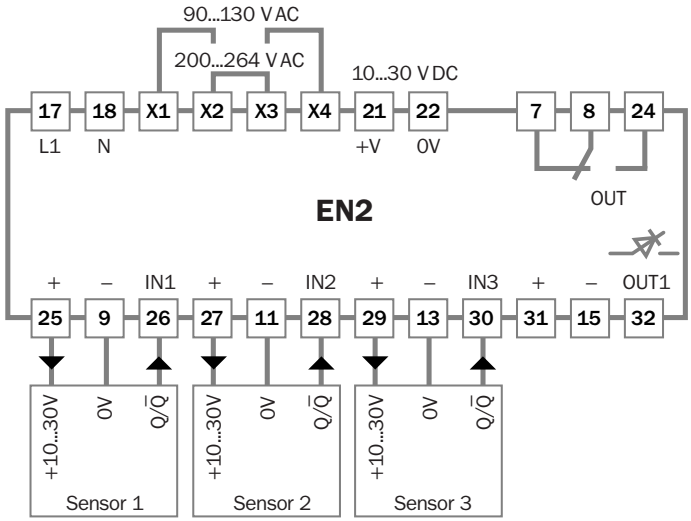
Type	Part no.
EN 2	6 009 654
EN 2T	6 010 342

Technical Data		EN 2	EN 2T
Supply voltage V_S	90…130 V AC or 200…264 V AC	■	■
	(can be reset using bridges)		
	10…30 V DC[1]	■	■
Mains frequency	48…62 Hz	■	■
Power consumption	Approx. 40 VA	■	■
Outputs			
Supply voltage for sensor	24 V DC ± 25%	■	■
Output current (total)	220 mA in total, see load curve	■	■
Transistor output	32 (OUT 1)	■	■
Switching current, max.	100 mA, short-circuit-resistant,	■	■
	display OUT, flashes on overload,		
	goes out if there is a short-circuit		
Switching frequency	10 kHz	■	■
Relay output	7/8/24 (OUT)	■	■
Switching voltage, max.	250 V AC	■	■
Switching current, max.	2 A	■	■
Switching frequency	10/s	■	■
Inputs	26 (IN 1) and 28 (IN 2) and 30 (IN 3)	■	■
	suitable for PNP, NPN[2] and B sensor		
	outputs		
Input voltage	10…30 V DC	■	■
HIGH	> 10 V DC	■	■
LOW	> 6 V DC	■	■
Minimum switching time	5 µs	■	■
Logic	Linking the 3 inputs and delay and	■	■
	storage modes via DIP-switches F1 – F8		
	(see truth table and function diagrams)		
Time stages			
Time delay on t_1	0.005…1 s, adjustable	■	■
Time delay off t_2	0.005…1 s, adjustable	■	
	1…120 s, adjustable		■
VDE protection class	⧈	■	■
Enclosure rating	IP 20	■	■
Ambient temperature	Operation -13...131°F (-25…55°C)	■	■
	Storage -40...158°F (-40…70°C)	■	■
Shock load	Complying with IEC 68	■	■
Approximate weight	14.1 oz (400 g)	■	■
Housing material	Plastic	■	■

1) Delivery 200…264 V AC

2) External pull-up resistor ≤ 10 kΩ required for NPN variant

Connection Type



SICK

Special Accessories

Truth Table

Logic module:
The logic input levels of the 3 inputs are linked together depending on the position of the 8 DIP switches F 1 – F 8 on the front of the equipment and immediately, or with a delay, produce a reaction at the output (which is formed in parallel as a relay and semiconductor output).

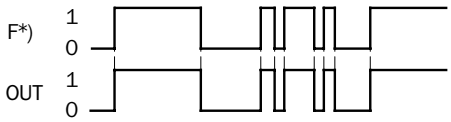
F 3	0	IN 1 normal		
	1	IN 1 inverted		
F 7	0	IN 2 normal		
	1	IN 2 inverted		
F 5	0	f (IN 1, IN 2) = IN 1 or IN 2		
	1	f (IN 1, IN 2) = IN 1 and IN 2		
F 8	0	**F 8 = 0**		
	1		**F 8 = 1**	
F 6	0	f (IN 1, IN 2, IN 3) = IN 3 or f (IN 1, IN 2)	IN 3 normal	
	1	f (IN 1, IN 2, IN 3) = IN 3 and f (IN 1, IN 2)	IN 3 inverted	
F 4	0	OUT 1 normal	**F 4 = 0**	
	1	OUT 1 inverted		**F 4 = 1**
F 1 **F 2**	0 0	**Mode 1** (no delay)	**Mode 5**	**Mode 9**
	0 1	**Mode 2** (switching on and switching off delay)	**Mode 6**	**Mode 10**
	1 0	**Mode 3** (dynamic delay)	**Mode 7**	**Mode 11**
	1 1	**Mode 4** (frequency discriminator)	**Mode 8**	**Mode 12**

Function Diagrams and Description of the Modes

F 8 = 0

Delay Modes

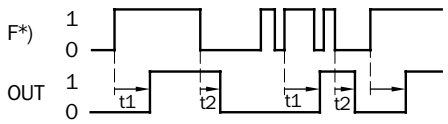
Mode 1 — F 1 = 0 — F 2 = 0



No Delay

Output OUT follows the logic linking of the inputs IN 1, IN 2 and IN 3 F*) without delay.

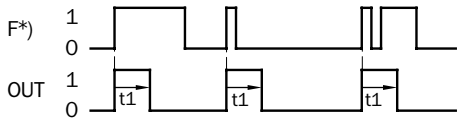
Mode 2 — F 1 = 0 — F 2 = 1



Delay Switching On and Switching Off

Output OUT follows with a delay in response and drop-out time F*). F*) must be high for a minimum of t_1 for OUT to react. If F*) is LOW, t_1 is reset. When t_1 elapses, OUT responds, the oscillator is stopped for t_1. If then F*) is low again, t_2 begins to run, after the end of which OUT becomes inactive. If F*) goes high again during t_2, t_2 is reset and begins to run again at F*) = LOW. Both times t_1 and t_2 can therefore be retriggered.

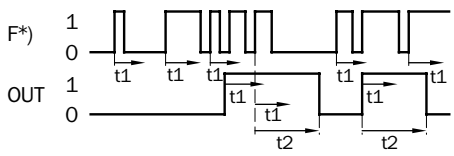
Mode 3 — F 1 = 1 — F 2 = 0



Dynamic Delay

Output OUT is set with a rising signal edge of F*) for the duration of t_1. This time cannot be retriggered here.

Mode 4 — F 1 = 1 — F 2 = 1



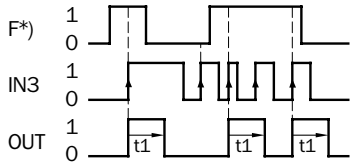
Frequency Discriminator

The time stage t_1 is set by the first rising signal edge of F*). If a further rising signal edge of F*) occurs within the course of t_1, OUT is set for the duration of t_2 and t_1 is retriggered simultaneously. All further rising signal edges of F*), if they arrive within the course of t_1, retrigger both t_1 and t_2. In practice, t_2 should always be set greater than t_1. If t_1 has elapsed but t_2 has not yet done so, t_2 is not retriggered by the next rising signal edge of F*).

This function produces a frequency discriminator for the setting $t_2 > t_1$: If the duration of the period T of the input frequency of F*) is less than t_1, OUT always goes to HIGH; if T is or becomes greater than t_1 OUT remains or becomes LOW.

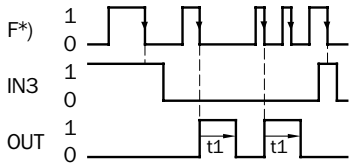
F*) logic link of the inputs: F = f (IN 1, IN 2, IN 3)

	F 8 = 1	F 4 = 0	Memory Modes
Mode 5	F 1 = 0	F 2 = 0	



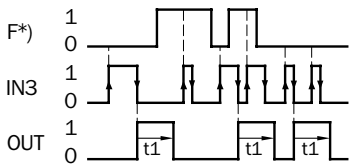
If during the rising signal edge of IN 3, the link F*) is HIGH, the output OUT is set with this signal edge for the time t_1.

Mode 6	F 1 = 0	F 2 = 1	



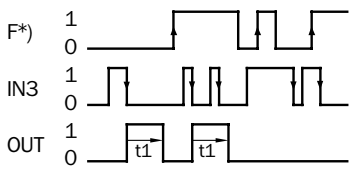
If during the falling signal edge of F*), IN 3 is not HIGH, the output is set for the duration of t_1.

Mode 7	F 1 = 1	F 2 = 0	



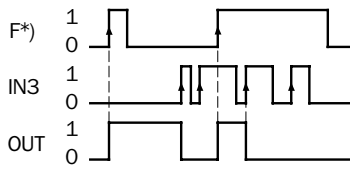
If F*) was not HIGH during the rising signal edge of IN 3, the output is set for the time t_1 with the falling signal edge of IN 3.

Mode 8	F 1 = 1	F 2 = 1	



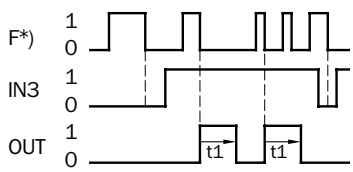
If no rising signal edge of F*) occurs during the HIGH time of IN 3, the output is set for the duration of t_1 by the falling signal edge of IN 3.

	F 8 = 1	F 4 = 1	Memory Modes
Mode 9	F 1 = 0	F 2 = 0	



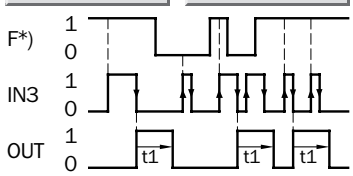
A rising signal edge of F*) sets the output; a rising signal edge of IN 3 resets it (signal edge-controlled RS-flipflop).

Mode 10	F 1 = 0	F 2 = 1	



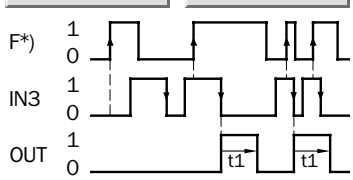
If IN 3 is HIGH during the falling signal edge of F*), the output is set for the duration of t_1 (i.e. as mode 2, but used inverted in IN 3).

Mode 11	F 1 = 1	F 2 = 0	



If F*) was not HIGH when the signal edge of IN 3 was rising, as the signal edge of IN 3 falls, the output is set for the time t_1 (as mode 3, F* used inverted).

Mode 12	F 1 = 1	F 2 = 1	



If no rising signal edge of F*) occurs during the HIGH time of IN 3, the output will be set for the duration of t_1 during the falling signal edge of IN 3.

F*) logic link of the inputs: F = f (IN 1, IN 2, IN 3)

SICK

EN 3

Special Accessories

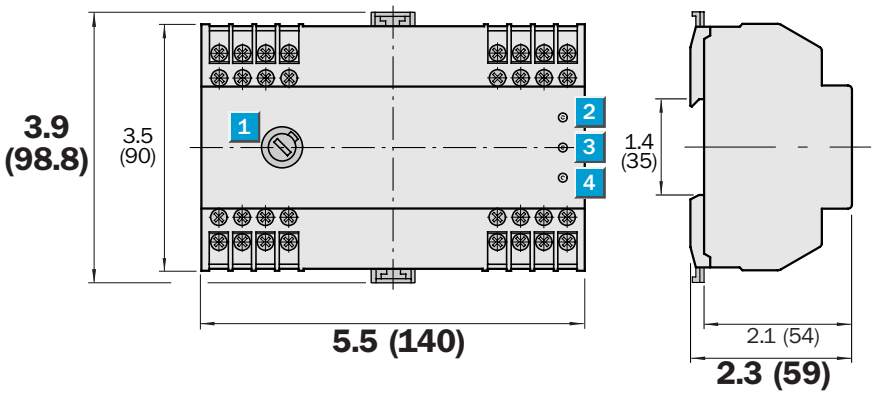
CE

Highlights

- Universal supply voltage
- Two inputs each with a relay output
- Housing with snap fastening for support rail DIN 46277

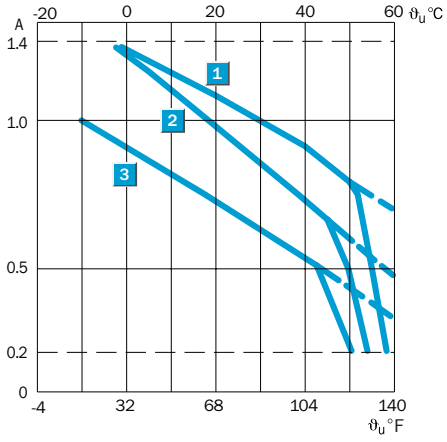
EN 3-Dual Voltage Power Supply

Dimensional Drawing



dimensions in inches (mm)

Load Curve - Output Current



1 Fuse (250 V/0.25 A)
2 Display IN 1
3 Operating display
4 Display IN 2

Order Information

Type	Part no.
EN 3	6 009 692

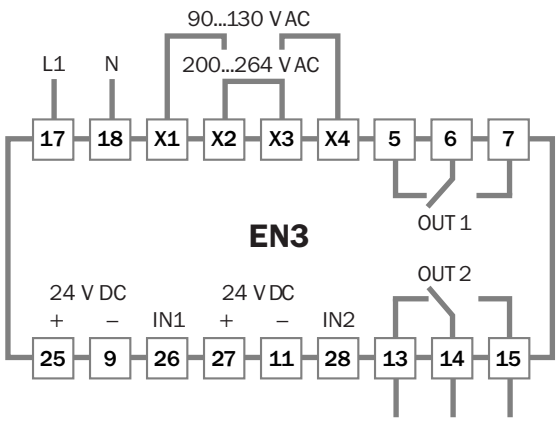
Technical Data

Supply voltage V_S	90 ... 130 V AC or 200 ... 264 V AC[1]
	(can be reset using bridges)
Mains frequency	48 ... 62 Hz
Power consumption	env. 40 VA
Outputs	
Supply voltage for sensor	24 V DC ± 25%
Output current (total)	1.4 A in total, see load graph,
	output current
Min. load	200 mA
Relay output	5/6/7 (OUT 1) and 13/14/15 (OUT 2)
Switching voltage, max.	250 V AC
Switching current, max.	2 A
Switching frequency	20/s
Inputs for PNP, NPN[2] and B	
sensor inputs	26 (IN 1), 28 (IN 2)
Input voltage	10 ... 30 V DC
HIGH	> 10 V DC
LOW	< 6 V DC
VDE protection class[1]	⧈
Enclosure rating	IP 20
Ambient temperature	Operation -13...131°F (-25...55°C)
	Storage -40...158°F (-40...70°C)
Shock load	Complying with IEC 68
Approximate weight	34.2 oz (970 g)
Housing material	Plastic

1) Delivery 200 ... 264 V AC

2) External pull-up resistor ≤ 10 kΩ required for NPN variant

Connection Type



SICK

EN 2 Ex

Special Accessories

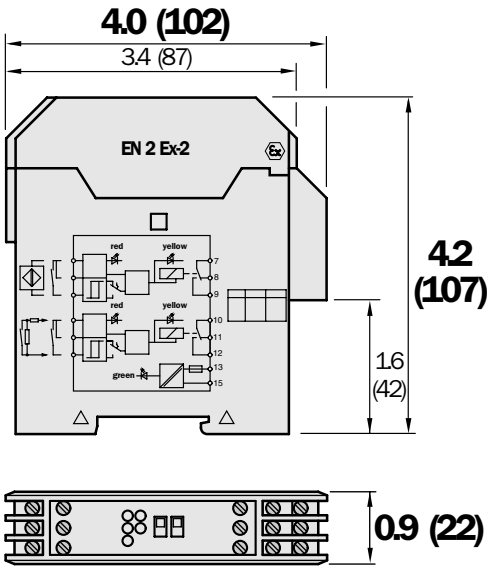
CE

Highlights

- Reliable DC-decoupling between input, output and supply voltage in accordance with VDE 0100 Part 410
- 2-channel with one relay output SPDT respectively
- For 230 V AC, 115 V AC or 24 V DC
- Intrinsically safe inputs complying with [EEx 1a] IIC
- Housing with snap fastening for support rail DIN 46277

EN 2 Ex-Power Supply for NAMUR Sensors

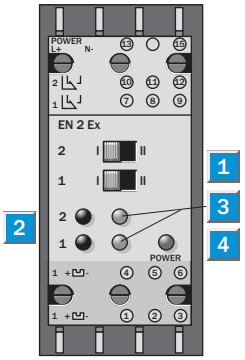
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Light/dark change-over switch to reverse the active direction between input circuit and output.

2 LED (red) signalling for line monitoring.The activation of line break and line short-circuit monitoring can only function if a sensor complying with EN 50227 or NAMUR, or a mechanical contact with a corresponding resistance circuit is connected. This circuit monitors the input current and switches the output off for input currents < 0.3 mA line break and > 6.5 mA/independently of short circuits from the point when the active direction is set.

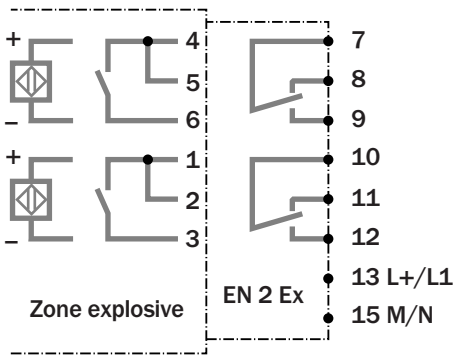
3 LED (yellow) function display.
This LED is triggered in parallel with the output.

4 LED (green) operating display.

Order Information

Type	Part no.
EN 2 EX-1	6 010 459
EN 2EX-2	6 010 460
EN 2EX-3	6 009 944

Connection Type



Technical Data	EN 2 Ex-	-1	-2	-3
Supply voltage V_S	115 V AC	■		
	230 V AC		■	
	24 V DC			■
Mains frequency	48 ... 62 Hz	■	■	
Power consumption per channel	Approx. 1.5 VA	■	■	
	Approx. 0.7 W			■
Inputs	For 2 sensors or one through beam	■	■	■
	photoelectric switch			
	(transmitter and receiver)			
No load voltage	8.5 V DC	■	■	■
Switching points	0: I ≤ 1.55 mA	■	■	■
	1: I ≥ 1.75 mA	■	■	■
Short-circuit current	I ≥ 6 mA	■	■	■
Permissible external capacitance	max. 567 nF	■	■	■
Permissible external inductance	max. 5 mH	■	■	■
Switching outputs[1]	1 relay per input: SPDT	■	■	■
Switching voltage $U_{max.}$	250 V AC	■	■	■
Switching current $I_{max.}$	5 A	■	■	■
Switching output $P_{max.}$	100 VA	■	■	■
Permit	PTB-no. Ex-95.C.2003X	■	■	■
VDE protection class	I	■	■	■
Enclosure rating	IP 20	■	■	■
Ambient temperature	Operation -13...140°F (-25...60°C)	■	■	■
	Storage -13...185°F (-25...85°C)	■	■	■
Approximate weight	8.8 oz (250 g)	■	■	■
Housing material	Plastic	■	■	■

1) Provide suitable spark extinguishing system for inductive or capacitive loads

Transmission Characteristics	
Active direction	
(light/dark switching):	Can be changed over (see table)
Cable monitoring:	Can be switched off
Max. switching frequency:	20 Hz

Table of Switching Functions

Input		Active direction light/dark change-over switch on		Cable monitoring		Output status	
		I	**II**		Red LED	Relay	Yellow LED
No fault in input circuit	Contact open	Normal		as desired	off	dropped off	off
			Inverted	as desired	off	responded	on
	Contact closed	Normal		as desired	off	responded	on
			Inverted	as desired	off	dropped off	off
With fault in input circuit	Cable break	Normal		on	on	dropped off	off
			Inverted	on	on	dropped off	off
	Short-circuit	Normal		on	on	dropped off	off
			Inverted	on	on	dropped off	off
	Cable break	Normal		off	off	dropped off	off
			Inverted	off	off	responded	on
	Short-circuit	Normal		off	off	responded	on
			Inverted	off	off	dropped off	off

MVE 1 Power Supply

Special Accessories

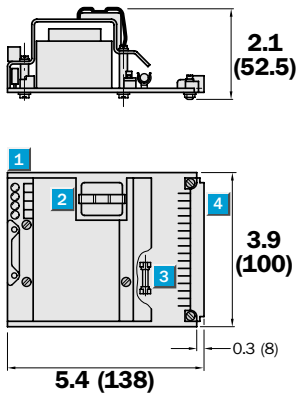
Highlights

- Power supply units for NT 6, NT 8 contrast scanners
- Snap-rail assembly or European card (shortened) 100 x 130 mm with VG-strip complying with DIN, 32 pin, a and c occupied
- Plug-in card holder for wall mounting, connection at the front
- Mains voltage, selectable
- Lamp voltage 4.5 V, 1 A
- Relay output

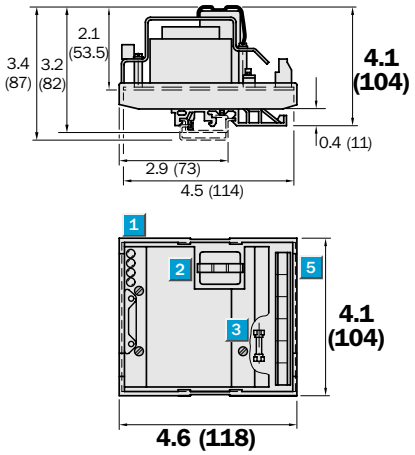
MVE 1-Power Supply

Dimensional Drawing

MVE 1-150



MVE 1-250



1 Indicator lights
2 Relay (plug-in type)
3 Fuse (NT 8 transmission bulb)
4 Spring strip DIN 41612, shape D
5 Terminals

Input Functions

Reset input RS

The memory is reset via a HIGH signal to RS. The RS input takes precedence over all other inputs.

Short distance scanner $\overline{NT}$

The memory is set with a LOW signal to NT. If not reset by an RS command (machine contact), NT can be linked to RS.

External circuit FS

The memory is set by a LOW signal to FS. FS is only effective for machine-controlled resetting.

Long distance scan input $\overline{AT}$

Sentence commands to $\overline{NT}$ and $\overline{FS}$ are ignored if there is a LOW signal at AT.

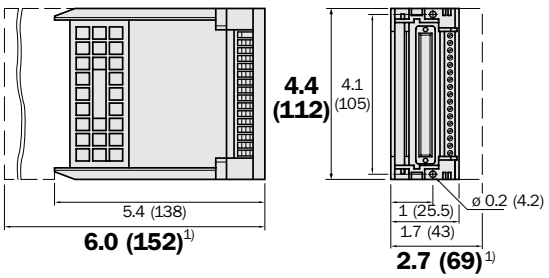
Order Information

Type	Part no.
MVE 1-150	1 008 964
MVE 1-250	1 010 494
BEF-FL-MVE	6 000 353

Accessories

Accessory for MVE 1-150

Card Holder BEF–FL-MVE



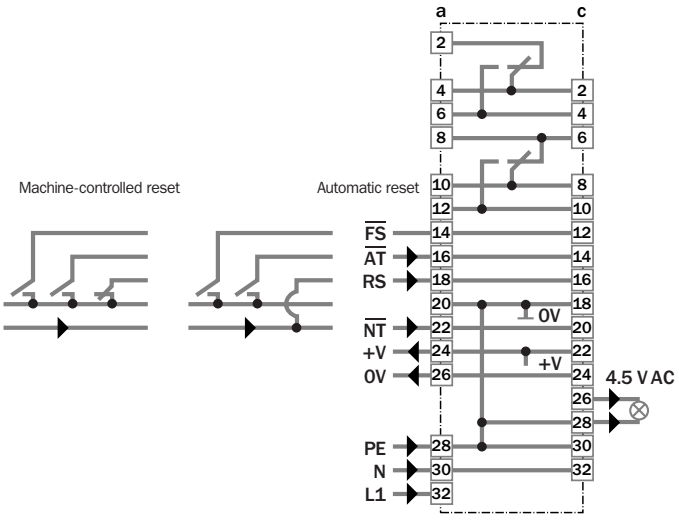
1) With power supply unit inserted

Technical Data	MVE 1-	150	250
Assembly	In card holder	■	
	On snap rail		■
Supply voltage V_S	AC 100, 110, 120, 200, 220[1], 240	■	■
	+ 10 % – 15 %		
Power consumption	Approx. 10 VA	■	■
Outputs			
Voltage output for sensor	24 V DC + 5% – 15%	■	■
Output current I_A max.	80 mA	■	■
Voltage output for NT 8	4.5 V AC	■	■
transmission bulb			
Output current	1 A	■	■
Relay output	2 x SPDT	■	■
Switching voltage max.	250 V AC	■	■
Switching current max.	10 A	■	■
Switching power max.	650 VA (AC), 240 W (24 V DC),	■	■
	48 W (48 V DC)		
Inputs	NT, FS, AT, RS	■	■
Input voltage HIGH	≥ 10…≤ 24 V	■	■
Input voltage LOW	≤ 2 V	■	■
Input current LOW	1 mA	■	■
Time periods			
Time delay on	0.1…2.5 s	■	■
Time delay off	0.1…2.5 s	■	■
Pulse responding	0.1…2.5 s	■	■
Pulse dropping off	0.1…2.5 s	■	■
Enclosure rating	IP 00	■	■
Ambient temperature	Operation -4...149°F (-20…65°C)	■	■
	Storage -4...167°F (-20…75°C)	■	■
Shock load	Complying with IEC 68	■	■
Approximate weight	22.2 oz (630 g)	■	■

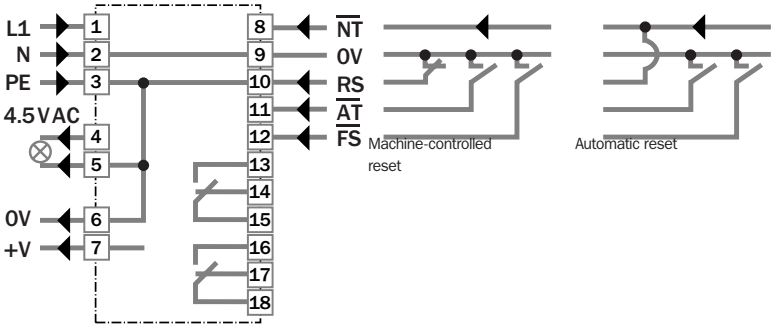
1) Default setting

Connection Type

MVE 1-150



MVE 1-250



SICK

PS 24

Special Accessories

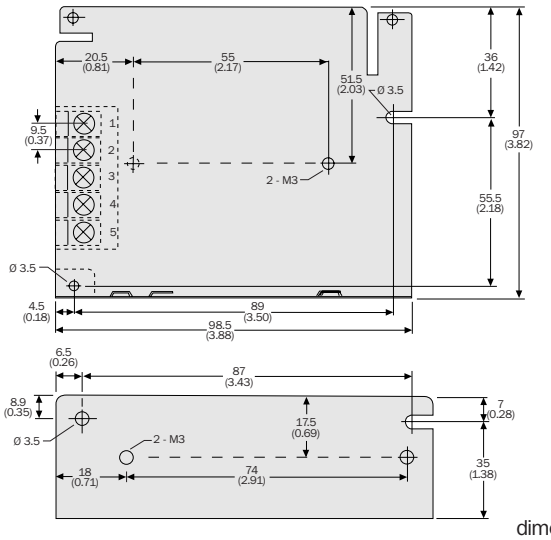
CE

Highlights

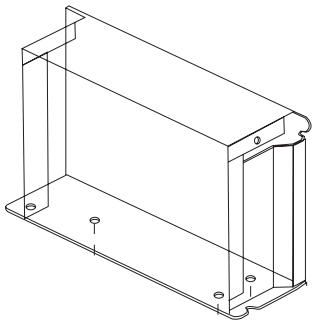
- Low-cost, high efficiency power supply
- Universal AC input
- Compact size
- Power indicator
- DIN rail mountable
- 24 v DC at 1.1 A

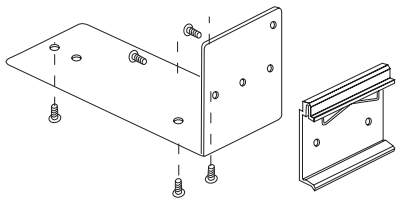
PS 24-Power Supply

Dimensional Drawing



dimensions in inches (mm)





Order Information	
Type	**Part no.**
PS 24-25	7 025 584

Technical Data	PS 24-	-25								
Supply voltage V_S	85...264 V AC universal									
Frequency	47...440 Hz									
Power consumption	25 Watts									
Voltage output	24 V DC									
DC output voltage adjustable	23...30 V DC									
Output current	1.1 A									
Line regulation	±0.5% Max.									
Load regulation	±0.5% Max.									
Over voltage protection	115%...165% of output voltage									
Overload protection	105%...150% output pulsing mode									
Ambient temperature	Operation 14...140°F (-10…60°C)									
Approximate weight	1 lb (485 g)									
DIN rail mounting track DRT-35	5 303 710, sold in 1 m lengths									

ASI Modules

Special Accessories

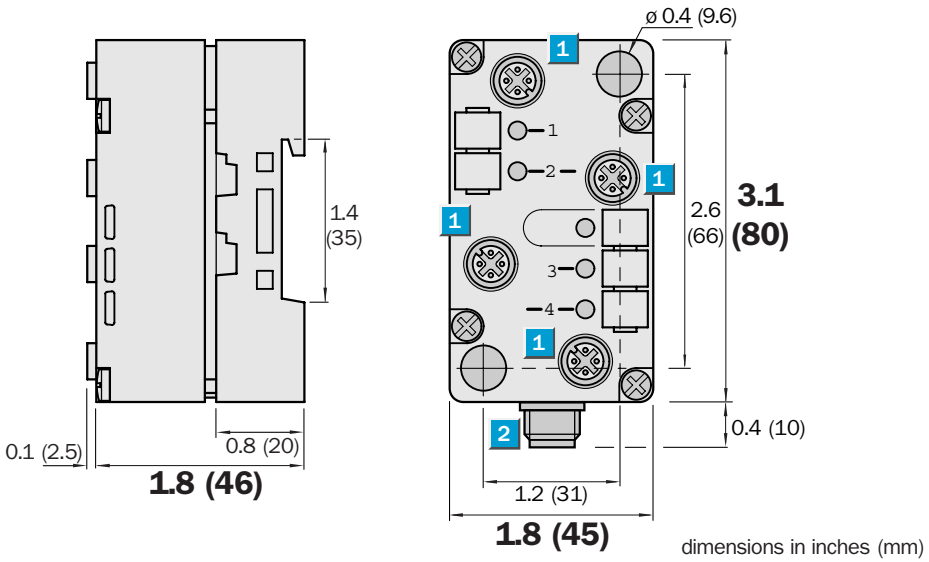
CE

Highlights

- 2 models
  - with 4 inputs
  - with 2 inputs and 2 outputs
- Can be mounted using 2 x 9.6 mm diameter tapped holes or attached to a din rail

ASI Modules

Dimensional Drawing



dimensions in inches (mm)

1 For plug and socket connections M 12 x 1
2 Only on ASI-module AM 2E2A for external voltage

Order Information	
Type	**Part no.**
ASI-AM 2E2A	6 009 934
ASI-AM 4E	6 009 933

Accessories	page
Cables and connectors	

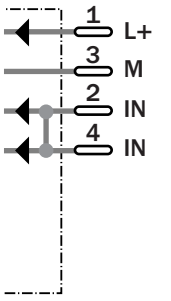
Technical Data	ASI/-AM-	2E2A	4E
Socket connection	Complying with ASI specification	■	■
LOW signal	≤ 1.5 mA	■	■
HIGH signal	≥ 10 V/≥ 5 mA	■	■
Voltage range	20…30 V DC	■	■
Logic allocation			
Socket 1 (data bit D_0)	Input 1	■	■
Socket 2 (data bit D_1)	Input 2	■	■
Socket 3 (data bit D_2)	Output (relay) 1	■	
	Input 3		■
Socket 4 (data bit D_3)	Output (relay) 2	■	
	Input 4		■
Operating voltage V_S	26.5…31.6 V DC	■	■
Power consumption	≤ 140 mA	■	
	≤ 120 mA		■
Inputs			
Switch level – HIGH 1	≥ 10 V	■	■
Input current LOW/HIGH	≤ 1.5 mA/≥ 5 mA	■	■
Voltage range	20…30 V	■	■
Ability to withstand current	200 mA[1)]	■	■
Outputs	Relay 24 V	■	
Ability to withstand current DC 12 V	1 A (max. 2 A)	■	
External supply voltage	Via plug 5	■	
Enclosure rating	IP 67	■	■
Ambient temperature	Operation -13...185°F (-25…85°C)	■	■
	Storage -40...185°F (-40…85°C)	■	■

1) Short-circuit resistant

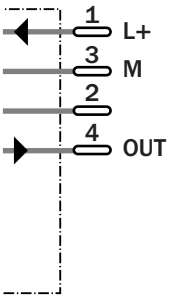
Connection Type

ASI-AM 2E2A

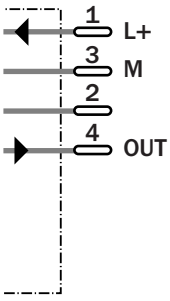
Socket 1 and 2 — Input 1 and 2



Socket 3 and 4 — Output 1 and 2

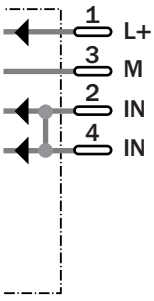


Plug 5 — Ext. voltage



ASI-AM 4E

Socket 1 – 4 — Input 1 – 4



SICK

ASI Addressing Unit

Special Accessories

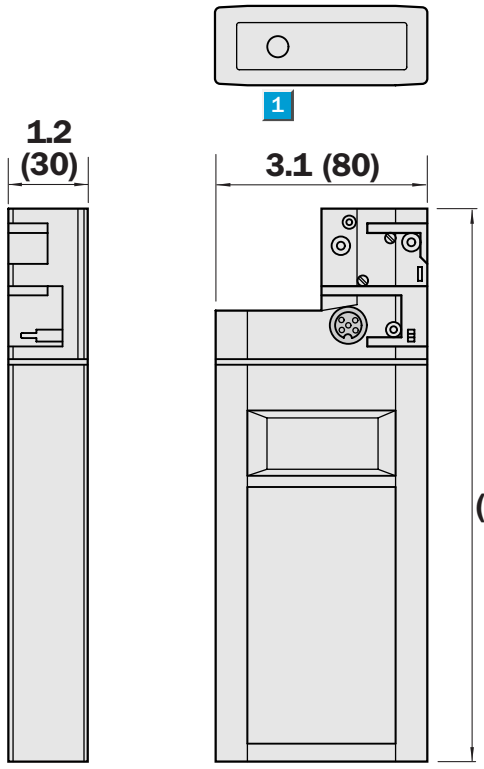
CE

Highlights

- Determination of slave address
- Readdressing with check
- Slave connection is short circuit protected and overload resistant
- LCD display
- Error analysis

ASI

Dimensional Drawing



dimensions in inches (mm)

1 Load socket

Order Information

Type	Part no.
ASI-PM 1	6 009 935

Technical Data	ASI-	PM 1
Display	LCD, 13 mm digit height	
Keypad	Membrane keypad, 4 keys	
Interface[1]	ASI	
Power supply	Battery operated[2]	
Charger	Plug-in charger 230 V AC	
Operating period	8 h/≥ 250 read/write procedures	
Enclosure rating	IP 20	
Ambient temperature	Operation 32...122°F (0…50°C)	
	Storage -4...131°F (-20…55°C)	
Approximate weight	19.4 oz (550 g)	

1) Short-circuit proof and overload-resistant (slave connection)

2) Use charger (charging time approx. 14 h)

Fault Messages

F 1 = Overload of the ASI supply

F 2 = Slave not connected or defective

F 3 = Fault in slave programming

LOBAT = **Charge battery!** After being displayed once, a further approx. 30 reading or addressing procedures are possible. Only charge the battery with the charger supplied

Status Display

÷ = The address displayed is identical to the last slave address determined or the pre-programmed one.

Operation

The unit is switched on using the "ADR" key. It switches off automatically if it is unused for a period of approximately 1 minute.

- The current slave address appears on the display when the "ADR" key is pressed.
- The two keys "↑" and "↓" are used to select the new address to be programmed from the address loop (i.e. 31…0…31)

  Tapping the keys advances in single steps, a longer press scrolls the addresses (0.5 s per address).
- The new address is loaded into the slave by pressing the "PRG" key. If the address is programmed without any errors, it is displayed automatically after approximately 0.5 s (the display is empty during this period.)
- If "ADR" and "PRG" are pressed simultaneously for longer, address 0 is automatically programmed into the slave.
- No other key combinations trigger any action
- **WARNING! Charge battery before using for the first time.**

ASI EN 8

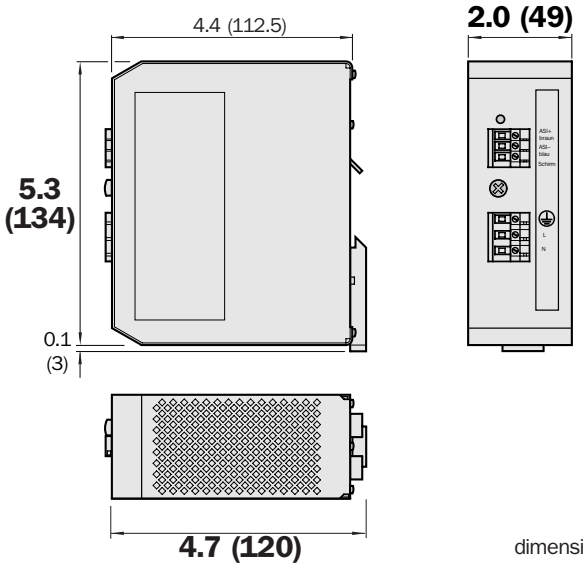
Special Accessories

Highlights

- Stable voltage output
- Simple assembly on DIN support rails TS 35
- Compensation of voltage fluctuations
- Overvoltage and short circuit protected
- Mains input and DC output electrically insulated

ASI EN 8

Dimensional Drawing



dimensions in inches (mm)

Technical Data

Technical Data	ASI-	EN 8										
Input voltage	100…127 V AC, switch position 115 V											
	220…240 V AC, switch position 250 V[1]											
Nominal frequency of mains	47… 63 Hz											
Voltage output[2]	30.55 V DC											
Output current	2.8 A											
Output power	85.4 W											
Derating	3 W/k at 140...158°F (60…70°C)											
Operating display	LED display, green											
Connection terminals[3]												
Input	Per 1 terminal, max. 2.5 mm²											
Output	Per 2 terminals, max 2.5 mm²											
Ambient temperature	Operation 32...158°F (0…70°C)											
	Storage -4...176°F (-20…80°C)											
Approximate weight	19.4 oz (550 g)											

1) 230 V set
2) Output-overload protected, short circuit-protected and no load-resistant
3) Ability of contact to withstand loading, max. 10 A at +70 °C

Order Information

Type	Part no.
ASI-EN 8	6 009 936

ASI Clip

ASI Clip

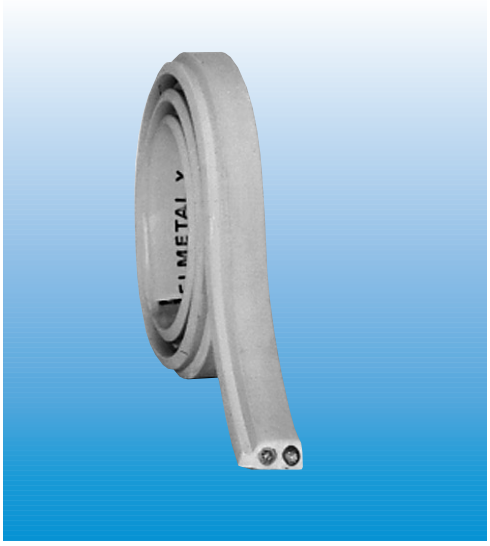
Technical Data

Dimensions	1.9 x 1.3 x 0.6 in (48 x 34 x 14 mm)
Current	Min. 5 mA/max 120 mA
Voltage	Max. 50 V
Cable cross-section	0.009 in^2 /0.01 in^2 (0.24 mm^2/0.35 mm^2)
Enclosure rating	IP 52
Ambient temperature	Operation 50...131°F (10…55°C)
	Storage -13...167°F (-25…75°C)

Order Information

Type	Part no.
ASI-AD	2 016 755

Cable



Technical Data

Pulse cable	Brown
Negative cable	Blue
Sheath color	Yellow
Wall thickness	0.02 in (0.5 mm)
Voltage rating	300 V
Test voltage	1.5 kV
Ambient temperature	Operation -22...194°F (-30…90°C)

Order Information

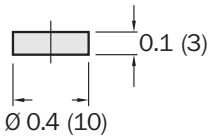
Type	Part no.
ASI-LTG	6 009 638

Special Accessories

Magnets - Dimensional Drawings and Order Information

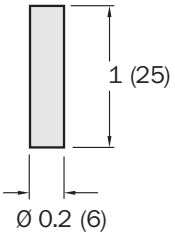
Magnet (M1.0)	
Type	**Part no.**
MAG-1003-S	7 901 782

- Samarium-cobalt
- Temperature resistance -58...356°F (-50...180°C)



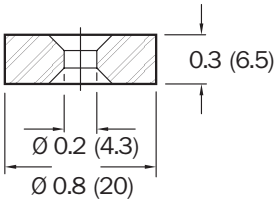
Magnet (M2.0)	
Type	**Part no.**
MAG-0625-A	7 901 783

- AlNiCo
- Temperature resistance -148...842°F (-100...450°C)



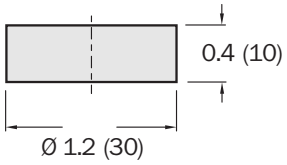
Magnet (M3.0)	
Type	**Part no.**
MAG-2006-B	7 901 784

- Barium ferrite
- Temperature resistance -13...266°F (-25...130°C)



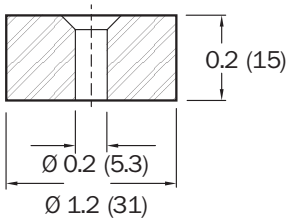
Magnet (M4.0)	
Type	**Part no.**
MAG-3010-B	1 002 314

- Barium ferrite
- Temperature resistance -13...266°F (-25...130°C)



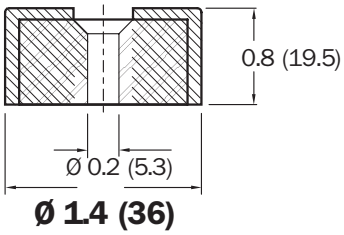
Magnet (M5.0)	
Type	**Part no.**
MAG-3015-B	7 901 786

- Barium ferrite
- Temperature resistance -13...266°F (-25...130°C)



Magnet (M5.1)	
Type	**Part no.**
MAG-3515-B	7 902 086

- Barium ferrite with plastic jacket



Fiber Optic Cables - Proximity System

Fiber Optic Cables - Through Beam System

Fiber optic systems: Bending light the easy way

Sensors which are used in fully automatic production processes must be compact and extremely powerful. However, many situations demand more complex solutions. For example, if not enough space is available or a reduction in weight is necessary. Also if the environment of the device is subject to severe vibrations, electromagnetic interference or excessive temperatures. Once again, SICK has the answer: fiber optic systems. SICK offers an extensive range of both pre-assembled fiber optic cables and cables which can be adapted and cut to length to meet your own specific needs. Cables are available with plastic or metal jackets, plug or screw connections, and a wide selection of different end sleeves.

The different types of fiber optic cables are distinguished by their jacket and the number, as well as arrangement, cross section and material of the optical fibers. Glass fiber optic cables can be used in temperatures of up to 315 °C. Fiber optic cables with plastic fibers can usually be shortened to any length and their bending radii are smaller.

Assignment of systems to fiber optic cable types:

- **LL3-D:**
  Standard proximity system
  (from page 982)
  – tip adapters as accessories,
  – plastic fibers and jackets,
  – in most cases can be cut to any length,
  – approx. 25 variants, each optimized for different physical loads and installation dimensions.
- **LL3-T:**
  Standard through beam system
  (from page 984)
  – tip adapters as accessories,
  – plastic fibers and jackets,
  – in most cases can be cut to any length,
  – approx. 25 variants, each optimized for different physical loads and installation dimensions.
- **LT: Proximity system**
  (from page 1004)
  – glass fibers in chromium-plated metal jackets.
- **LM: Through beam system**
  (from page 1004)
  – glass fibers in metal jackets and PVC coating.
- **LBS/LSS: Proximity system**
  (from page 1000)
  – glass fibers in stainless steel jackets,
  – Ambient operating temperature -72 to 599°F (-58 to 315°C).
- **LIS: Through beam system**
  (from page 1001)
  – glass fibers in stainless steel jackets,
  – Ambient operating temperature -72 to 599°F (-58 to 315°C).
- **LLUV: Proximity system**
  (from page 1007)
  – UV fiber-optic cable.

WLL 160(T)

WLL 160
with LL 3 fiber optic cable, plastic
- manual sensitivity adjustment,
- alarm output and test input,
- timer 0 to 100 ms,
- light/dark switching.

WLL 160T
with LL 3 fiber optic cable, plastic
- teach-in sensitivity adjustment, via button on device or externally via control signal,
- switching frequency 830/s or 1,600/s, switch-selectable,
- timer.

WLL 170(T)

WLL 170
with LL 3 fiber optic cable, plastic
- manual sensitivity adjustment,
- red light LED sender,
- large scanning ranges,
- timer and L.ON-/D.ON selector.

WLL 170 high-speed
with LL 3 fiber optic cable, plastic
- high-speed 10,000/s,
- red light LED sender,
- timer and L.ON-/D.ON selector.

WLL 170 analog
with LL 3 fiber optic cable, plastic
- analog output voltage 1 to 5 V,
- red light LED sender,
- variable gain.

WLL 170T
with LL 3 fiber optic cable, plastic
- teach-in sensitivity adjustment via button on device,
- large scanning ranges,
- red light LED sender,
- optional: anti-interference.

WLL 170T mark sensor
with LL 3 fiber optic cable, plastic
- teach-in sensitivity adjustment via button on device,
- green light LED sender,
- optional: anti-interference.

WLL 12

with LL 3, LT, LM fiber optic cable
- red, infrared or green light LED sender,
- complementary switching outputs, selectable via control cable,
- switching frequency: 1,300/s.

WLL 1000/WLL 2000

with LBS, LIS fiber optic cable
- direct voltage supply,
- cable chamber or M12 plug,
- test input.
- universal voltage supply, relay switching output

WLL 260

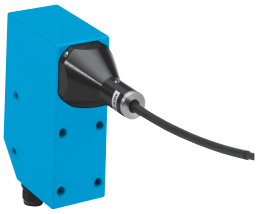
WLL 260 DC
with LBS, LIS fiber optic cable
- direct voltage supply,
- terminal chamber or M12 plug,
- test input.

WLL 260 UC
with LBS, LIS fiber optic cable
- universal voltage supply,relay switching output,
- terminal chamber.

KTL 5G-2

with LBS, LIS, LSS fiber optic cable
- green light LED sender,
- switching frequency 10,000/s.

LUT



LUT 3-820
with LLX 3 fiber optic cable
- UV light source,
- supplementary optical filter.

LUT 1-4
with LLUV 5 fiber optic cable
- UV light source with high-pressure mercury-vapor burner,
- supplementary optical filter.

CSL

with LBS, LSS, LIS fiber optic cable
- teach-in,
- adjustable color selectivity.

VLL 18

with LL 3 fiber optic cable
- adjustable sensitivity: per teach-in
- simplest handling.

LL 3 Plastic Fiber Optic Cables

Fiber Optic Cables - Diffuse Sensing (Proximity)

LL 3 fiber optic cables			WLL 170 Red Light		WLL 170 T Red Light		WLL 170 T Green Light	
Description	**Type**	**Part no.**	SD	MD	SD	MD	SD	MD
Standard								
Compact sleeve, M4, threaded	LLK1-M4BM02	5 304 161	27	0.02	25	0.015	7	0.015
Compact sleeve, M4, long sensing range	LL3-DM01	5 308 071	100	0.02	100	0.015	25	0.015
Super compact, sleeve 2.5 mm diameter	LL3-DT03	5 308 072	25	0.02	25	0.015	7	0.015
Super compact, sleeve M3	LL3-DS06	5 308 073	25	0.02	25	0.015	7	0.015
Coaxial								
Long sensing range, M6, coaxial fiber optic cable	LL3-DB01	5 308 074	100	0.02	100	0.015	25	0.015
M6, coaxial fiber optic cable, 10 m	LL3-DB01-10	5 308 075	50	0.02	50	0.015	20	0.015
For front lenses, M3	LL3-DT01	5 308 076	45	0.02	35	0.015	7	0.015
Thin, short sleeve, M4, coaxial fiber optic cable	LL3-DM02	5 308 077	45	0.02	35	0.015	7	0.015
Flexible								
Highly flexible, M6, long sensing range	LL3-DR01	5 308 078	75	0.02	85	0.015	20	0.015
Highly flexible, small sleeve, M3	LL3-DR02	5 308 079	8	0.02	14	0.015	0	0
Highly flexible, 3 mm diameter, thin sleeve	LL3-DR03	5 308 080	22	0.02	25	0.015	3	0.015
Highly flexible, 1.5 mm diameter, thin sleeve	LL3-DR04	5 308 081	8	0.02	14	0.015	0	0
Highly flexible, M4, compact sleeve	LL3-DR06	5 308 082	22	0.02	25	0.015	3	0.015
Sleeve Head								
Supple sleeve, M6, long sensing range	LL3-DB02	5 308 083	90	0.02	100	0.015	25	0.015
Supple sleeve, M4	LL3-DM03	5 308 084	22	0.02	25	0.015	4	0.015
Thin long tip, M3	LL3-DT02	5 308 085	5	0.02	6	0.015	0	0
Thin long tip, M3, coaxial fiber optic cable	LL3-DT04	5 308 086	10	0.02	13	0.015	0	0
Diameter 3.0 mm, thin tip, 0.82 mm diameter	LL3-DR05	5 308 087	5	0.02	8	0.015	0	0
Side View								
90° offset, 5.0 mm diameter	LL3-DV01	5 308 088	40	0.03	50	0.025	10	0.025
90° offset, small sleeve, 3.0 mm diameter	LL3-DV02	5 308 089	9	0.02	12	0.015	0	0
90° offset, M6	LL3-DV03	5 308 090	70	0.03	50	0.025	10	0.025
Array Head								
Block style	LLK1-Y9NM02	5 304 167	50	●	50	●	15	●
Liquid Detection								
Level switch, clear liquid, 6.0 mm diameter	LL3-DF01	5 308 094	yes	0	yes	0	0	0
Level switch, cloudy liquid, 6.0 mm diameter	LL3-DF02	5 308 095	yes	0	yes	0	0	0
Heat Resistance								
Temperature resistant up to 180°C, M6, long sensing range	LL3-DH01	5 308 091	110	0.02	135	0.015	25	0.015
Temperature resistant up to 100°C, M6	LL3-DH02	5 308 092	60	0.02	75	0.015	5	0.015
Temperature resistant up to 180°C, right angle	LVBPPA 102000	7 023 270	125	●	135	●	30	●
Temperature resistant up to 260°C, right angle	LVBSAA 23500	7 022 321	80	●	90	●	20	●
Temperature resistant up to 260°C, fuerle tip, 4.7 mm	LVBSF 23500	7 022 296	125	●	135	●	30	●
Temperature resistant up to 260°C, 6 mm threaded 900 mm long	LVBSTM6 23900	7 021 999	125	●	100	●	30	●
Temperature resistant up to 260°C, 6 mm threaded 3000 mm long	LVBSTM6 233000	7 022 947	125	●	135	●	30	●
Temperature resistant up to 260°C, 6 mm threaded 4500 mm long	LVBSTM6 234500	7 022 813	100	●	100	●	30	●
Chemically Resistant								
Teflon sheath, resistant to chemicals, 6.0 mm diameter	LL3-DY01	5 308 093	50	0.02	60	0.02	●	●
Teflon sheath, resistant to chemicals, 9.0 mm diameter	LLK1-M9EB02	7 023 977	60	0.02	60	0.02	12	0.02
Teflon sheath, resistant to chemicals, 8.0 mm diameter	LLK1-G8EB02	7 023 981	60	0.02	85	0.02	12	0.02

WLL 170 Red Light High-speed		WLL 170 A Analog			WLL 160 Red Light		WLL 160 Red Light (NORM/MAX)		WLL 160 T Red Light (FAST)		VLL 18 T Red Light		
		5 V	3 V										
SD	MD	SD	SD	MD	SD	MD	SD	MD	SD	MD	SD	MD	**Bend radius (mm)**
11	0.015	●	●	0.015	20	0.015	20	0.015	15	0.015	15	0.015	15
20	0.015	30	45	0.015	70	0.015	70	0.015	50	0.015	50	0.015	25
7	0.015	11	15	0.015	20	0.015	20	0.015	14	0.015	15	0.015	15
7	0.015	11	15	0.015	20	0.015	20	0.015	14	0.015	15	0.015	15
20	0.015	28	40	0.015	70	0.02	70	0.015	50	0.015	50	0.015	25
8	0.015	15	20	0.015	40	0.015	40	0.015	30	0.015	25	0.015	25
8	0.015	15	20	0.015	25	0.02	25	0.015	18	0.015	20	0.015	15
8	0.015	15	20	0.015	25	0.02	25	0.015	18	0.015	20	0.015	15
25	0.015	25	35	0.015	70	0.02	70	0.015	50	0.015	45	0.015	4
0	0	0	0	0	9	0.02	9	0.015	6	0.015	0	0	4
4	0.015	7	10	0.015	20	0.02	20	0.015	14	0.015	13	0.015	4
0	0	0	0	0	9	0.02	9	0.015	6	0.015	0	0	4
4	0.015	7	10	0.015	20	0.02	20	0.015	14	0.015	13	0.015	4
25	0.015	30	40	0.015	70	0.02	70	0.015	50	0.015	50	0.015	25
6	0.015	11	15	0.015	20	0.02	20	0.015	14	0.015	15	0.015	25
0	0	0	0	0	5	0.02	5	0.015	3	0.015	0	0	15
0	0	0	0	0	9	0.02	9	0.015	5	0.015	0	0	15
0	0	0	0	0	5	0.02	5	0.015	3	0.015	0	0	4
10	0.025	17	24	0.025	40	0.03	40	0.025	30	0.025	25	0.025	25
0	0	0	0	0	9	0.02	8	0.015	5	0.015	0	0	15
10	0.025	17	24	0.025	40	0.03	40	0.025	30	0.025	25	0.025	25
20	●	N/A	N/A	N/A	50	●	50	●	35	●	35	●	7.5
0	0	N/A	N/A	N/A	0	0	yes	0	0	0	0	0	50
0	0	N/A	N/A	N/A	0	0	yes	0	0	0	0	0	50
40	0.2	45	65	0.015	100	0.02	100	0.015	70	0.015	65	0.015	30
18	0.5	22	30	0.015	55	0.02	55	0.015	50	0.015	35	0.015	25
50	0.5	N/A	N/A	N/A	100	●	100	●	70	●	50	●	16
30	0.5	N/A	N/A	N/A	70	●	70	●	50	●	30	●	16
50	0.5	N/A	N/A	N/A	100	●	100	●	70	●	50	●	16
30	N/A	N/A	N/A	N/A	70	●	70	●	50	●	40	●	16
50	0.2	N/A	N/A	N/A	100	●	100	●	70	●	50	●	16
30	●	N/A	N/A	N/A	70	●	70	●	50	●	40	●	16
●	0.2	N/A	N/A	N/A	●	●	45	0.02	●	●	30	0.02	40
60	0.1	N/A	N/A	N/A	60	0.02	60	0.02	40	0.02	30	0.02	40
60	0.1	N/A	N/A	N/A	60	0.02	60	0.02	40	0.02	30	0.02	40

● not available

LL 3 Plastic Fiber Optic Cables

Selection table: sensors, fiber optic cables, sensing ranges | **Sensing distance SD and minimum target diameter MD**

Fiber Optic Cables - Through Beam System

LL 3 fiber optic cables			WLL 170 Red Light		WLL 170 T Red Light		WLL 170 T Green Light	
Description	**Type**	**Part no.**	SD	MD	SD	MD	SD	MD
Standard								
Standard, 3 mm diameter, long range	LL3-TS 07	5 304 161	580	0.5	580	0.5	140	0.5
Standard, M4, long range	LL 3-TB 01	5 304 161	580	0.5	580	0.5	140	0.5
Standard, M4, length 10 m	LL 3-TB 01-10	5 308 072	350	0.5	300	0.5	120	0.5
Standard M4	LL 3-TB 02	5 308 073	350	0.2	350	0.2	75	0.2
Standard M4	LLK 2-M4AM02	5 308 074	90	0.1	100	0.1	25	0.1
Flexible								
Highly flexible, M4, long range	LL3-TR01	5 308 052	300	0.3	270	0.3	60	0.3
Highly flexible, M3	LL3-TR02	5 308 053	80	0.1	80	0.1	15	0.1
Small sleeve, 1.5 mm diameter, highly flexible, 1 m	LL3-TR03	5 308 054	80	0.1	80	0.1	15	0.1
Small sleeve, 1.5 mm diameter, highly flexible, 2 m	LL3-TR03-2	5 308 055	80	0.1	80	0.1	15	0.1
Sleeve Head								
Flexible end sleeve, M4	LLK2-04MM02	5 304 155	175	0.2	175	N/A	90	N/A
Flexible end sleeve, M4	LL3-TB03	5 308 056	350	0.2	330	0.2	75	0.2
Compact, M3, end piece 1.0 mm diameter	LL 3-TT01	5 308 057	23	0.1	23	0.1	●	●
Side View 90°								
90° offset, standard, 3 mm diameter	LL3-TV01	5 308 058	300	0.2	230	0.2	55	0.2
90° offset, compact, 2.5 mm diameter	LL3-TV02	5 308 059	80	0.1	60	0.1	15	0.1
90° offset, compact, M3	LL3-TV04	5 308 060	80	0.1	60	0.1	15	0.1
90° offset, standard, 3 mm diameter	LL3-TS08	5 308 061	250	0.2	250	0.2	55	0.2
90° offset, long range	LL3-TS12	5 308 062	1000	0.5	1000	0.5	450	0.5
Array Head								
Fiber optic cable cell	LL 3-TS10	5 308 063	330	0.1	330	0.1	60	0.1
Heat Resistance								
Temperature resistant, M4	LL 3-TH 01	5 308 064	250	0.2	250	0.2	60	0.2
Temperature resistant up to 180°C, M4	LL 3-TH 02	5 308 065	450	0.5	500	0.5	85	0.5
Temperature resistant up to 260°C, right angle	LVISAA 16900	7 022 109	500	0.5	600	0.5	170	0.5
Temperature resistant up to 260°C, 4.7 mm	LVISF 16500	7 022 320	500	0.5	600	0.5	170	0.5
Temperature resistant up to 260°C, 5/16 threaded	LVIST 161800	7 022 886	500	0.5	600	0.5	170	0.5
Chemically Resistant								
Teflon sheath, 6.0 mm diameter, chemically resistant	LL3-TY01	5 308 066	1500	0.3	1800	0.3	200	0.3
Teflon sheath, 6.0 mm diameter, chemically resistant, right angle	LL3-TY02	5 308 067	500	0.3	380	0.3	50	0.3
Teflon jacket, 6.0 mm diameter, chemically resistant	LLK2-M6DB02	7 024 459	800	●	1400	●	150	●
Teflon jacket, 4.0 mm diameter, chemically resistant	LLK2-M4DB02	7 023 478	100	0.2	350	0.2	90	0.2
Small Head								
Small end sleeve, M3, long range	LL3-TM01	5 308 068	350	0.2	350	0.2	75	0.2
Small end sleeve, M3	LL3-TM02	5 308 069	100	0.1	100	0.1	15	0.1
Small end sleeve, 1.5 mm diameter	LL3-TM03	5 308 070	100	0.1	100	0.1	15	0.1

in mm in combination with sensor type

WLL 170 Red Light High-speed		WLL 170 A Analog			WLL 160 Red Light		WLL 160 Red Light (NORM/MAX)		WLL 160 T Red Light (FAST)		VLL 18 T Red Light		
		5 V	3 V										
SD	MD	SD	SD	MD	SD	MD	SD	MD	SD	MD	SD	MD	**Bend radius (mm)**
130	0.5	160	230	0.5	500	0.5	500	0.5	360	0.5	200	0.5	30
130	0.5	160	230	0.5	400	0.5	400	0.2	280	0.2	200	0.5	30
75	0.5	80	110	0.5	250	0.5	250	0.5	190	0.5	250	0.5	30
80	0.2	95	135	0.2	200	0.2	200	0.2	150	0.2	120	0.2	25
25	0.1	●	●	●	70	0.1	70	0.1	50	0.1	40	0.1	15
60	0.3	●	●	●	180	●	●	●	●	●	●	●	4
15	0.1	25	35	0.1	50	0.2	50	0.1	40	0.2	25	0.1	4
15	0.1	25	35	0.1	50	0.2	50	0.1	40	0.2	25	0.1	4
15	0.1	25	35	0.1	50	0.2	50	0.1	40	0.2	25	0.1	4
100	N/A	N/A	N/A	N/A	140	0.2	140	0.2	100	0.2	120	0.2	15
80	0.2	90	125	0.2	200	0.2	200	0.2	150	0.2	120	0.2	25
●	●	●	●	●	●	●	●	●	●	●	●	●	15
30	0.2	80	110	0.2	150	0.2	150	0.2	130	0.2	70	0.2	25
15	0.1	23	33	0.1	40	0.2	40	0.2	30	0.2	20	0.1	15
15	0.1	23	33	0.1	40	0.2	40	0.2	30	0.2	20	0.1	15
65	0.2	80	110	0.2	200	0.2	200	0.2	150	0.2	85	0.2	25
340	0.5	550	800	0.5	700	0.5	700	0.5	400	0.5	350	0.5	25
70	0.1	●	●	●	260	1	260	1	190	1	100	0.1	25
60	0.2	●	95	0.2	180	0.2	180	●	●	●	●	●	25
120	0.5	130	180	0.5	350	0.5	350	0.5	240	0.5	170	0.5	25
170	0.5	N/A	N/A	N/A	400	0.5	400	0.5	280	0.5	200	0.5	15.8
170	0.5	N/A	N/A	N/A	400	0.5	400	0.5	280	0.5	200	0.5	15.8
170	0.5	N/A	N/A	N/A	400	0.5	400	0.5	280	0.5	200	0.5	15.8
300	0.3	0	0	0	1000	0.8	1000	0.5	700	0.5	350	0.3	60
60	0.3	0	0	0	250	0.5	250	0.3	180	0.3	120	0.3	60
200	●	N/A	N/A	N/A	750	●	750	●	500	●	400	●	40
100	0.2	N/A	N/A	N/A	200	0.2	200	0.2	150	0.2	125	0.2	25
80	0.2	95	135	0.2	200	0.2	200	0.2	150	0.2	120	0.2	25
20	0.1	27	38	0.1	70	0.2	70	0.1	50	0.1	30	0.1	15
20	0.1	27	38	0.1	70	0.2	70	0.1	50	0.1	30	0.1	15

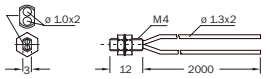
● not available

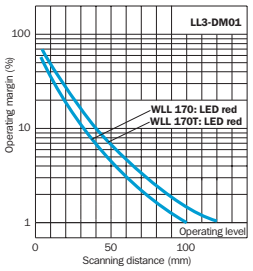
Adaptor for WLL 12-2		
Type	**Part no.**	**LL-1**
AD-LL 2M2	2 015 210	2.2 mm

LL 3 Plastic Fiber Optic Cables-Proximity Systems

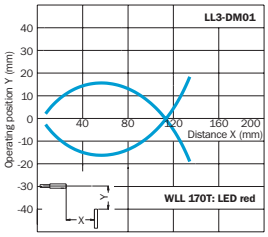
Dimensional drawings and characteristic curves (WLL 170/T) for LL 3 fiber optic cables – proximity systems

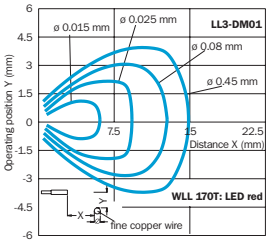
Order information	
Type	**Part no.**
LL 3-DM01	5 308 071

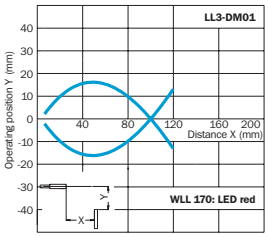


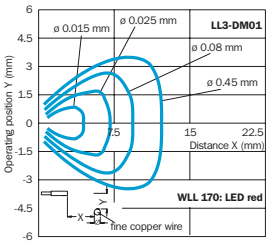


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

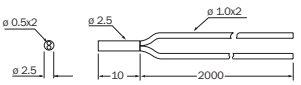


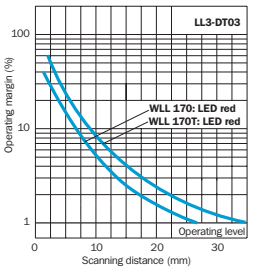




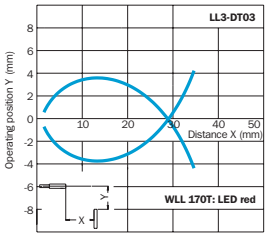


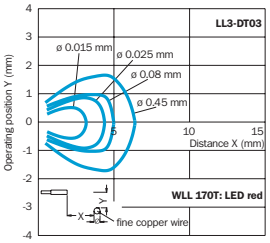
Order information	
Type	**Part no.**
LL 3-DT03	5 308 072

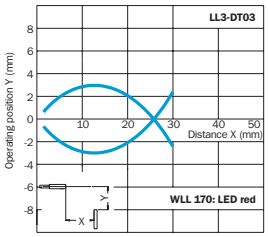


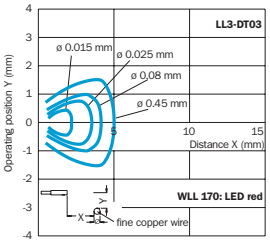


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

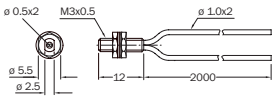


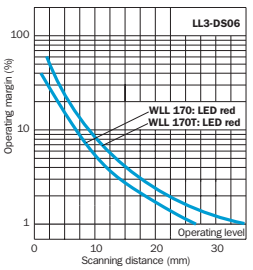




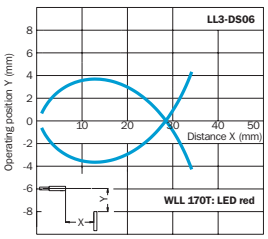


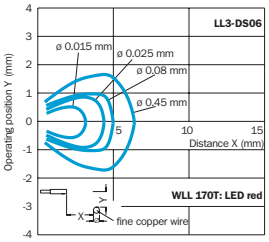
Order information	
Type	**Part no.**
LL 3-DS06	5 308 073

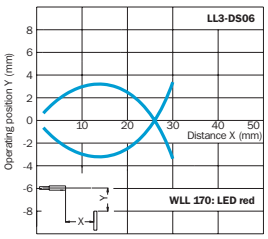


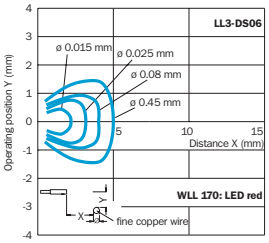


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

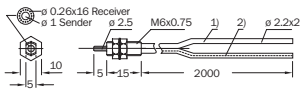




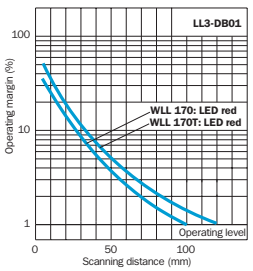




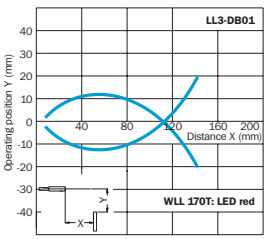
Order information	
Type	**Part no.**
LL 3-DB01	5 308 074

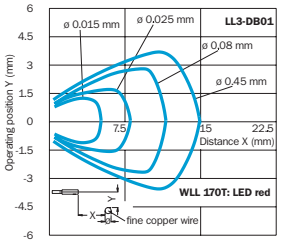


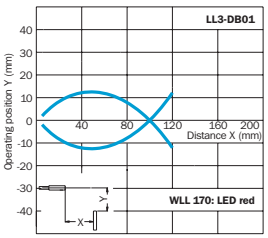
1) Sender
2) Receiver

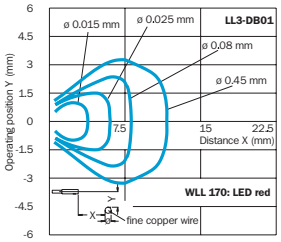


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids





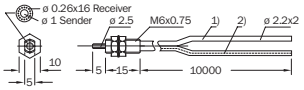




Dimensional drawings and characteristic curves (WLL 170/T) for LL 3 fiber optic cables – proximity systems

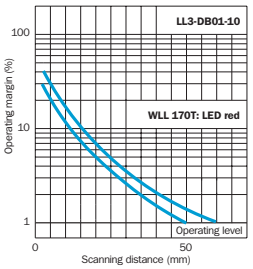
Order information

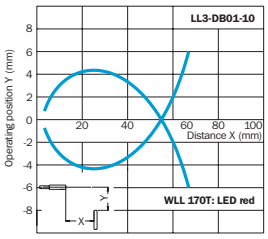
Type	Part no.
LL 3-DB01-10	5 308 075

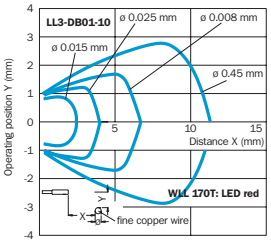


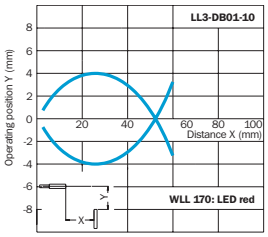
1) Sender
2) Receiver

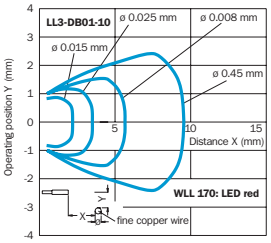
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids





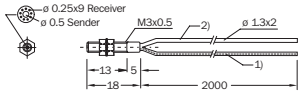






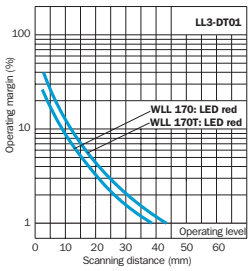
Order information

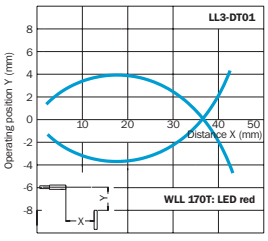
Type	Part no.
LL 3-DT01	5 308 076

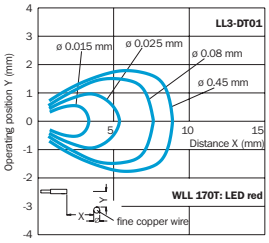


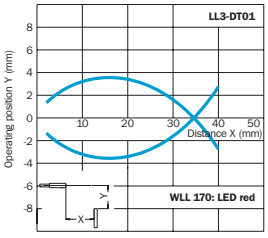
1) Sender
2) Receiver

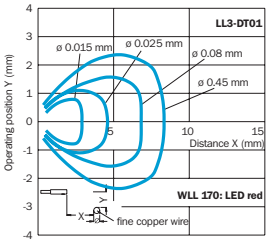
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids





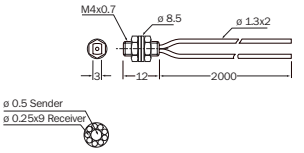




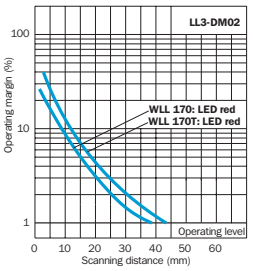


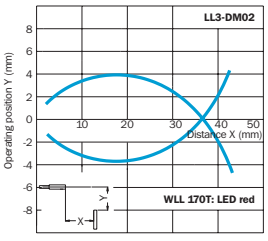
Order information

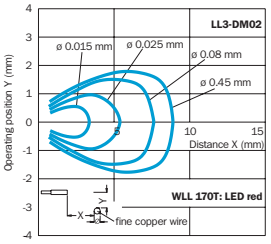
Type	Part no.
LL 3-DM02	5 308 077

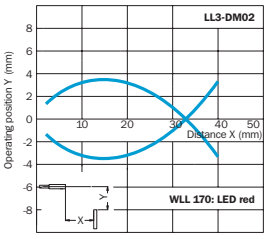


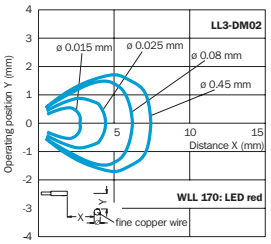
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids





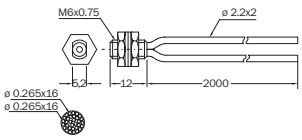




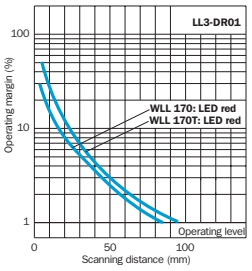


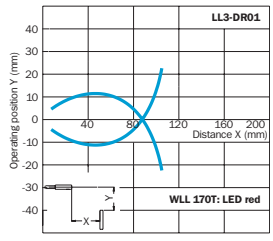
Order information

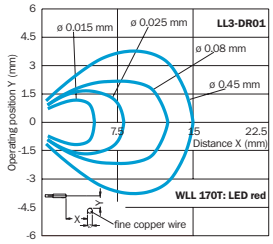
Type	Part no.
LL 3-DR01	5 308 078

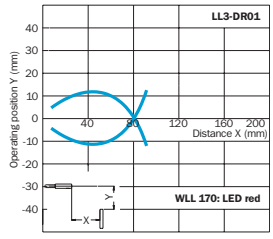


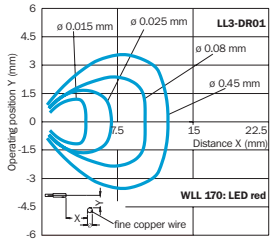
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids











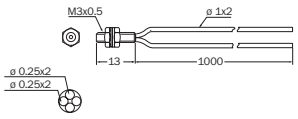
SICK

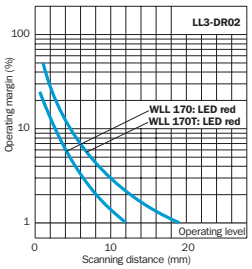
LL 3 Plastic Fiber Optic Cables-Proximity Systems

Dimensional drawings and characteristic curves (WLL 170/T) for LL 3 fiber optic cables – proximity systems

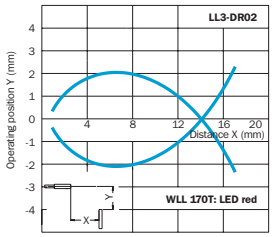
Order information

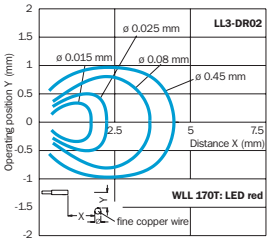
Type	Part no.
LL 3-DR02	5 308 079

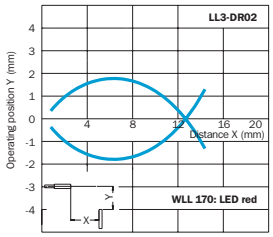


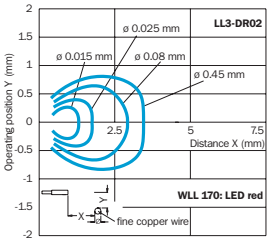


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



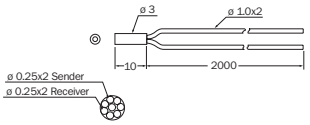


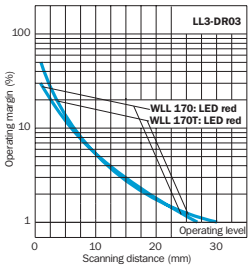




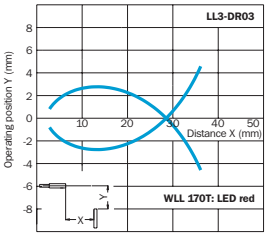
Order information

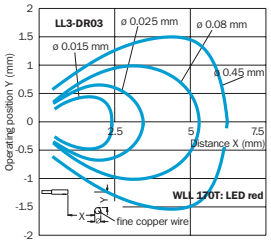
Type	Part no.
LL 3-DR03	5 308 080

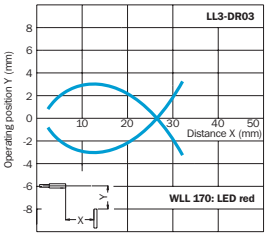


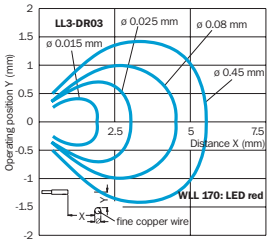


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



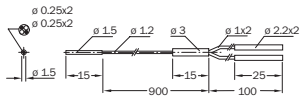


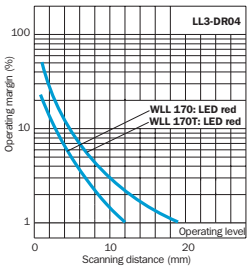




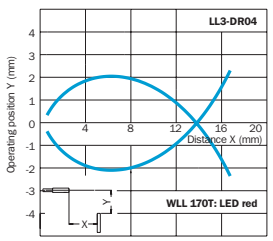
Order information

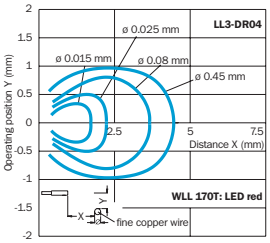
Type	Part no.
LL 3-DR04	5 308 081

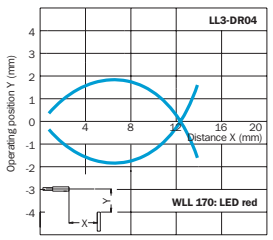


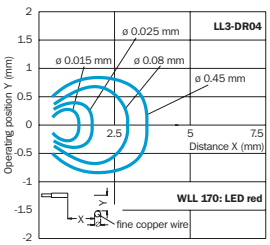


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



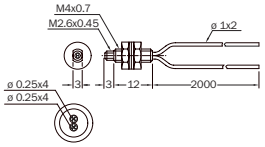


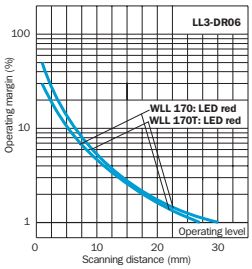




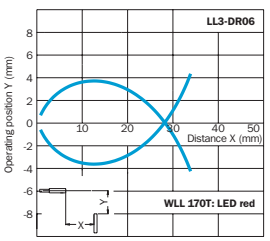
Order information

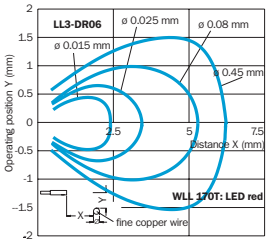
Type	Part no.
LL 3-DR06	5 308 082

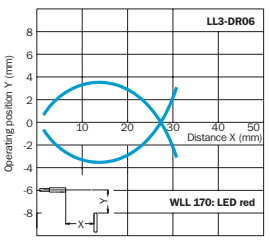


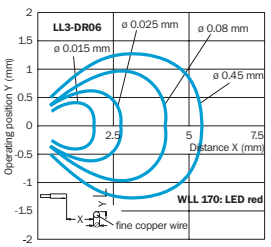


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids





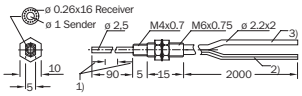




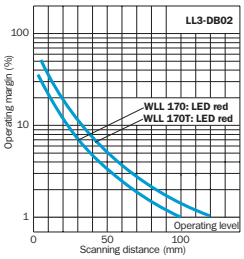
Dimensional drawings and characteristic curves (WLL 170/T) for LL 3 fiber optic cables – proximity systems

Order information

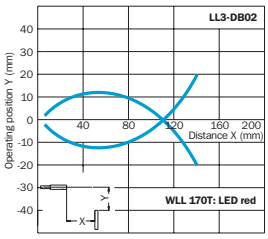
Type	Part no.
LL 3-DB02	5 308 083

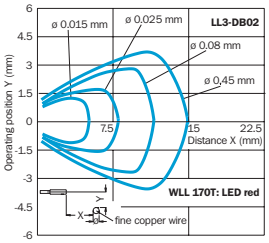


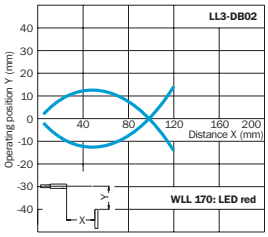
1) Flexible end sleeve, do not bend in this region (10 mm), bend radius R10
2) Sender (marked in blue)
3) Receiver

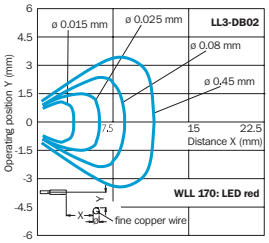


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



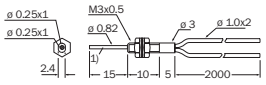






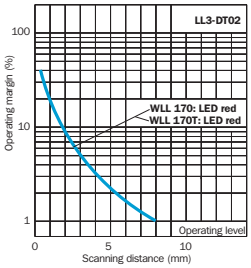
Order information

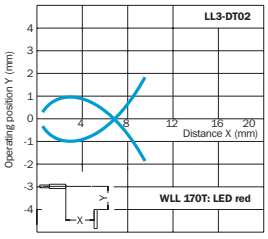
Type	Part no.
LL 3-DT02	5 308 085

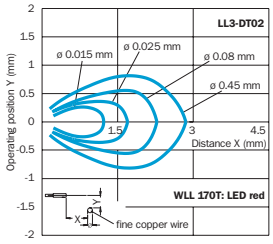


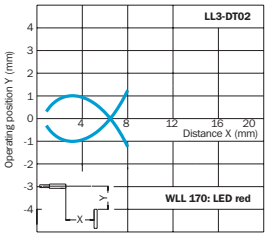
1) End sleeve cannot be bent

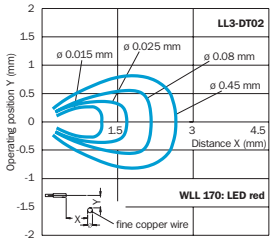
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids





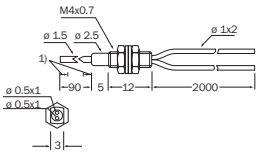




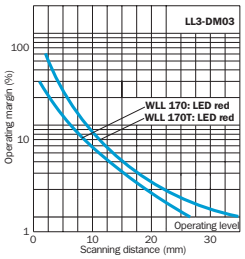


Order information

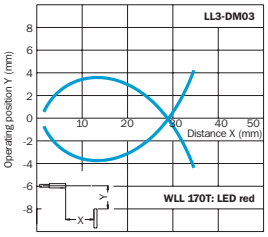
Type	Part no.
LL 3-DM03	5 308 084

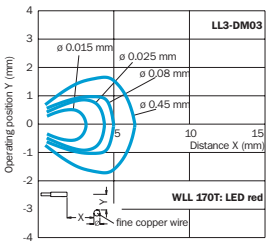


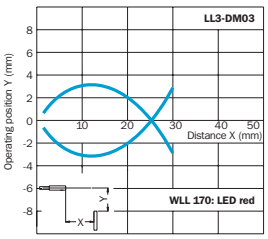
1) Flexible end sleeve, do not bend in this region (10 mm), bend radius R10

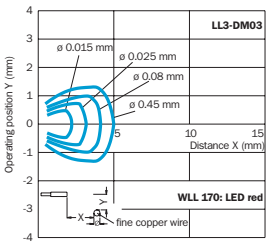


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



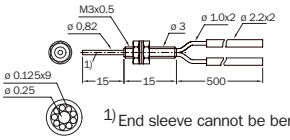






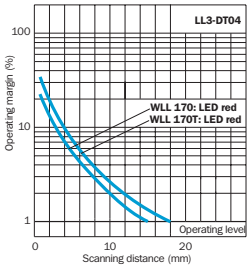
Order information

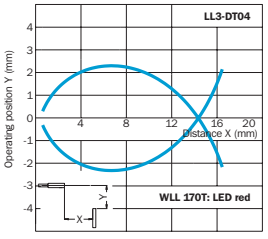
Type	Part no.
LL 3-DT04	5 308 086

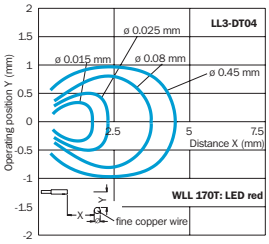


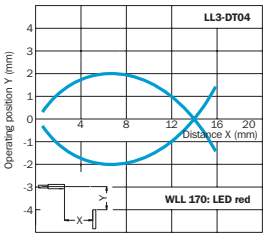
1) End sleeve cannot be bent

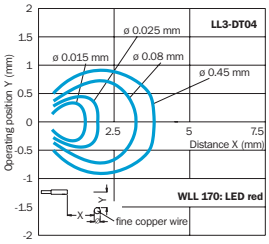
Material: Core: PMMA, Sheath: PE
Sleeve: CuZn, nickel-plated brass











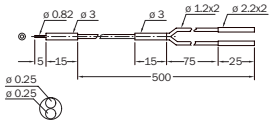
SICK

LL 3 Plastic Fiber Optic Cables-Proximity Systems

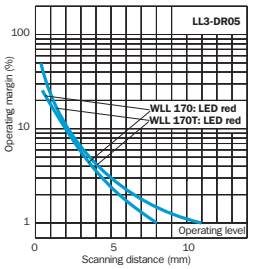
Dimensional drawings and characteristic curves (WLL 170/T) for LL 3 fiber optic cables – proximity systems

Order information

Type	Part no.
LL 3-DR05	5 308 087

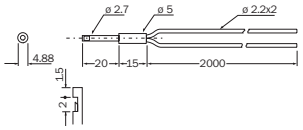


Material: Core: PMMA, Sheath: PE
Sleeve: CuZn, nickel-plated brass

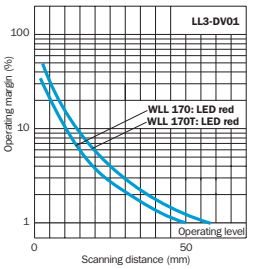


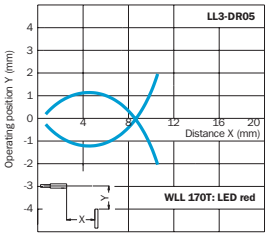
Order information

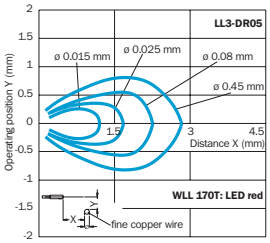
Type	Part no.
LL 3-DV01	5 308 088

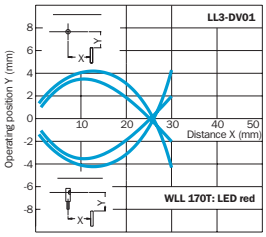


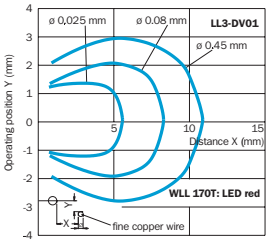
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

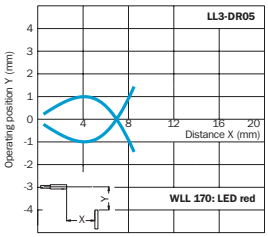


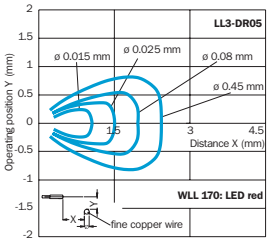


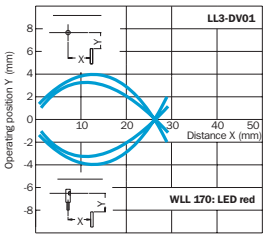


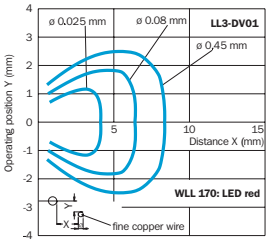






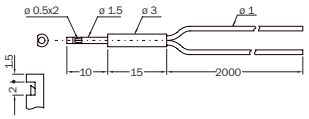




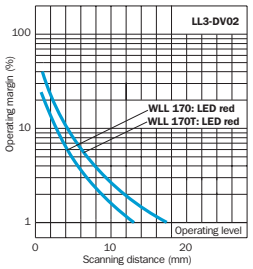


Order information

Type	Part no.
LL 3-DV02	5 308 089

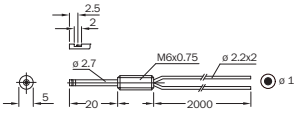


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

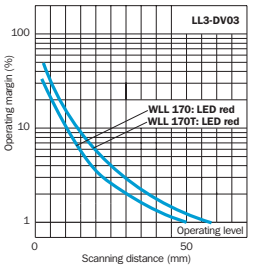


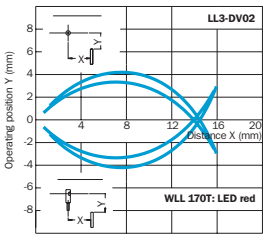
Order information

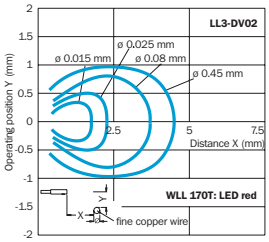
Type	Part no.
LL 3-DV03	5 308 090

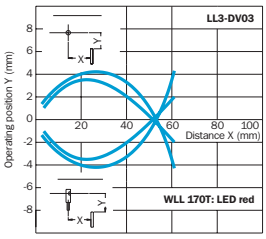


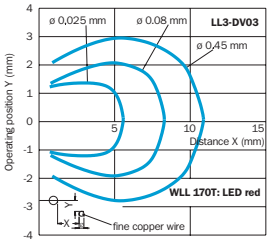
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

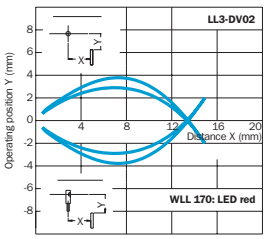


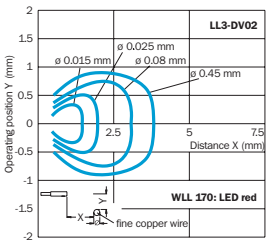


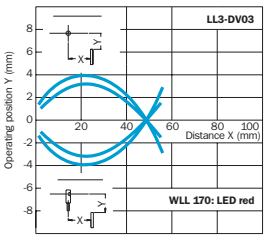


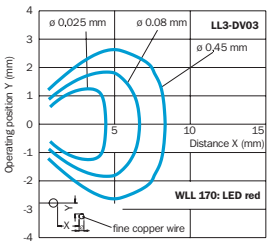






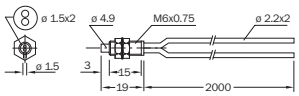


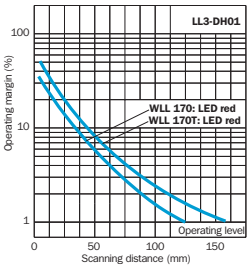




Dimensional drawings and characteristic curves (WLL 170/T) for LL 3 fiber optic cables – proximity systems

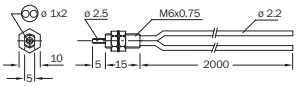
Order information	
Type	**Part no.**
LL 3-DH01	5 308 091

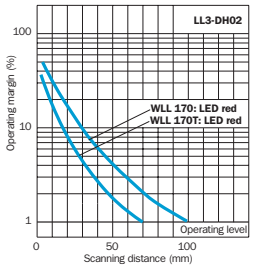




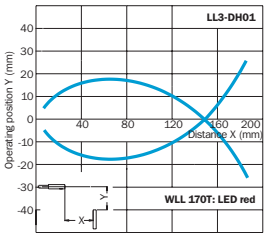
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

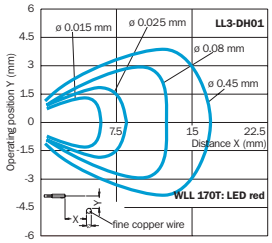
Order information	
Type	**Part no.**
LL 3-DH02	5 308 092

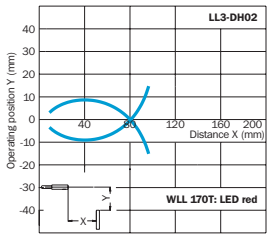


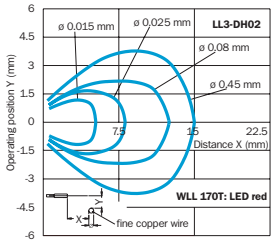


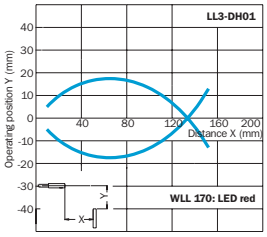
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

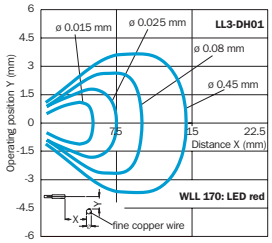


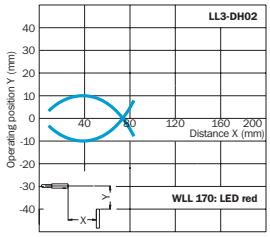


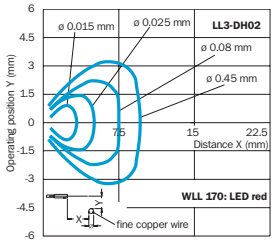




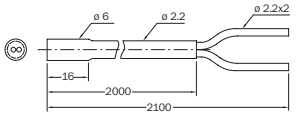


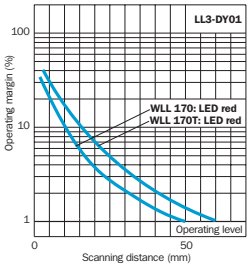




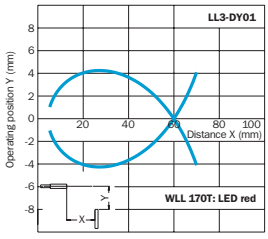


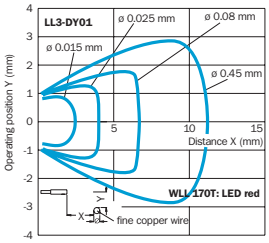
Order information	
Type	**Part no.**
LL 3-DY01	5 308 093

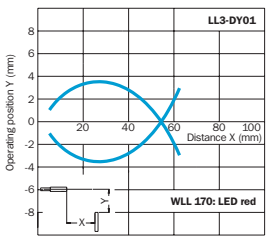


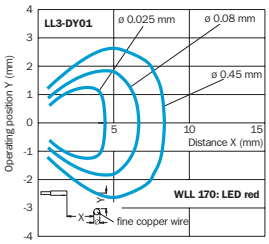


Material: Core: PMMA, Sheath: Teflon
Sleeve: Teflon



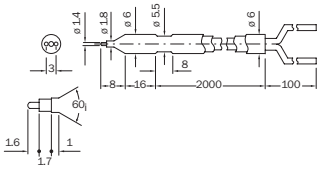






Order information	
Type	**Part no.**
LL 3-DF01	5 308 094 1)
LL 3-DF02	5 308 095 2)

1) For transparent liquids
2) For cloudy liquids

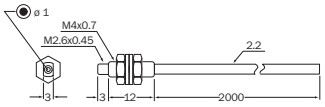


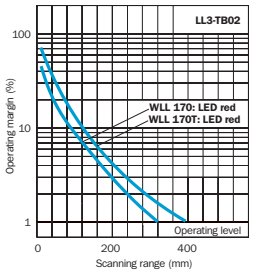
Material: Core: PMMA, Sheath: Teflon
Sleeve: Teflon

LL 3 Plastic Fiber Optic Cables-Through Beam Systems

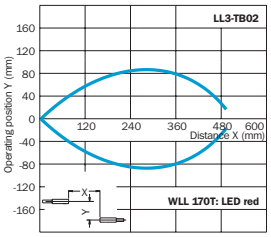
Dimensional Drawings and Characteristic Curves (WLL 170/T) for LL 3 Fiber Optic Cables – Through Beam Systems

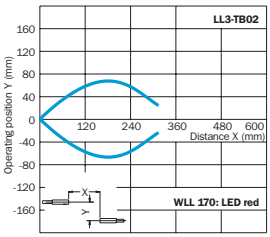
Order information	
Type	**Part no.**
LL 3-TB02	5 308 048



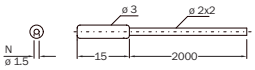


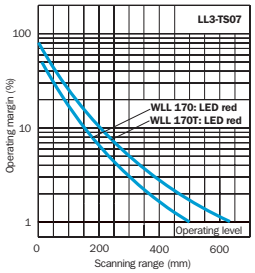
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



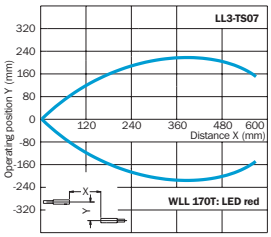


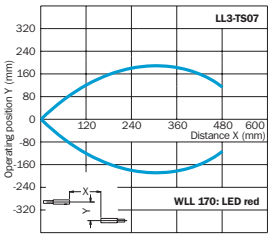
Order information	
Type	**Part no.**
LL 3-TS07	5 308 049



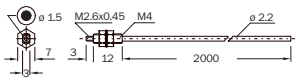


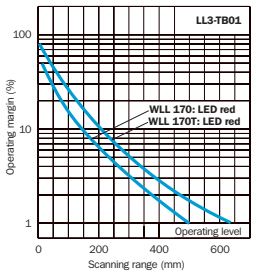
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



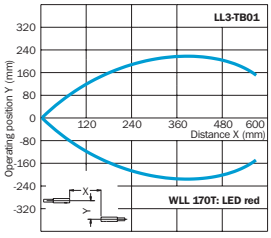


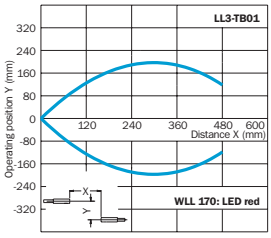
Order information	
Type	**Part no.**
LL 3-TB01	5 308 050



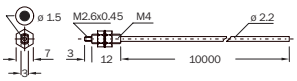


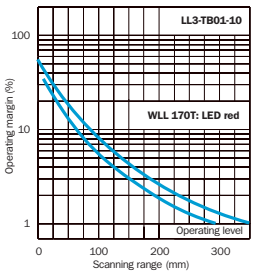
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



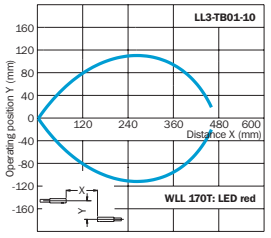


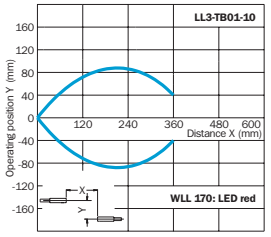
Order information	
Type	**Part no.**
LL 3-TB01-10	5 308 051



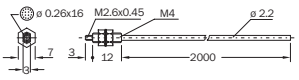


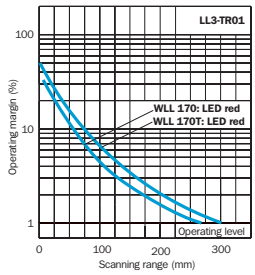
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



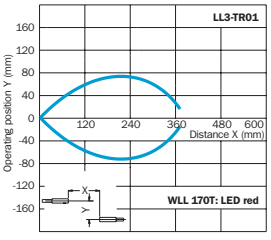


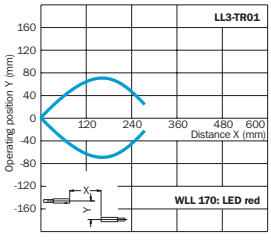
Order information	
Type	**Part no.**
LL 3-TR01	5 308 052



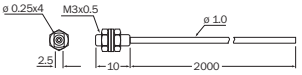


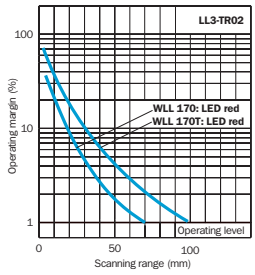
Material: Core: PMMA, Sheath: PE
Sleeve: CuZn, nickel-plated brass



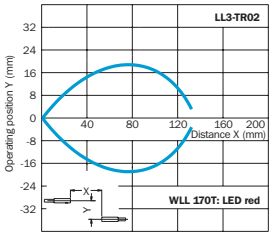


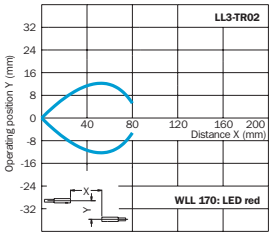
Order information	
Type	**Part no.**
LL 3-TR02	5 308 053





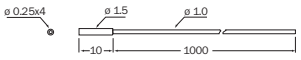
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



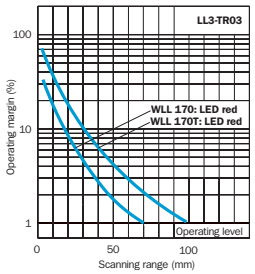


Dimensional Drawings and Characteristic Curves (WLL 170/T) for LL 3 Fiber Optic Cables – Through Beam Systems

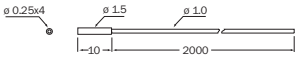
Order information	
Type	**Part no.**
LL 3-TR03	5 308 054



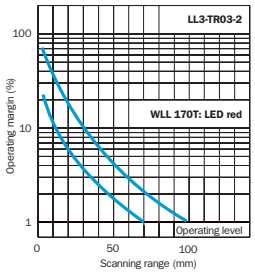
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

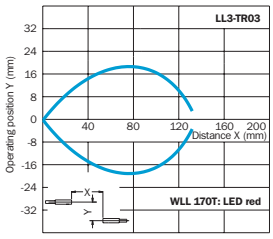


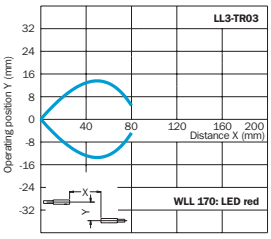
Order information	
Type	**Part no.**
LL 3-TR03-2	5 308 055

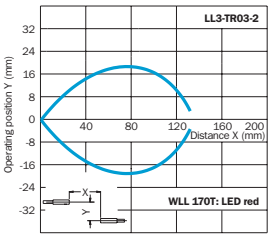


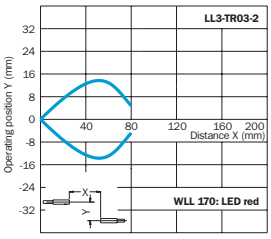
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



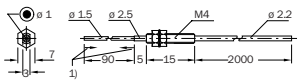






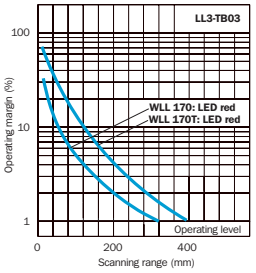


Order information	
Type	**Part no.**
LL 3-TB03	5 308 056

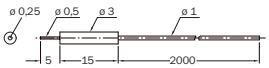


1) Flexible end sleeve, do not bend in this area (10 mm), radius of curvature R10

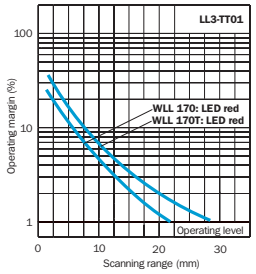
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

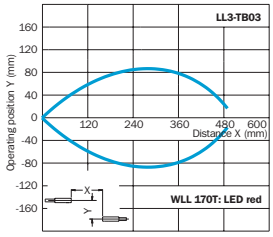


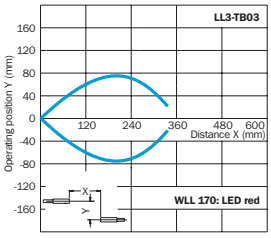
Order information	
Type	**Part no.**
LL 3-TT01	5 308 057

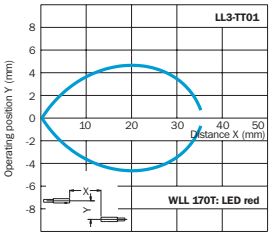


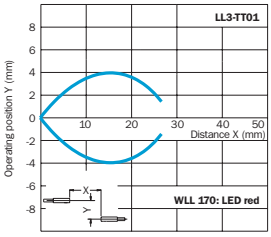
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



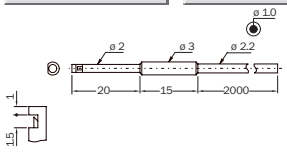




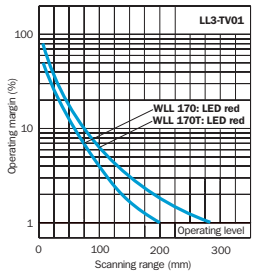




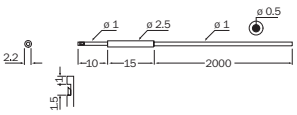
Order information	
Type	**Part no.**
LL 3-TV01	5 308 058



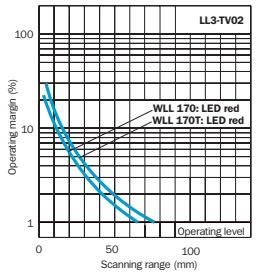
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

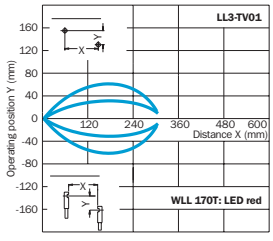


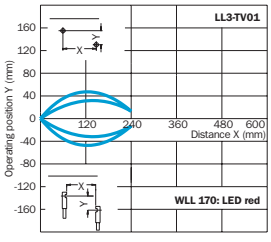
Order information	
Type	**Part no.**
LL 3-TV02	5 308 059

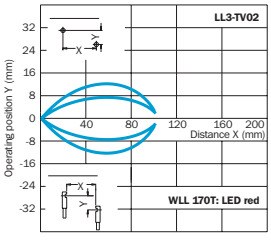


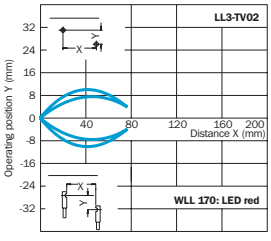
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids











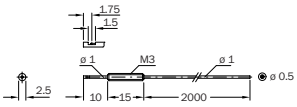
SICK

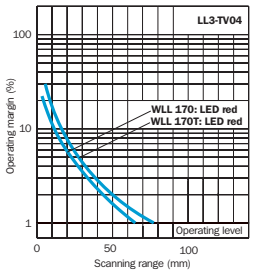
LL 3 Plastic Fiber Optic Cables-Through Beam Systems

Dimensional Drawings and Characteristic Curves (WLL 170/T) for LL 3 Fiber Optic Cables – Through Beam Systems

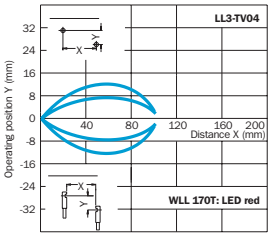
Order information

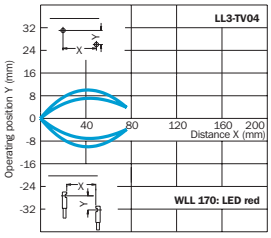
Type	Part no.
LL 3-TV04	5 308 060





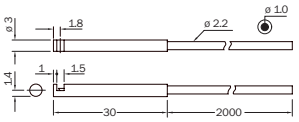
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

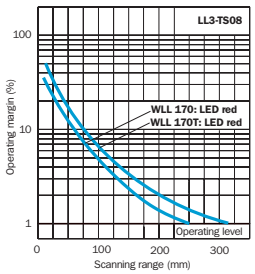




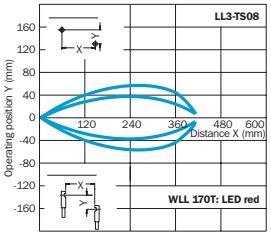
Order information

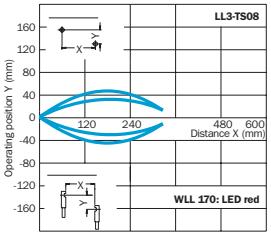
Type	Part no.
LL 3-TS08	5 308 061





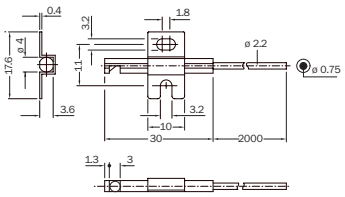
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

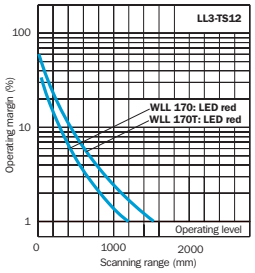




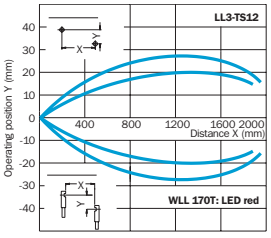
Order information

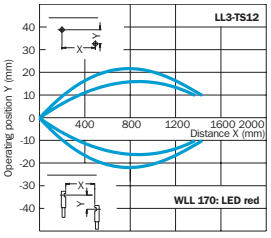
Type	Part no.
LL 3-TS12	5 308 062





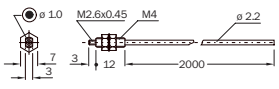
Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting
and acids

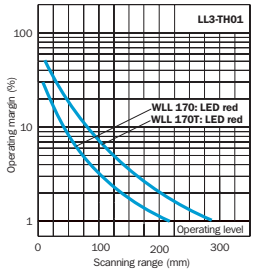




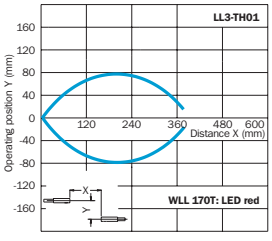
Order information

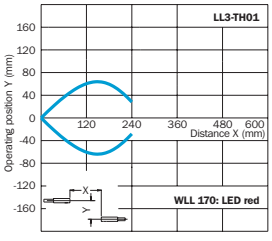
Type	Part no.
LL 3-TH01	5 308 064





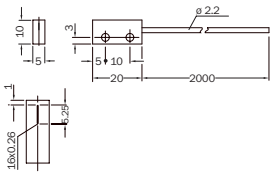
Material: Core: PMMA, Sheath: PE
Sleeve: CuZn, nickel-plated brass

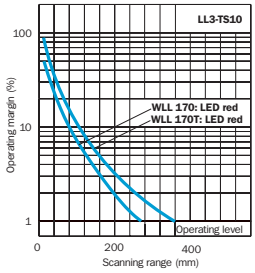




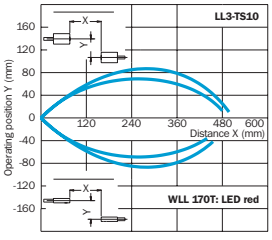
Order information

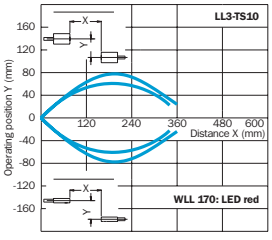
Type	Part no.
LL 3-TS10	5 308 063





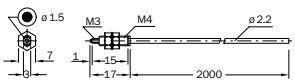
Material: Core: PMMA, Sheath: PE
Sleeve: CuZn, nickel-plated brass

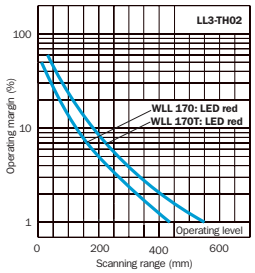




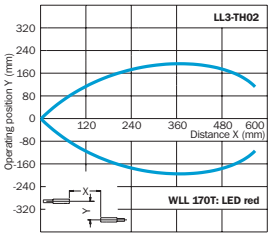
Order information

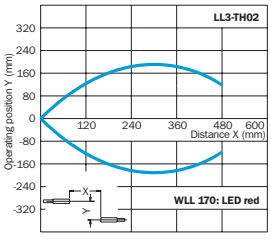
Type	Part no.
LL 3-TH02	5 308 065





Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

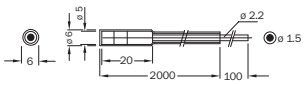


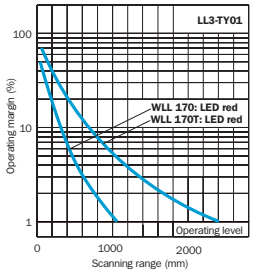


Dimensional Drawings and Characteristic Curves (WLL 170/T) for LL 3 Fiber Optic Cables – Through Beam Systems

Order information

Type	Part no.
LL 3-TY01	5 308 066

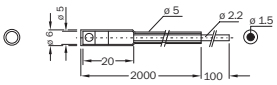


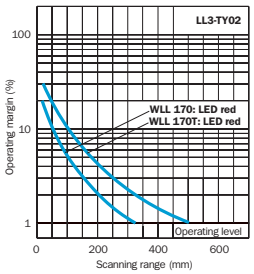


Material: Core: PMMA; Sheath: Teflon;
Sleeve: Teflon

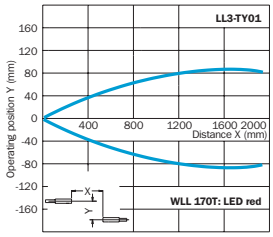
Order information

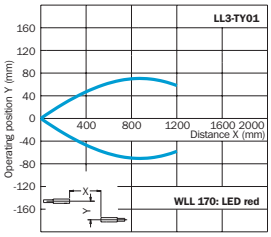
Type	Part no.
LL 3-TY02	5 308 067

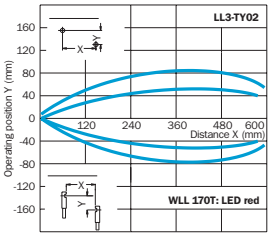


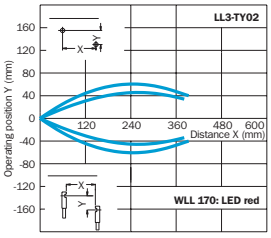


Material: Core: PMMA; Sheath: Teflon;
Sleeve: Teflon



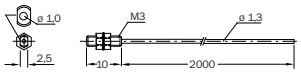


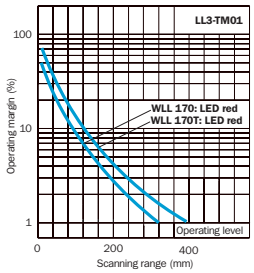




Order information

Type	Part no.
LL 3-TM01	5 308 068

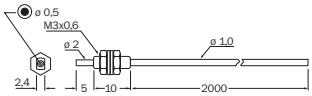


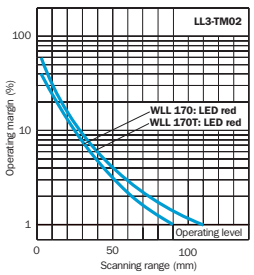


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids

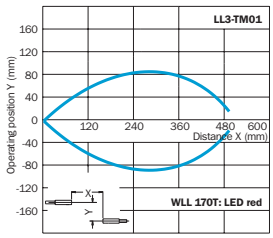
Order information

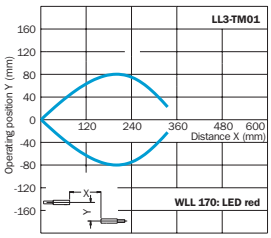
Type	Part no.
LL 3-TM02	5 308 069

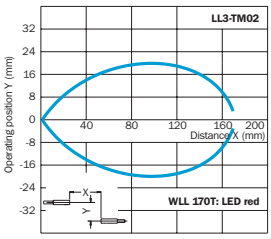


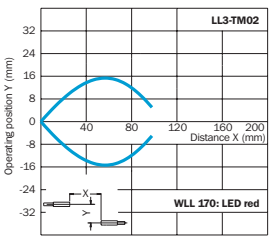


Material: Core: PMMA, Sheath: PE;
Sleeve: 1.4305 (German materials no.)
Stainless steel, resistant to rusting and acids



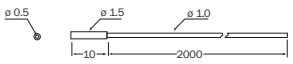


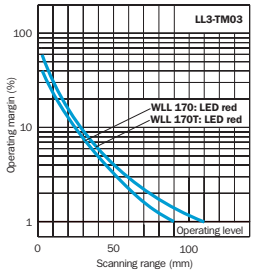




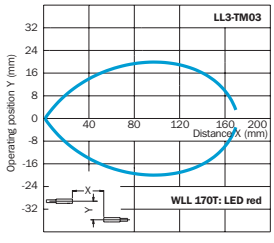
Order information

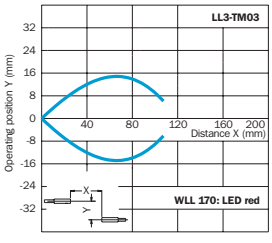
Type	Part no.
LL 3-TM03	5 308 070





Material: Core: PMMA, Sheath: PE
Sleeve: 1.4305 (German material no.)
Stainless steel, rust-and acid-resistant





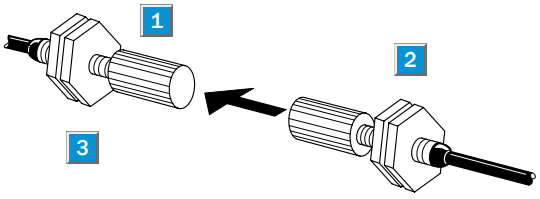
SICK

Fiber Optic Accessories-Front Lenses

Front Lenses for Through Beam Systems

- Long ranges

1 Light spot ø: approx. 170 mm at 1000 mm
2 Aperture approx. 15°
3 Material: CuZn (nickel-plated)/glass

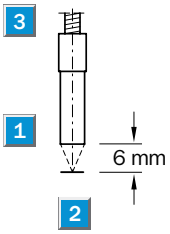


Order information

Type	Part no.
LL 3-TA01	5 308 128

Front Lenses for Proximity Systems

- For detection of very small parts
- Focused, very small light spot
- High sensitivity (6% remission)
- For suppressing interference-causing backgrounds



1 Light spot ø: approx. 0.25 mm at the focal point = 6 mm
2 Aperture: focus = 6 mm
3 Material: Al (aluminum)/glass

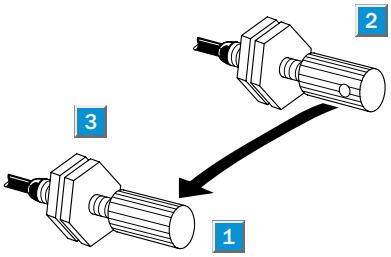
Order information

Type	Part no.
LL 3-DA01	5 308 127

Front Lenses for Through Beam Systems

- Compact 90° offset

1 Light spot ø: X-axis approx. 110 mm
Y-axis: approx. 170 mm, for 200 mm range
in each case
2 Aperture, X-axis approx. 30°, Y-axis: approx. 40°
3 Material: CuZn (nickel-plated)/glass

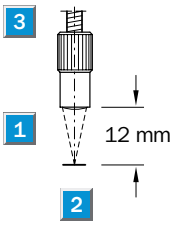


Order information

Type	Part no.
LL 3-TA02	5 308 129

Front Lenses for Proximity Systems

- Suitable as a “mark sensor” for color marks
- Focused, very small light spot
- High sensitivity (6% remission)
- For suppressing interference-causing backgrounds



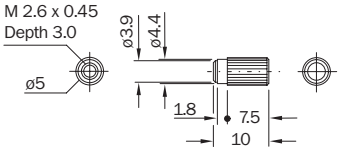
1 Light spot ø approx. 3 mm at the focal point = 12 mm
2 Aperture: focus = 12 mm
3 Material: Al (aluminum)/glass

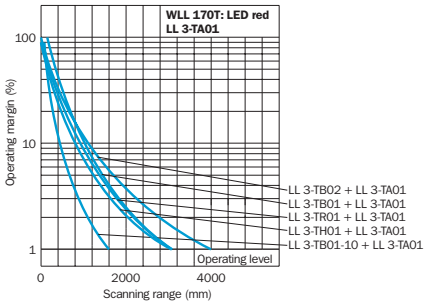
Order information

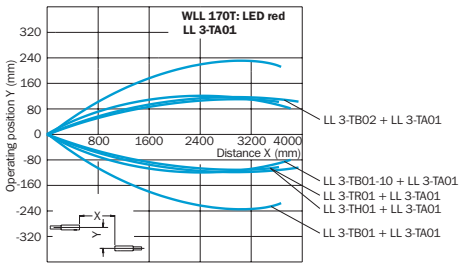
Type	Part no.
LL 3-DA02	5 308 130

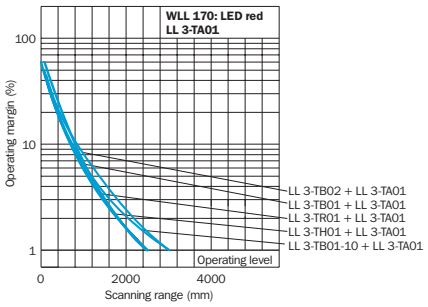
Dimensional Drawings and Characteristic Curves (WLL 170/T) for LL 3 Front Lenses

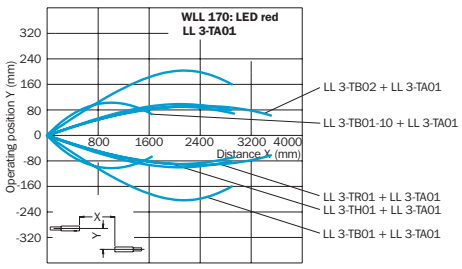
Order information	
Type	**Part no.**
LL 3-TA01	5 308 128



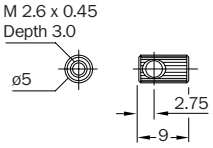


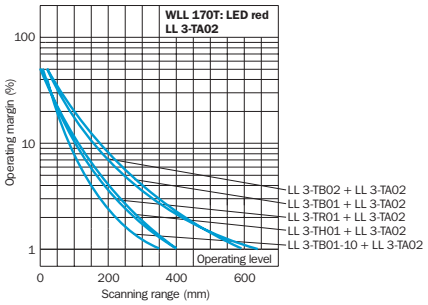


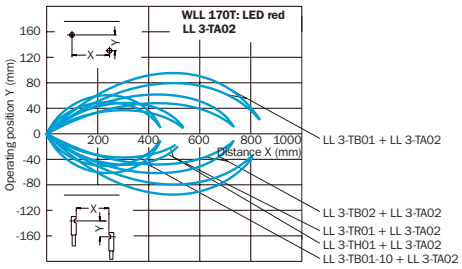


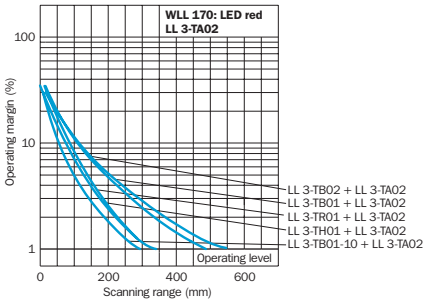


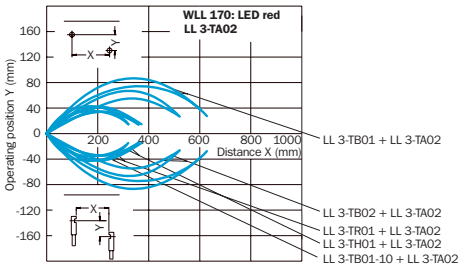
Order information	
Type	**Part no.**
LL 3-TA02	5 308 129



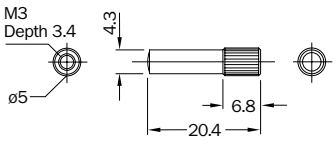




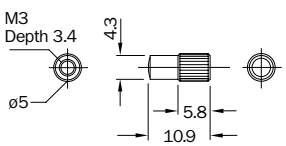




Order information	
Type	**Part no.**
LL 3-DA01	5 308 127



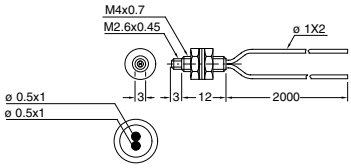
Order information	
Type	**Part no.**
LL 3-DA02	5 308 130



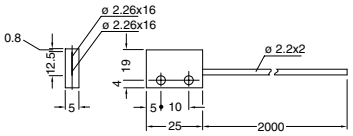
LL3 Special Fiber Optics

Dimensional Drawings (WLL 170/T) for LL 3 Special Fiber Optics - Diffuse Sensing (Proximity)

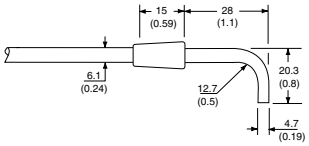
Order information	
Type	**Part no.**
LLK1-M4BM02	5 304 161



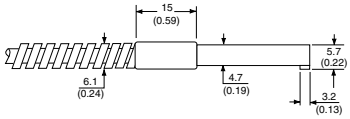
Order information	
Type	**Part no.**
LLK1-Y9NM02	5 304 167



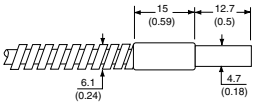
Order information	
Type	**Part no.**
LVBPPA 102000	7 023 270



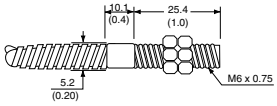
Order information	
Type	**Part no.**
LVBSAA 23500	7 022 321



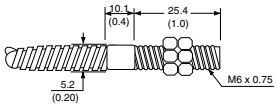
Order information	
Type	**Part no.**
LVBSF 23500	7 022 296



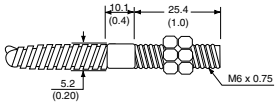
Order information	
Type	**Part no.**
LVBSTM6 23900	7 021 999



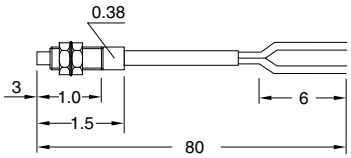
Order information	
Type	**Part no.**
LVBSTM6 233000	7 022 947



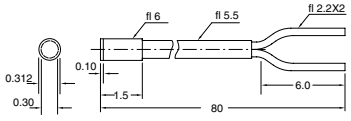
Order information	
Type	**Part no.**
LVBSTM6 234500	7 022 813



Order information	
Type	**Part no.**
LLK1-M9EB02	7 023 977

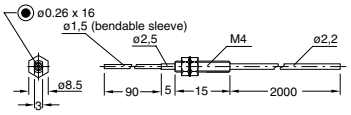


Order information	
Type	**Part no.**
LLK1-G8EB02	7 023 981

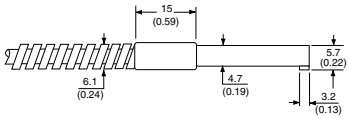


Dimensional Drawings (WLL 170/T) for LL 3 Special Fiber Optics - Through Beam

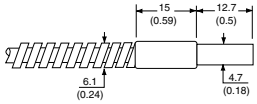
Order information	
Type	**Part no.**
LLK2-04MM02	5 304 155



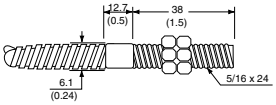
Order information	
Type	**Part no.**
LVISAA 16900	7 022 109



Order information	
Type	**Part no.**
LVISF 16500	7 022 320



Order information	
Type	**Part no.**
LVIST 161800	7 022 886

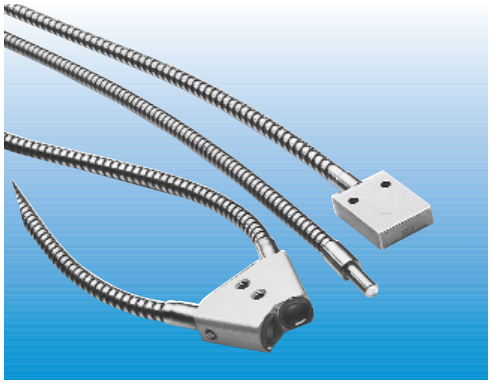


SICK

LIS/LBS/LSS Fiber Optic Cables with Stainless Steel Sheath

Fiber Optic Cables - Proximity Systems

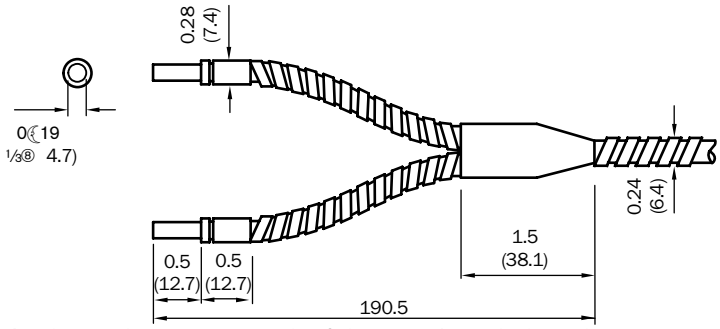
Fiber Optic Cables - Through Beam Systems



Highlights

- Glass fiber cable with stainless steel sheath
- Sender and receiver fibers are randomly mixed
- Operating temperature -72...599°F (-58...315°C)
- Length of fiber optic cable 900 mm
- Bend radius 19 mm

Proximity Systems



Mounting materials (cap nut, clamp ring, O-ring seal and mounting instructions) are included with fiber optic cables.

Selection Table: Sensors, Fiber Optic Cables, Range/Sensing Distances

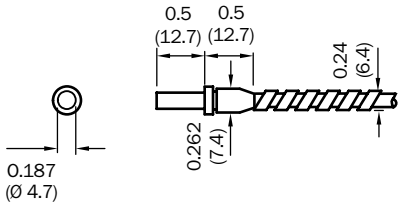
Proximity Systems

LBS Fiber Optic Cables			Sensing distance in mm[1] when combined with sensor		
Description	**Type**	**Part no.**	WLL 260	KTL 5-2	W.1000/W.2000
End sleeve ø 7.4 mm, FOC ø 3.2 mm	LBSA 32 900	7 020 040	50	9	150/175
End sleeve ø 6.4 mm, FOC ø 2.3 mm	LBSAA 23 900	7 020 103	30	9	75/75
Mounting 5/16" x 24, FOC ø 3.2 mm	LBSAT 32 900	7 020 036	50	9	150/175
End sleeve ø 7.4 mm, FOC ø 3.2 mm	LBSF 32 900	7 020 038	50	9	150/175
End sleeve ø 8 mm, FOC ø 1.2 mm	LBSM 12 900	7 020 054	6	9	70/80
End sleeve ø 7.9 mm, FOC ø 1.6 mm	LBSP 16 900	7 020 044	6	9	80/100
Fiber optic cable cell 0.5 mm x 3.8 mm	LBSR 16 900	7 020 050	15	9	100/110
Fiber optic cable cell 0.8 mm x 9.7 mm	LBSR 32 900	7 020 042	50	9	200/220
Fiber optic cable cell 0.2 mm x 38.1 mm	LBSR 40 900	7 020 052	90	9	230/260
Mounting 5/16" x 24, FOC ø 3.2 mm	LBST 32 900	7 020 046	50	9	150/175
Mounting 5/16" x 24, FOC ø 3.2 mm	LBSTA 32 900	7 020 048	50	9	150/175
Optical head with fiber optic cables	OCSL	1 016 296	–	9	–
End sleeve ø 7.4 mm, FOC ø 3.2 mm, 50/50 split	LSSA 32 900	7 023 582	50	9	150/175
End sleeve ø 6.4 mm, FOC ø 2.3 mm, 50/50 split	LSSAA 23 900	7 023 583	30	9	75/100
Mounting 5/16" x 24, FOC ø 3.2 mm, 50/50 split	LSSAT 32 900	7 023 584	50	9	150/175
End sleeve ø 7.4 mm, FOC ø 3.2 mm, 50/50 split	LSST 32 900	7 023 586	50	9	150/175
Mounting 5/16" x 24, FOC ø 3.2 mm, 50/50 split	LSSTA 32 900	7 023 587	50	9	150/175
Mounting 5/16" x 24, FOC ø 3.2 mm, 50/50 split	LSSF 32 900	7 023 585	50	9	150/175

1) Operating range or scanning distance
Scanned material 90% remission
(DIN 5033)
Size of scanned material = diameter of light spot (aperture approx. 60°)

Adaptation of Fiber Optic Cables

Through Beam Systems



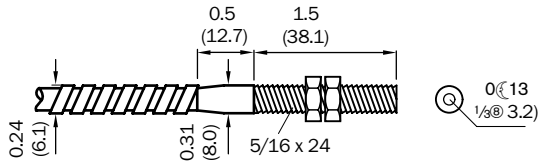
Through Beam Systems

LIS Fiber Optic Cables			Sensing range in mm[1] when combined with sensor		
Description	**Type**	**Part No.[2]**	WLL 260	KTL 5-2	W.1000/W.2000
End sleeve ø 7.4 mm, FOC ø 3.2 mm	LISA 32 900	7 020 039	700	20	1 m/800 mm
End sleeve ø 6.4 mm, FOC ø 2.3 mm	LISAA 23 900	7 020 102	240	20	150/120 mm
Mounting 5/16" x 24, FOC ø 3.2 mm	LISAT 32 900	7 020 035	700	20	1 m/800 mm
End sleeve ø 7.4 mm, FOC ø 3.2 mm	LISF 32 900	7 020 037	700	20	1 m/800 mm
End sleeve ø 8 mm, FOC ø 1.2 mm	LISM 12 900	7 020 053	90	20	
End sleeve ø 7.9 mm, FOC ø 1.6 mm	LISP 16 900	7 020 043	100	20	
Fiber optic cable cell 0.5 mm x 3.8 mm	LISR 16 900	7 020 049	220	20	400/350 mm
Fiber optic cable cell 0.8 mm x 9.7 mm	LISR 32 900	7 020 041	700	20	1 m/800 mm
Fiber optic cable cell 0.2 mm x 38.1 mm	LISR 40 900	7 020 051	600	20	1 m/800 mm
Mounting 5/16" x 24, FOC ø 3.2 mm	LIST 32 900	7 020 045	700	20	1 m/800 mm
Mounting 5/16" x 24, FOC ø 3.2 mm	LISTA 32 900	7 020 047	700	20	1 m/800 mm

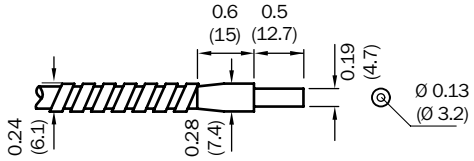
1) Operating range or scanning distance
Scanned material 90% remission (DIN 5033)
Size of scanned material = diameter of light spot (aperture approx. 60°)

2) The part number includes one fiber optic cable. Two fiber optic cables are needed for a through beam system.

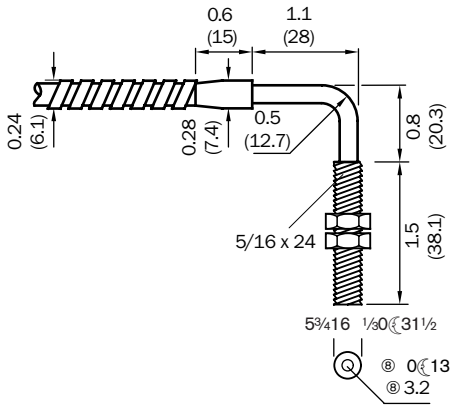
LIS/LBS 32 900 Fiber Optic Cables		
System	**Type**	**Part no.**
Through-beam	LIST 32 900	7 020 045
Proximity system	LBST 32 900	7 020 046
Proximity system	LSST 32 900	7 023 962



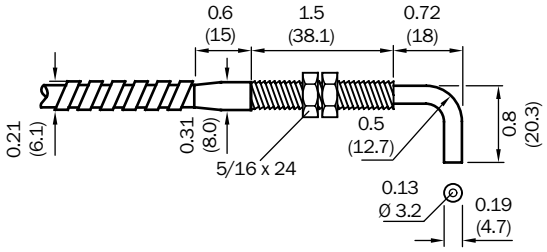
LIS/LBS 32 900 Fiber Optic Cables		
System	**Type**	**Part no.**
Through-beam	LISF 32 900	7 020 037
Proximity system	LBSF 32 900	7 020 038
Proximity system	LSSF 32 900	7 023 585



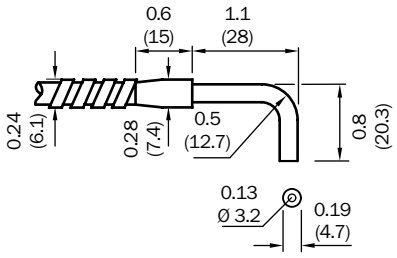
LIS/LBS 32 900 Fiber Optic Cables		
System	**Type**	**Part no.**
Through-beam	LISAT 32 900	7 020 035
Proximity system	LBSAT 32 900	7 020 036
Proximity system	LSSAT 32 900	7 023 586



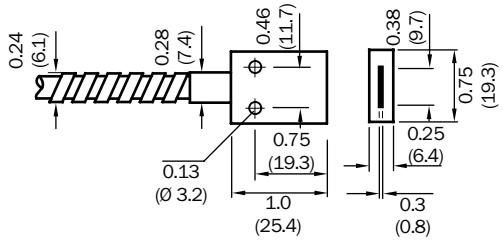
LIS/LBS 32 900 Fiber Optic Cables		
System	**Type**	**Part no.**
Through-beam	LISTA 32 900	7 020 047
Proximity system	LBSTA 32 900	7 020 048
Proximity system	LSSTA 32 900	7 023 587



LIS/LBS 32 900 Fiber Optic Cables		
System	**Type**	**Part no.**
Through-beam	LISA 32 900	7 020 039
Proximity system	LBSA 32 900	7 020 040
Proximity system	LSSA 32 900	7 023 582



LIS/LBS 32 900 Fiber Optic Cables		
System	**Type**	**Part no.**
Through-beam	LISR 32 900	7 020 041
Proximity system	LBSR 32 900	7 020 042



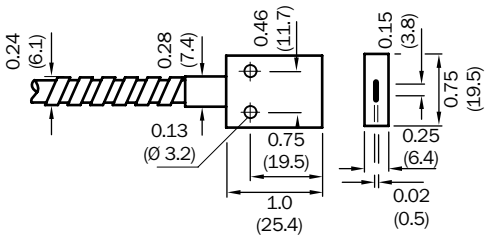
NOTE: Only standard length fibers are shown (900 mm). Please consult www.sickusa.com or call (800).325.7425 to check availability of alternate lengths

LIS/LBS Fiber Optic Cables with Stainless Steel Sheath

Dimensional Drawings and Order Information

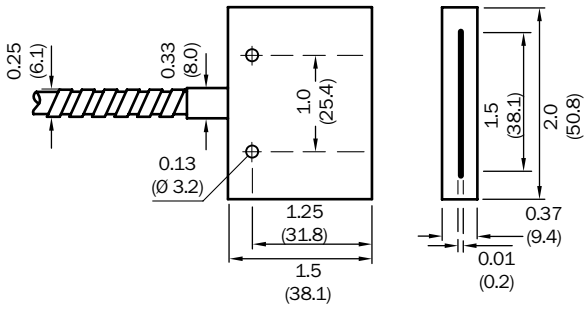
LIS/LBS 16 900 Fiber Optic Cables

System	Type	Part no.
Through beam	LISR 16 900	7 020 049
Proximity system	LBSR 16 900	7 020 050



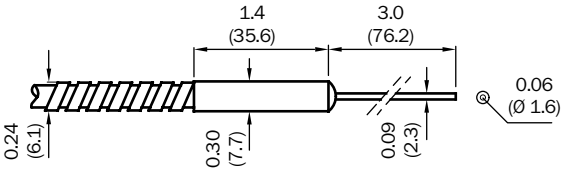
LIS/LBS 40 900 Fiber Optic Cables

System	Type	Part no.
Through beam	LISR 40 900	7 020 051
Proximity system	LBSR 40 900	7 020 052



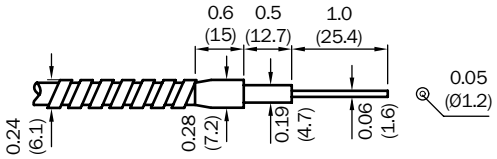
LIS/LBS 16 900 Fiber Optic Cables

System	Type	Part no.
Through beam	LISP 16 900	7 020 043
Proximity system	LBSP 16 900	7 020 044



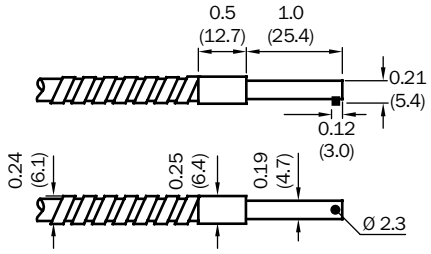
LIS/LBS 12 900 Fiber Optic Cables

System	Type	Part no.
Through beam	LISM 12 900	7 020 053
Proximity system	LBSM 12 900	7 020 054



LIS/LBS 23 900 Fiber Optic Cables

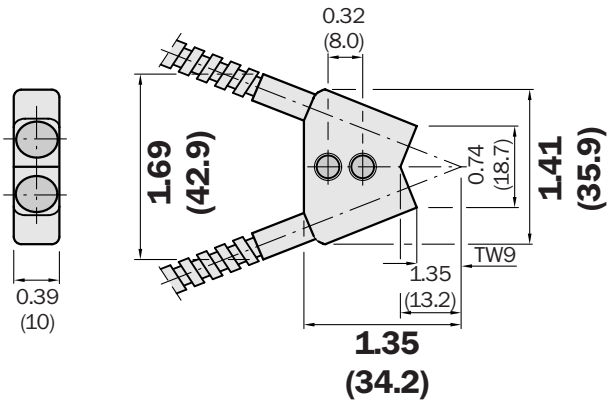
System	Type	Part no.
Through beam	LISAA 23 900	7 020 102
Proximity system	LBSAA 23 900	7 020 103
Proximity system	LSSAA 23 900	7 023 583



NOTE: Only standard length fibers are shown (900 mm). Please consult www.sickusa.com or call (800).325.7425 to check availability of alternate lengths

OCSL Fiber Optic Cables

System	Type	Part no.
Proximity system	OCSL-S01	1 018 259



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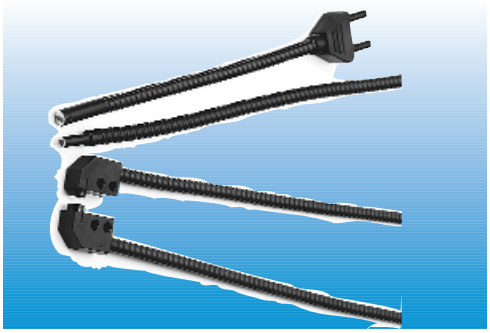
LM/LT Fiber Optic Cables for WLL 12 Sensors

Fiber Optic Cables - Proximity Systems

Fiber Optic Cables - Through Beam Systems



Highlights

- Robust glass fiber-fiber optic cable within a helical metal spring
- Operating temperature for chrome-plated helical metal spring -13...482°F (-25… 250°C)
- Operating temperature for helical metal spring with PVC sheath 14...140°F (-10… 60°C)
- Minimum bend radius 20 mm

1	With reference to standard white, 90% remission
2	With reference to standard grey, 18% remission
3	With reference to standard black, 6% remission
4	On "diamond grade" reflective tape

Selection Table: sensors, Fiber Optic Cables, Sensing Distance/Range

Fiber Optic Cables, Proximity Systems

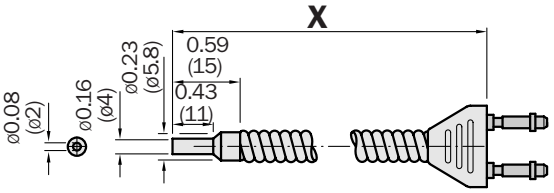
			Sensing range in mm with photoelectric switches								
			WLL 12-B 5181			WLL 12-B 5281			WLL 12-B 5381		
			1	2	4	1	2	4	1	2	3
Description	**Type**	**Part no.**	**Red light**			**Infrared light**			**Green light**		
150 mm	LM 31-150	2 015 225	50	12	280	60	20	280	5	2	60
450 mm	LM 31-450	2 015 223	50	12	280	60	20	280	5	2	60
750 mm	LM 31-750	2 015 224	50	12	280	60	20	280	5	2	60
1500 mm	LM 31-1500	2 017 381	50	12	280	60	20	280	5	2	60
150 mm, with rectangular light outlet	LM 35-150	2 015 226	50	12	280	60	20	280	5	2	60
450 mm, with rectangular light outlet	LM 35-450	2 015 230	50	12	280	60	20	280	5	2	60
750 mm, with rectangular light outlet	LM 35-750	2 015 231	50	12	280	60	20	280	5	2	60
150 mm, with 90° offset head with rectangular light outlet	LM 36-150	2 015 232	50	12	280	60	20	280	5	2	60
450 mm, with 90° offset head with rectangular light outlet	LM 36-450	2 015 233	50	12	280	60	20	280	5	2	60
750 mm, with 90° offset head with rectangular light outlet	LM 36-750	2 015 234	50	12	280	60	20	280	5	2	60
1000 mm, with 90° offset head with rectangular light outlet	LM 36-1000	2 016 772	50	12	280	60	20	280	5	2	60
1250 mm, with 90° offset head with rectangular light outlet	LM 36-1250	2 016 792	50	12	280	60	20	280	5	2	60
150 mm, as LM 36, but with light outlet turned 90°	LM 37-150	2 015 235	50	12	280	60	20	280	5	2	60
450 mm, as LM 36, but with light outlet turned 90°	LM 37-450	2 015 236	50	12	280	60	20	280	5	2	60
750 mm, as LM 36, but with light outlet turned 90°	LM 37-750	2 015 237	50	12	280	60	20	280	5	2	60
450 mm, up to 250 °C	LT 31-450	2 015 227	50	12	280	60	20	280	5	2	60
750 mm, up to 250 °C	LT 31-750	2 015 228	50	12	280	60	20	280	5	2	60
2200 mm, up to 250 °C	LT 31-2200	2 017 871	50	12	280	60	20	280	5	2	60

Fiber Optic Cables, Through Beam Systems

			Sensing range in mm with photoelectric switches		
			WLL 12-B 5181	WLL 12-B 5281	WLL 12-B 5381
Description	**Type**	**Part no.**	**Red light**	**Infrared light**	**Green light**
450 mm	LM 32-450	2 014 850	200	300	20
750 mm	LM 32-750	2 015 038	200	300	20
150 mm, with 90° offset head	LM 38-150	2 016 788	200	300	20
450 mm, with 90° offset head	LM 38-450	2 015 049	200	300	20
750 mm, with 90° offset head	LM 38-750	2 015 050	200	300	20
750 mm, with 90° offset head and front lens	LM 38-751	2 015 970	330	550	32
450 mm, as LM 38, but with light outlet turned 90°	LM 39-450	2 015 047	200	300	20
750 mm, as LM 38, but with light outlet turned 90°	LM 39-750	2 015 048	200	300	20
450 mm, up to 250 °C	LT 32-450	2 015 072	200	300	20
750 mm, up to 250 °C	LT 32-750	2 015 073	200	300	20

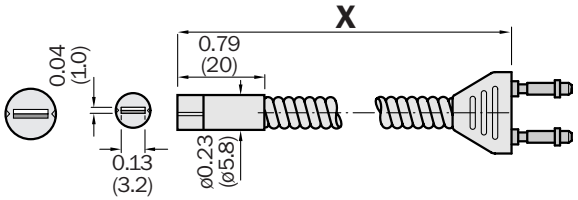
LM 31 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 31-150	2 015 225	150 mm
LM 31-450	2 015 223	450 mm
LM 31-750	2 015 224	750 mm
LM 31-1500	2 017 381	1500 mm



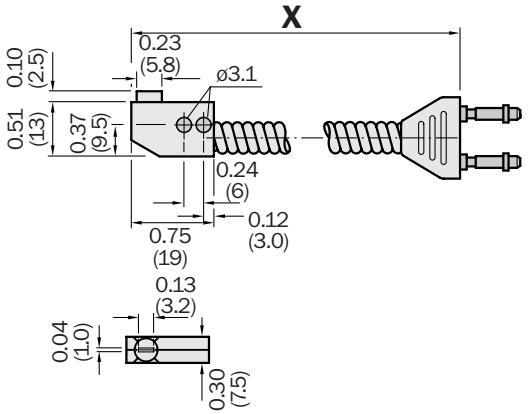
LM 35 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 35-150	2 015 226	150 mm
LM 35-450	2 015 230	450 mm
LM 35-750	2 015 231	750 mm



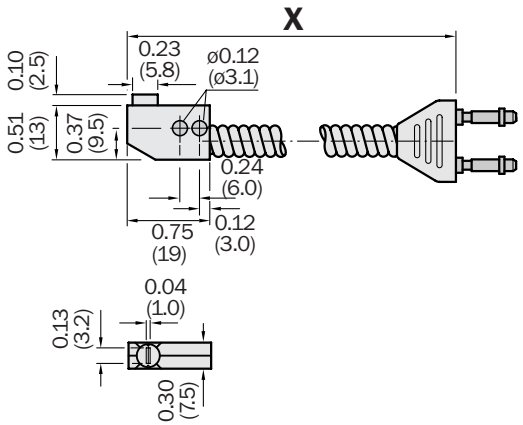
LM 36 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 36-150	2 015 232	150 mm
LM 36-450	2 015 233	450 mm
LM 36-750	2 015 234	750 mm
LM 36-1000	2 016 772	1000 mm
LM 36-1250	2 016 792	1250 mm



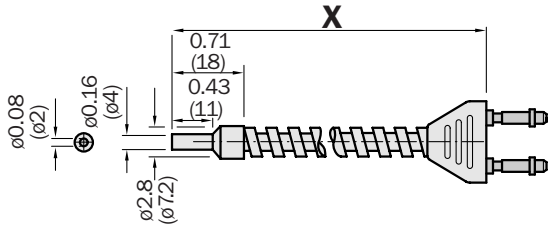
LM 37 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 37-150	2 015 235	150 mm
LM 37-450	2 015 236	450 mm
LM 37-750	2 015 237	750 mm



LT 31 Fiber Optic Cables, Helical Metal Spring, Chrome-plated

Type	Part no.	Length X
LT 31-450	2 015 227	450 mm
LT 31-750	2 015 228	750 mm
LT 31-2200	2 017 871	2200 mm

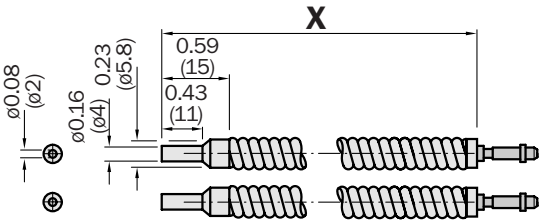


LM/LT Fiber Optic Cables for WLL 12 Sensors

Dimensional Drawings and Order Information

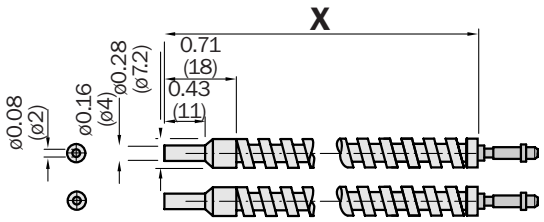
LM 32 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 32-450	2 014 850	450 mm
LM 32-750	2 015 038	750 mm



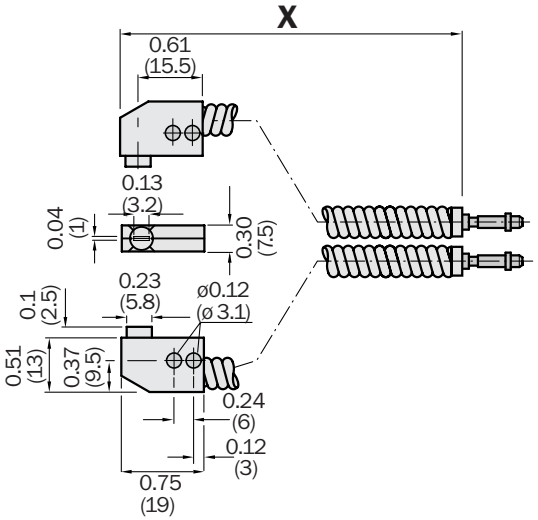
LT 32 Fiber Optic Cables, Helical Metal Spring, Chrome-plated

Type	Part no.	Length X
LT 32-450	2 015 072	450 mm
LT 32-750	2 015 073	750 mm



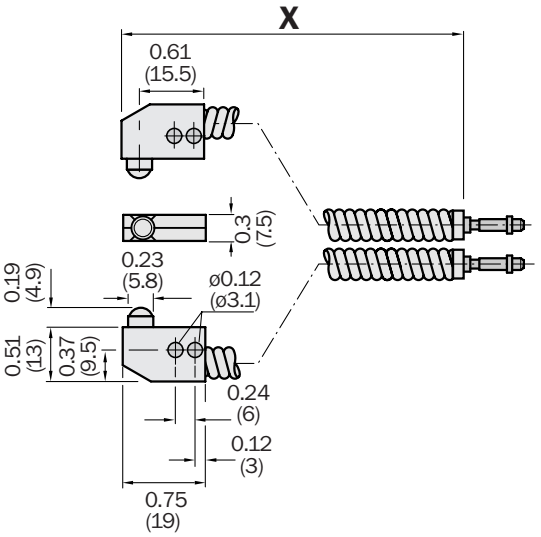
LM 38 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 38-150	2 015 788	150 mm
LM 38-450	2 015 049	450 mm
LM 38-750	2 015 050	750 mm



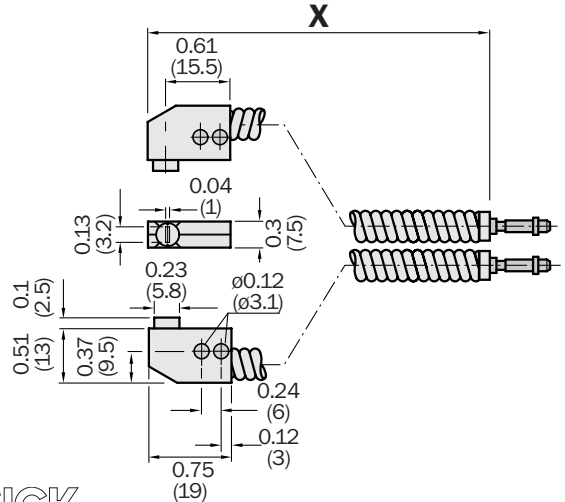
LM 38 Fiber Optic Cables, with Front Lens, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 38-751	2 015 970	750 mm



LM 39 Fiber Optic Cables, Helical Metal Spring with PVC Sheath

Type	Part no.	Length X
LM 39-450	2 015 047	450 mm
LM 39-750	2 015 048	750 mm



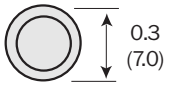
Fiber Optic Cables for LUT Luminescence Sensor

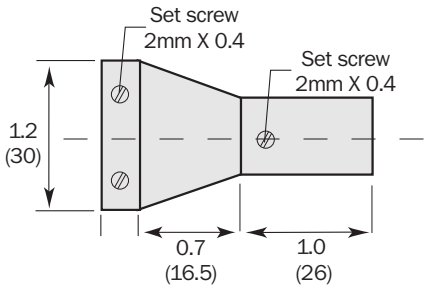
- UV fiber optic cables
- Operating temperature 23...95°F (-5…35°C).
  Unable to withstand mechanical loading outside this range.
  Must not be bent below 32°F (0°C).

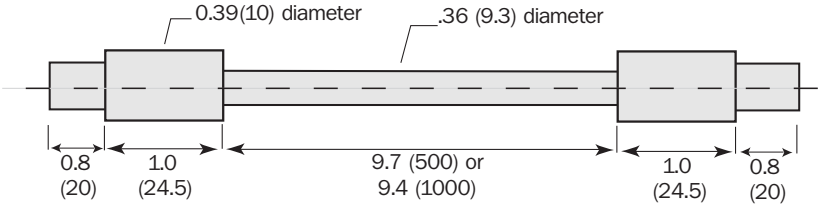
Dimensional Drawings and Order Information

LLUV 8 Fiber Optic Cables for LUT 3-820 and LUT 3-920 Luminescence Sensor

Type	Part no.	Length X
LLX3-500	7 023 566	500 mm
LLX3-1000	7 023 567	1000 mm
LL-LUT8	7 023 568	Fiber adapter

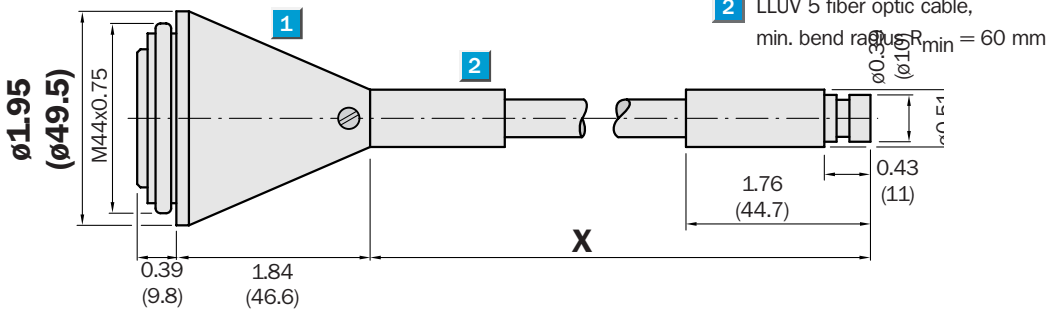






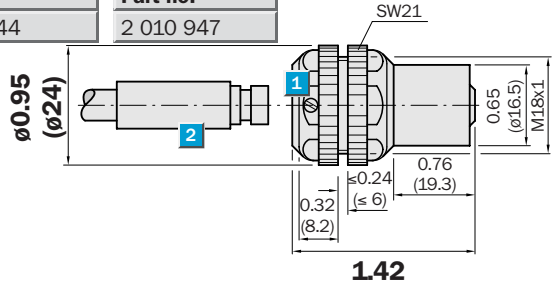
LLUV 8 Fiber Optic Cables for LUT 1-4 Luminescence Sensor

Type	Part no.	Length X
with adjustable lens		
LLUV 5-500-A	1 005 621	500 mm
LLUV 5-1000-A	1 005 622	1000 mm
LLUV 5-1500-A	1 005 623	1500 mm
without adjustable lens		
LLUV 5-500	2 008 435	500 mm
LLUV 5-1000	2 008 436	1000 mm
LLUV 5-1500	2 008 437	1500 mm



Front lens for LLUV 5 Fiber Optic Cables

Type	Part no.
OBJ-144	2 010 947

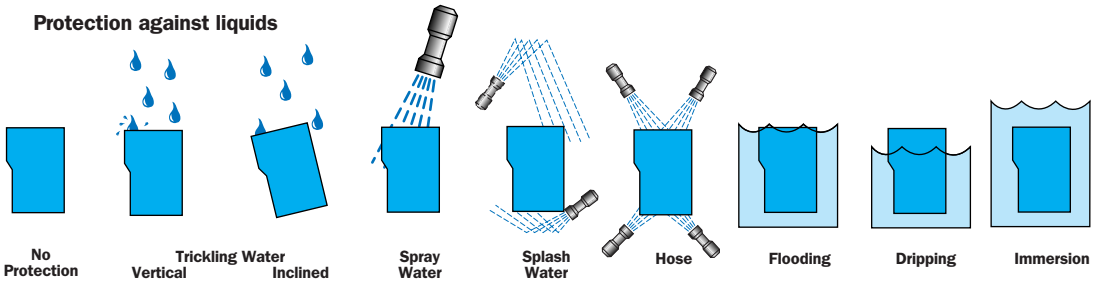


1 M 3 Fixing screw
2 LLUV 5 fiber optic cable

Data Tables and Glossary

Data Tables and Glossary

IP Enclosure Ratings



IEC 529 DIN 40050	IP...0	IP...1	IP...2	IP...3	IP...4	IP...5	IP...6	IP...7	IP...8
Protection against foreign bodies: No Protection	IP 00				No Protection				
Maximum Size of Foreign Body: 50 mm	IP 10	IP 11	IP 12						
Maximum Size of Foreign Body: 12.5 mm	IP 20	IP 21	IP 22	IP 23					
Maximum Size of Foreign Body: 2.5 mm	IP 30	IP 31	IP 32	IP 33	IP 34				
Maximum Size of Foreign Body: 1 mm	IP 40	IP 41	IP 42	IP 43	IP 44				
Dust-Protected	IP 50	IP 51	IP 52	IP 53	IP 54	IP 55	IP 56		
Dust-Tight	IP 60	IP 61	IP 62	IP 63	IP 64	IP 65	IP 66	IP 67	

NEMA Enclosure Ratings

Standard NEMA (IEC)	NEMA 1 (IP 10)	NEMA 2 (IP 11)	NEMA 3 (IP 54)	NEMA 3S (IP 54)	NEMA 4 (IP 56)	NEMA 4X (IP 56)	NEMA 6 (IP 67)	NEMA 6P (IP 67)	NEMA 12 (IP 52)	NEMA 13 (IP 54)
Suggested Usage	Inside	Inside	Outside	Outside	Inside or Outside	Inside or Outside	Inside or Outside	Inside or Outside	Inside	Inside
Accidental Bodily Contact	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Falling Dirt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dust, Lint, Fibers (non volatile)			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Windblown Dust			Yes	Yes	Yes	Yes	Yes	Yes		
Falling Liquid Light Splash		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hosedown and Heavy Splash					Yes	Yes	Yes	Yes		
Rain, Snow and Sleet			Yes	Yes	Yes	Yes	Yes	Yes		
Ice Buildup				Yes						
Oil or Coolant Seepage									Yes	Yes
Oil or Coolant Spray and Wash										Yes
Occasional Submersion							Yes	Yes		
Prolonged Submersion								Yes		
Corrosive Agents						Yes		Yes		

Data Tables

English-Metric Conversion

Inch Fraction	Inch Decimal	Millimeter	Inch Fraction	Inch Decimal	Millimeter	Inch Fraction	Inch Decimal	Millimeter
--	.0039	0.1	9/32	.2812	7.144	21/32	.6562	16.669
--	.0079	0.2	19/64	.2969	7.541	--	.6693	17
--	.0118	0.3	5/16	.3125	7.938	43/64	.6719	17.066
1/64	.0156	0.397	--	.3150	8	11/16	.6875	17.462
--	.0157	0.4	21/64	.3281	8.334	45/64	.7031	17.859
--	.0197	0.5	11/32	.3438	8.731	--	.7087	18
--	.0236	0.6	--	.3543	9	23/32	.7188	18.256
--	.0276	0.7	23/64	.3594	9.128	47/64	.7344	18.653
1/32	.0312	0.794	3/8	.375	9.525	--	.7480	19
--	.0315	0.8	25/64	.3906	9.922	3/4	.750	19.050
--	.0354	0.9	--	.3937	10	49/64	.7656	19.447
--	.0394	1	13/32	.4062	10.319	25/32	.7812	19.844
3/64	.0469	1.191	27/64	.4219	10.716	--	.7874	20
1/16	.0625	1.588	--	.4331	11	51/64	.7969	20.241
5/64	.0781	1.984	7/16	.4375	11.112	13/16	.8125	20.638
--	.0787	2	29/64	.4531	11.509	--	.8268	21
3/32	.0938	2.381	15/32	.4688	11.906	53/64	.8281	21.034
7/64	.1094	2.778	--	.4724	12	27/32	.8438	21.431
--	.1181	3	31/64	.4844	12.303	55/64	.8594	21.828
1/8	.1250	3.175	1/2	.500	12.700	--	.8661	22
9/64	.1406	3.572	--	.5118	13	7/8	.875	22.225
5/32	.1562	3.969	33/64	.5156	13.097	57/64	.8906	22.622
--	.1575	4	17/32	.5312	13.494	--	.9055	23
11/64	.1719	4.366	35/64	.5469	13.891	29/32	.9062	23.019
3/16	.1875	4.762	--	.5512	14	59/64	.9219	23.416
--	.1968	5	9/16	.5625	14.288	15/16	.9375	23.812
13/64	.2031	5.159	37/64	.5781	14.684	--	.9449	24
7/32	.2188	5.556	--	.5905	15	61/64	.9531	24.209
15/64	.2344	5.953	19/32	.5938	15.081	31/32	.9688	24.606
--	.2362	6	39/64	.6094	15.478	--	.9842	25
1/4	.2500	6.350	5/8	.625	15.875	63/64	.9844	25.003
17/64	.2656	6.747	--	.6299	16	1	1.000	25.400
--	.2756	7	41/64	.6406	16.272	--	--	--

To convert millimeters to inches, multiply by 0.0394.

To convert inches to millimeters, multiply by 25.4.

Drill Sizes for Mounting Hardware

Thread Size	Tap Drill	Clearance Drill	Thread Size	Tap Drill	Clearance Drill
#2-56	#50 (0.0700")	#42 (0.0935")	M2.5 x 0.45	2.05 mm (0.0807")	2.9 mm (0.1142")
#4-40	#43 (0.0890")	#31 (0.1200")		or #46 (0.0810")	or #32 (0.1160")
#6-32	#36 (0.1065")	#25 (0.1495")	M3 x 0.5	2.50 mm (0.0984")	3.4 mm (0.1339")
#6-40	#33 (0.1130")	#25 (0.1495")		or #39 (0.0995")	or #29 (0.1360")
#8-32	#29 (0.1360")	#16 (0.1770")	M4 x 0.7	3.30 mm (0.1299")	4.5 mm (0.1772")
#10-24	#25 (0.1495")	#7 (0.2010")		or #29 (0.1360")	or #15 (0.1800")
#10-32	#21 (0.1590")	#7 (0.2010")	M6 x 0.75	5.00 mm (0.1969")	6.6 mm (0.2598")
1/4"-20	#7 (0.2010"	#H (0.2660")		or #8 (0.1990")	or #G (0.2610")
5/16"-24	#I (0.2720")	#Q (0.3320")	M18 x 1	15.5 mm (0.6102")	20.0 mm (0.7874")
3/8"-32	11/32 (0.3438")	25/64" (0.3906")		or 39/64" (0.6094")	or 51/64" (0.7969")
7/16"-20	25/64 (0.3906")	15/32" (0.4687")	M30 x 1.5	26.5 mm (1.0433")	33.0 mm (1.2992")
1/2"-14 NPSM	23/32" (0.7188")	55/64" (0.8594")		or 1-3/64" (1.0469")	or 1-5/16" (1.3125")
1/2"-32	15/32" (0.4688")	17/32" (0.5312")			

Velocity Conversion

1		2		3		4	
Feet/ Minute	**Meters/ Minute**	**Inches/ Minute**	**Millimeters/ Minute**	**Inches Second**	**Millimeters/ Second**	**Seconds/ Inch**	**Seconds/ Millimeter**
.5	.152	6	152.4	.10	2.540	10.0	.394
1	.305	12	304.8	.20	5.080	5.0	.197
2	.610	24	609.6	.40	10.16	2.50	.098
3	.914	36	914.4	.60	15.24	1.67	.0656
4	1.22	48	1219.2	.80	20.32	1.25	.0492
5	1.52	60	1524.0	1.0	25.40	1.00	.0394
6	1.83	72	1828.8	1.2	30.48	.833	.0328
7	2.13	84	2133.6	1.4	35.56	.714	.0281
8	2.44	96	2438.4	1.6	40.64	.625	.0246
9	2.74	108	2743.2	1.8	45.72	.555	.0219
10	3.05	120	3048.0	2.0	50.8	.500	.0197
11	3.35	132	3352.8	2.2	55.88	.455	.0179
12	3.66	144	3657.6	2.4	60.96	.417	.0164
13	3.96	156	3962.4	2.6	66.04	.385	.0151
14	4.27	168	4267.2	2.8	71.12	.357	.0141
15	4.57	180	4572.0	3.0	76.20	.333	.0131
16	4.88	192	4876.8	3.2	81.28	.313	.0123
17	5.18	204	5181.6	3.4	86.36	.294	.0116
18	5.49	216	5486.4	3.6	91.44	.278	.0109
19	5.79	228	5791.2	3.8	96.52	.263	.0104
20	6.10	240	6096.0	4.0	101.6	.250	.00984
21	6.40	252	6400.8	4.2	106.7	.238	.00937
22	6.71	264	6705.6	4.4	111.8	.227	.00895
23	7.01	276	7010.4	4.6	116.8	.217	.00856
24	7.31	288	7315.2	4.8	121.9	.208	.00820
25	7.62	300	7620.0	5.0	127.0	.200	.00787
30	9.14	360	9144.0	6.0	152.4	.167	.00656
40	12.19	480	12192	8.0	203.2	.125	.00492
50	15.24	600	15240	10	254.0	.100	.00394
60	18.29	720	18288	12	304.8	.083	.00328
70	21.34	840	21336	14	355.6	.071	.00281
80	24.38	960	24384	16	406.4	.063	.00246
90	27.43	1080	27432	18	457.2	.056	.00219
100	30.48	1200	30480	20	508.0	.050	.00197
125	38.10	1500	38100	25	635.0	.040	.00157
150	45.72	1800	45720	30	762.0	.033	.00131
175	53.34	2100	53340	35	889.0	.029	.00112
200	60.96	2400	60960	40	1016	.025	.00098
225	68.58	2700	68580	45	1143	.022	.00087
250	76.20	3000	76200	50	1270	.020	.00079
275	83.82	3300	83820	55	1397	.018	.00072
300	91.44	3600	91440	60	1524	.016	.00066
325	99.06	3900	99060	65	1651	.015	.00061
350	106.7	4200	106680	70	1778	.014	.00056
375	114.3	4500	114300	75	1905	.013	.00052
400	121.9	4800	121920	80	2032	.012	.00049
450	137.2	5400	137160	90	2286	.011	.00044
500	152.4	6000	152400	100	2540	.010	.00039
600	182.9	7200	182880	120	3048	.0083	.00033
700	213.4	8400	213360	140	3556	.0071	.00028
800	243.8	9600	243840	160	4064	.0063	.00025
900	274.3	10800	274320	180	4572	.0055	.00022
1000	304.8	12000	304800	200	5080	.0050	.000197
1250	381.0	15000	381000	250	6350	.0040	.000157
1665	507.5	19980	507492	333	8458	.0030	.000118
2500	762.0	30000	762000	500	12700	.0020	.000079
5000	1524	60000	1524000	1000	25400	.0010	.000039

Data Tables

Temperature Conversion °C ⟷ °F					
Celsius°	Fahrenheit°	Celsius°	Fahrenheit°	Celsius°	Fahrenheit°
-62	-80	0.0	32	22.2	72
-57	-70	0.6	33	22.8	73
-51	-60	1.1	34	23.3	74
-46	-50	1.7	35	23.9	75
-40	-40	2.2	36	24.4	76
-34	-30	2.8	37	25.0	77
-29	-20	3.3	38	25.6	78
-23	-10	3.9	39	26.1	79
-17.8	0	4.4	40	26.7	80
-17.2	1	5.0	41	27.2	81
-16.7	2	5.6	42	27.8	82
-16.1	3	6.1	43	28.3	83
-15.6	4	6.7	44	28.9	84
-15.0	5	7.2	45	29.4	85
-14.4	6	7.8	46	30.0	86
-13.9	7	8.3	47	30.6	87
-13.3	8	8.9	48	31.1	88
-12.8	9	9.4	49	31.7	89
-12.2	10	10.0	50	32.2	90
-11.7	11	10.6	51	32.8	91
-11.1	12	11.1	52	33.3	92
-10.6	13	11.7	53	33.9	93
-10.0	14	12.2	54	34.4	94
-9.4	15	12.8	55	35.0	95
-8.9	16	13.3	56	35.6	96
-8.3	17	13.9	57	36.1	97
-7.8	18	14.4	58	36.7	98
-7.2	19	15.0	59	37.2	99
-6.7	20	15.6	60	37.8	100
-6.1	21	16.1	61	43	110
-5.6	22	16.7	62	49	120
-5.0	23	17.2	63	54	130
-4.4	24	17.8	64	60	140
-3.9	25	18.3	65	66	150
-3.3	26	18.9	66	71	160
-2.8	27	19.4	67	77	170
-2.2	28	20.0	68	82	180
-1.7	29	20.6	69	88	190
-1.1	30	21.1	70	93	200
-0.6	31	21.7	71	100	212

NOTE: For temperatures not given in the table, use the conversion information at the right.

Temperature Scale	Water Boiling Point	Water Freezing Point	To Convert Scales
°F (Fahrenheit)	212°F	32°F	°C = (°F-32) x 5/9
°C (Celsius or Centigrade)	100°F	0°F	°F = (°C x 9/5) + 32

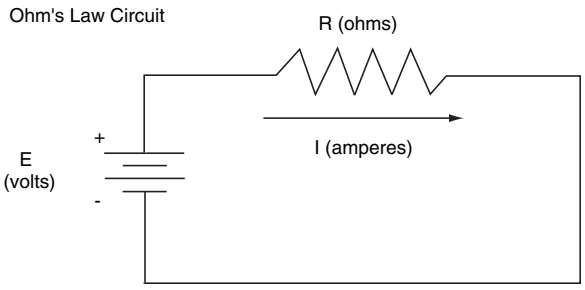
Basic Electrical Formulas

Ohm's Law describes the relationship between voltage, resistance and current in electrical circuits. As stated by Ohm's Law, the current in the figure below is directly proportional to the applied voltage and inversely proportional to the resistance of the circuit. This relationship, in the form of an equation, is written as follows:

$$I = \frac{E}{R}$$

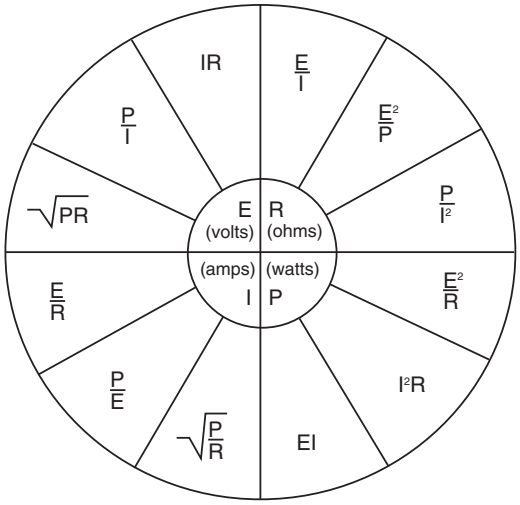
where **I** is the current (in amperes), **E** is the electromotive force (in volts), and **R** is the resistance (in ohms). It follows that:

$$E = I \times R \quad \text{and} \quad R = \frac{E}{I}$$



As an example, if R = 100 ohms and E = 10 volts, then the current in the circuit is equal to:

$$I = \frac{10}{100}$$ or 1/10 amp, or 100 milliamps



Electrical power may also be quantified in terms of a single equation. Power is the rate of doing work, and is measured in units called watts. Watts are equal to voltage x current. DC power equations relate power (in watts), current (in amperes), and resistance (in ohms), as follows:

$$P = E \times I \qquad P = \frac{E^2}{R} \qquad P = I^2 \times R$$

As an example, if R = 1000 ohms and E = 10 volts, the power used in the circuit is:

$$P = \frac{E^2}{R} = \frac{100}{1000}$$ = 1/10 watt = 100 milliwatts

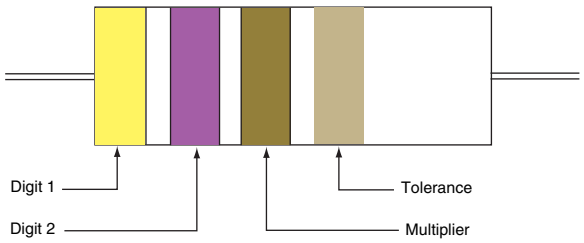
Resistor Color Codes

Color	Digit	Multiplier	Tolerance
black	0	1	±1%
brown	1	10	±2%
red	2	100	±3%
orange	3	1000	±4%
yellow	4	10000	
green	5	100000	
blue	6	1000000	
violet	7	10000000	
gray	8	100000000	
white	9		
gold		0.1	±5%
silver		0.01	±10%
no color			±20%

The colored bands on the bodies of resistors denote their value (in ohms), and their tolerance (in ±%). With the resistor positioned as shown below, the first two color bands are digits, the next is the multiplier, and the next (if present) is the tolerance.

As an example, a resistor color coded YELLOW-VIOLET-BROWN-GOLD would be 47 x 10, ±5% tolerance or: 470 ohms (±5% tolerance).

Precision resistors usually have their values stamped on the resistor body. Some film-type resistors may have three significant figures and therefore, use five color bands (including 3 digit bands and 1 multiplier band).



Data Tables

Units for Photoelectric Specifications		
Unit	**Symbol**	**Physical Quantity**
AC volts	V AC	electrical potential - alternating current
ampere	A	electrical current
DC volts	V DC	electrical potential - direct current
degrees Celsius	°C	temperature
degrees Fahrenheit	°F	temperature
Hertz	Hz	frequency
lumen*	lm	light energy
lux	lx	illumination (lm/m^2)
meter	m	length
microamp	µA	electrical current (10^{-6} A)
microsecond	µs	time (10^{-6} s)
milliamp	mA	electrical current (10^{-3} A)
millimeter	mm	length (10^{-3} m)
millisecond	ms	time (10^{-3} s)
nanometer	nm	length (light wavelength)
ohm	Ω	electrical resistance
second	s	time
volt	V	electrical potential
volt-amp	VA	power
watt	W	power

* 1 lumen = 0.001496 watt of monochromatic light at a wavelength of 546 nm.

Unit Prefixes			
Decimal Equivalent	**Prefix**	**Symbol**	**Exponential Expression**
1 000 000 000 000	tera	T	10^{12}
1 000 000 000	giga	G	10^{9}
1 000 000	mega	M	10^{6}
1 000	kilo	k	10^{3}
100	hecto	h	10^{2}
10	deka	da	10
0.1	deci	d	10^{-1}
0.01	centi	c	10^{-2}
0.001	milli	m	10^{-3}
0.000 001	micro	µ	10^{-6}
0.000 000 001	nano	n	10^{-9}
0.000 000 000 001	pico	p	10^{-12}

Copper Wire Information

AWG	Solid Wire Diameter American Wire or Brown and Sharpe Gage		Approximate Stranded Wire Diameter[1]		Approximate Resistance per 100 feet (30 meters)[2]
	Inches	Millimeters	Inches	Millimeters	Ohms
0000	.4601	11.687	.522	13.26	.0050
000	.4097	10.406	.464	11.79	.0060
00	.3648	9.266	.414	10.52	.0080
0	.3249	8.252	.368	9.35	.010
1	.2893	7.348	.328	8.33	.012
2	.2576	6.543	.292	7.42	.016
3	.2294	5.827			.020
4	.2043	5.189	.232	5.89	.025
5	.1819	4.620			.030
6	.1620	4.115	.184	4.67	.040
7	.1443	3.665			.050
8	.1285	3.264	.147	3.73	.060
9	.1144	2.906			.080
10	.1019	2.588	.116	2.95	.10
11	.0907	2.304			.13
12	.0808	2.052	.095	2.41	.16
13	.0720	1.829			.20
14	.0641	1.628	.073	1.85	.25
15	.0571	1.450			.32
16	.0508	1.290	.059	1.50	.40
17	.0453	1.151			.50
18	.0403	1.024	.048	1.22	.64
19	.0359	0.912			.80
20	.0320	0.813	.036	0.91	1.0
21	.0285	0.724			1.3
22	.0253	0.643	.030	0.76	1.6
23	.0226	0.574			2.0
24	.0201	0.511	.024	0.61	2.6
25	.0179	0.455			3.2
26	.0159	0.404	.020	0.51	4.1
27	.0142	0.361	.018	0.46	5.2
28	.0126	0.320	.015	0.38	6.5
29	.0113	0.287			8.2
30	.0100	0.254	.012	0.30	10
31	.00892	0.227			13
32	.00795	0.202	.008	0.20	16
33	.00708	0.180			20
34	.00630	0.160	.007	0.18	26
35	.00561	0.142			33
36	.00500	0.127	.006	0.15	42
37	.00445	0.113			52
38	.00396	0.101			66
39	.00353	0.090			83
40	.00314	0.080			105
41	.00280	0.071			130
42	.00249	0.063			170
43	.00222	0.056			210
44	.00198	0.050			270
45	.00176	0.045			330
46	.00157	0.040			420

[1]Exact diameter is dependent upon the wire gage used for the strands. Diameter listed represents the most common wire type for AWG.
[2]Resistance values assume the resistivity of solid copper wire. Stranding and/or copper alloy increase the resitance values.

Data Tables

Velocity Conversion Factors

From: \ To:	Miles/ Hour	Feet/ Minute	Inches/ Minute	Meters/ Minute	Centimeters/ Minute	Feet/ Second	Inches/ Second	Meters/ Second	Millimeters/ Second
1 mile/ hour	1.0	88	1056	26.822	2682.24	1.4667	17.60	0.4470	447.0
1 foot/ minute	1.1364×10^{-2}	1.0	12.0	0.3048	30.48	1.6667×10^{-2}	20.000	5.08×10^{-3}	5.08
1 inch/ minute	9.470×10^{-4}	8.333×10^{-2}	1.0	2.540×10^{-2}	2.54	1.3888×10^{-3}	1.6666×10^{-2}	4.23×10^{-4}	0.0423
1 meter/ minute	3.7282×10^{-2}	3.281	39.372	1.0	100.0	5.468×10^{-2}	0.6562	1.667×10^{-2}	16.667
1 centimeter/ minute	3.7282×10^{-4}	3.281×10^{-2}	0.3937	0.01	1.0	5.468×10^{-4}	6.5616×10^{-3}	1.667×10^{-4}	0.1667
1 foot/ second	0.6818	60	720	18.29	1829	1.0	12	0.3048	304.8
1 inch/ second	5.6818×10^{-2}	5	60	1.524	152.4	8.333×10^{-2}	1.0	2.540×10^{-2}	25.40
1 meter/ second	2.2369	196.85	2362.2	60.0	6000.0	3.281	39.372	1.0	1000
1 millimeter/ second	2.2369×10^{-3}	0.1969	2.3622	6.0×10^{-2}	6.000	3.281×10^{-3}	3.937×10^{-2}	1×10^{-3}	1.0

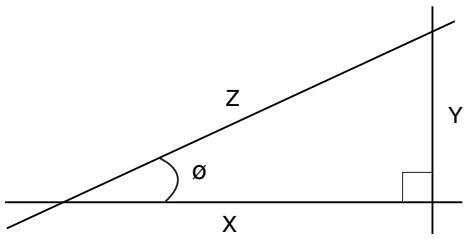
Length Conversion Factors

From: \ To:	Angstroms	Milli- meters	Centi- meters	Inches	Feet	Yards	Meters	Kilo- meters	Miles (Imperial)
1 Angstrom (Å)	1.0	1.0×10^{-7}	1.0×10^{-8}	3.937×10^{-9}	3.2808×10^{-10}	1.0936×10^{-10}	1.0×10^{-10}	1.0×10^{-13}	6.2137×10^{-14}
1 millimeter (mm)	1.0×10^{7}	1.0	0.1	0.3094	3.2808×10^{-3}	1.0936×10^{-3}	1.0×10^{-3}	1.0×10^{-6}	6.2137×10^{-7}
1 centimeter (cm)	1.0×10^{8}	10.0	1.0	0.3937	0.0328	0.0109	0.01	1.0×10^{-5}	6.2137×10^{-6}
1 inch (in)	2.54×10^{8}	25.4	2.54	1.0	0.0833	0.0278	0.0254	2.54×10^{-5}	1.5783×10^{-5}
1 foot (ft)	3.048×10^{9}	304.8	30.48	12.0	1.0	0.3333	0.3048	3.048×10^{-4}	1.8939×10^{-4}
1 yard (yd)	9.144×10^{9}	914.4	91.44	36.0	3.0	1.0	0.9144	9.144×10^{-4}	5.6818×10^{-4}
1 meter (m)	1.0×10^{10}	1.0×10^{3}	100.0	39.3701	3.2808	1.0936	1.0	1.0×10^{-3}	6.2137×10^{-4}
1 kilometer (km)	1.0×10^{13}	1.0×10^{6}	1.0×10^{5}	3.937×10^{4}	3.2808×10^{3}	1.0936×10^{3}	1.0×10^{3}	1.0	0.6214
1 mile (imperial)	1.6093×10^{13}	1.6093×10^{6}	1.6093×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	1.6093×10^{3}	1.6093	1.0

Trigonometric Functions and Formulas

Degrees	sin	cos	tan	cot	sec	csc	
0	0.0000	1.0000	0.0000	--	1.0000	--	90
1	0.0174	0.9998	0.0175	57.290	1.0002	57.299	89
2	0.0349	0.9994	0.0349	28.636	1.0006	28.654	88
3	0.0523	0.9986	0.0524	19.081	1.0014	19.107	87
4	0.0698	0.9976	0.0699	14.301	1.0024	14.336	86
5	0.0872	0.9962	0.0875	11.430	1.0038	11.474	85
6	0.1045	0.9945	0.1051	9.5144	1.0055	9.5668	84
7	0.1219	0.9925	0.1228	8.1443	1.0075	8.2055	83
8	0.1392	0.9903	0.1405	7.1154	1.0098	7.1853	82
9	0.1564	0.9877	0.1584	6.3138	1.0125	6.3924	81
10	0.1736	0.9848	0.1763	5.6713	1.0154	5.7588	80
11	0.1908	0.9816	0.1944	5.1446	1.0187	5.2408	79
12	0.2079	0.9781	0.2126	4.7046	1.0223	4.8097	78
13	0.2250	0.9744	0.2309	4.3315	1.0263	4.4454	77
14	0.2419	0.9703	0.2493	4.0108	1.0306	4.1336	76
15	0.2588	0.9659	0.2679	3.7320	1.0353	3.8637	75
16	0.2756	0.9613	0.2867	3.4874	1.0403	3.6280	74
17	0.2924	0.9563	0.3057	3.2708	1.0457	3.4203	73
18	0.3090	0.9511	0.3249	3.0777	1.0515	3.2361	72
19	0.3256	0.9455	0.3443	2.9042	1.0576	3.0715	71
20	0.3420	0.9397	0.3640	2.7475	1.0642	2.9238	70
21	0.3584	0.9336	0.3839	2.6051	1.0711	2.7904	69
22	0.3746	0.9272	0.4040	2.4751	1.0785	2.6695	68
23	0.3907	0.9205	0.4245	2.3558	1.0864	2.5593	67
24	0.4067	0.9135	0.4452	2.2460	1.0946	2.4586	66
25	0.4226	0.9063	0.4663	2.1445	1.1034	2.3662	65
26	0.4384	0.8988	0.4877	2.0503	1.1126	2.2812	64
27	0.4540	0.8910	0.5095	1.9626	1.1223	2.2027	63
28	0.4695	0.8829	0.5317	1.8807	1.1326	2.1300	62
29	0.4848	0.8746	0.5543	1.8040	1.1434	2.0627	61
30	0.5000	0.8660	0.5774	1.7320	1.1547	2.0000	60
31	0.5150	0.8572	0.6009	1.6643	1.1666	1.9416	59
32	0.5299	0.8580	0.6249	1.6003	1.1792	1.8871	58
33	0.5446	0.8387	0.6494	1.5399	1.1924	1.8361	57
34	0.5592	0.8290	0.6745	1.4826	1.2062	1.7883	56
35	0.5736	0.8192	0.7002	1.4281	1.2208	1.7434	55
36	0.5878	0.8090	0.7265	1.3764	1.2361	1.7013	54
37	0.6018	0.7986	0.7536	1.3270	1.2521	1.6616	53
38	0.6157	0.7880	0.7813	1.2799	1.2690	1.6243	52
39	0.6293	0.7771	0.8098	1.2349	1.2868	1.5890	51
40	0.6428	0.7660	0.8391	1.1918	1.3054	1.5557	50
41	0.6561	0.7547	0.8693	1.1504	1.3250	1.5242	49
42	0.6691	0.7431	0.9004	1.1106	1.3456	1.4945	48
43	0.6820	0.7314	0.9325	1.0724	1.3673	1.4663	47
44	0.6947	0.7193	0.9567	1.0355	1.3902	1.4396	46
45	0.7071	0.7071	1.0000	1.0000	1.4142	1.4142	45
	cos	**sin**	**cot**	**tan**	**csc**	**sec**	**Degrees**

Trigonometric Formulas for Distance or Angle Calculation



Relationships:

sin ø = Y/Z
cos ø = X/Z
tan ø = X/Y
csc ø = Z/Y = 1/sin ø
sec ø = Z/X = 1/cos ø
cot ø = X/Y = 1/tan ø

Given ø and X: Y = X tan ø Z = X sec ø
Given ø and Y: X = Y cot ø Z = Y csc ø

Given ø and Z: X = Z cos ø Y = Z sin ø
Given X and Y: $Z = \sqrt{X^2 + Y^2}$ ø = arctan (Y/X)

Glossary

A/D: Acronym for analog to digital converter; an electronic device that converts data from analog form to digital representation.

AC-coupled amplifier: AC-coupled amplifiers may sometimes be used reliably in close differential sensing applications, since they amplify only quick signal changes and ignore slow signal changes. As a result, very small changes in light level can be highly amplified. The output of AC-coupled amplifiers is a one-shot pulse. (See also "DC-coupled amplifier".) In photoelectric sensing, AC-coupled amplifiers are most often used to amplify the analog signal from a non-modulated remote sensor. However, AC-coupled amplifiers may also be used with specially designed modulated sensors. Use of AC-coupled amplifiers should be avoided, except when they are the only solution to a close differential sensing situation. Because AC-coupled amplifiers are sensitive to very small signal changes, they may respond to unwanted conditions like sensor vibration or electrical "noise".

Accuracy: A term used in measurement devices. It is the amount usually given as a percentage either of sensing range or percent of full scale. It relates the measured distance to the physical distance (actual).

Active face: Portion of the sensor which the electromagnetic field or ultrasonic pulse emanates.

Active switching zone: Area above the sensing face in which a proximity sensor responds by a change in switching status when attenuating material is brought nearer.

Alignment: Positioning of light source and receiver, reflector, or target in which maximum signal strength is obtained.

Alternate action: See "flip-flop".

Alternating current (AC): A sinusoidal current rated at a given frequency, usually 50 Hz or 60 Hz.

Ambient: The environmental conditions in a sensing area (e.g. temperature, light level, humidity, and air speed).

Ambient Light: Illumination of a receiver not generated by its light source.

Ampere (amp): A unit of measurement; electric current. One volt across one ohm of resistance causes a current flow of one amp. One ampere is equal to 6.28 x 10 18 electrons passing a point in one second.

Analog: Electronic circuit with a current or voltage output signal that varies as a function of the light intensity received by the photo detector.

AND logic: A logic function in which all of two or more defined input conditions must exist simultaneously before a load is energized (A and B and C = output).

Angle of acceptance: The included angle of the field of view of a sensor. See "field of view".

Angstrom: Unit of measurement used to determine the wavelength of light. 10 Angstrom (A) is equal to 1 nanometer (nm).

Anode: A positive electrode of a device. See "diode".

Anti-glare filter: See "polarizing filter".

Aperture: The size of a lens opening. A mechanical part attached to a lens used to restrict the size of a lens opening. Apertures are used to limit the amount of light reaching a photoelectric receiver. Apertures are used in opposed photoelectric sensing to shape the size of the effective beam to match the profile of the object to be sensed (e.g. a "line" or slit-type aperture is used on the receiver and/or emitter to sense small diameter wire or thread).

Artificial load: A resistor connected in parallel with a load to lower the load's effective resistance. Usually encountered when interfacing 2-wire sensors to high-impedance inputs in order to lower the off-state voltage at the input.

ASCII: Acronym of American Standard Code for Information Interchange. An 8 bit coded character set used to represent alphanumeric, punctuation marks and certain special control characters.

Attenuation: The reduction of signal strength. An example is when light travels through a fiber optic cable. The degree of attenuation depends on the fiber material and on the total length the fiber optic cable.

Axial Approach: The approach of the target with its center maintained on the reference axis.

Background suppression (BGS): A photoelectric diffuse sensing mode with response that is similar to a diffuse sensor, but with a defined range limit. The amount of reflected light received by each of two opto-elements is compared. An object is recognized as long as the amount of light reaching receiver R 1 is equal to or greater than the amount seen by R 2. The sensor's output switches as soon as the amount of light at R 2 becomes greater than at R 1.

Barrier: See "intrinsic safety barrier".

Beam pattern: A two-dimensional graph of a sensor's response. (Beam patterns are assumed to have the same shape in all sensing planes.) Beam patterns are plotted for perfectly clean sensing conditions, optimum angular sensor alignment, and the sensitivity (gain) setting for the specified range. Beam patterns are included as part of the description of each sensor. The dimensions of the plot are typical, and should not be considered exact specifications. Beam pattern information and assumptions are slightly different for each sensing mode. Beam patterns are helpful in predicting the performance of the sensor.

Beam-break: See “opposed sensing mode”.

Beamsplitter: A device for dividing a light beam into two or more separate beams.

Bifurcated fiber (optic):
A fiber optic assembly that is branched to combine emitted light with received light in the same assembly. Bifurcated fibers are used for diffuse (divergent) mode proximity sensing, or they may be equipped with a lens for use in the retroreflective mode.

Bipolar output: The dual output configuration of a DC sensing device, where one output switch is a sinking device (NPN transistor) and the other output switch is a sourcing device (PNP transistor). The solid-state equivalent of a DPST relay (for most loads).

Blanking input: An input signal sent to a sensor that inhibits or “blanks” the output function.

Burn-through: Describes the ability of high-powered modulated opposed mode sensors to “see” through paper, thin cardboard, opaque plastics, and materials of similar optical density. Burn-through may be used to advantage in some sensing situations, such as when looking through an opaque walled container (like a cereal box) to sense the presence or absence of product inside.

Capacitive sensor: Capacitive proximity sensors are triggered by a change in the surrounding dielectric. The transducer of a capacitive sensor is configured to act as the plate of a capacitor. The dielectric property of any object present in the sensing field increases the capacitance of the transducer circuit and, in turn, changes the frequency of an oscillator circuit. A detector circuit senses this change in frequency, and signals the output to change state.

Cathode: A negative electrode of a device. See “diode”.

CENELEC: Acronym for the European Committee for Electrotechnical Standardization. Responsible for the development of standards covering dimensional and operating characteristics of control components.

Close differential sensing: Sensing situations with low optical contrast (less than 3 to 1). Includes most color registration sensing applications. Also, breaking of a large effective beam with a small profile, as in ejected part detection or thread break detection. Close differential sensing often requires the use of an AC-coupled amplifier.

CMOS: Complementary Metal Oxide Semiconductor (device). Highly efficient semiconductors used in custom monolithic photoelectric circuit designs.

Collimation: Optical collimation is the process by which a lens converts a divergent beam into a parallel beam of light.

Complementary output: Output circuit with a dual output device such that when one output is energized the other output is de-energized (similar to SPDT contact).

Contact bounce: Occurs on the closure of a mechanical contact pair. When the contact pair closes, the contacts make and break several times before a stable closed condition is established. Contact bounce is not a characteristic of solid-state switch contacts.

Continuous current (Ia): Current at which the proximity sensor can function reliably.

Contrast (optical): The ratio of light falling on the receiver in the “light” state as compared to the “dark” state. Contrast is also referred to as the “light-to-dark-ratio.” Optimizing the contrast in any sensing situation will increase the reliability of the sensing system.

Control end: Refers to the end of a fiber optic assembly that attaches to the photoelectric sensor. An individual fiber optic assembly has one control end; a bifurcated fiber has two. See “fiber optic”.

Conventional current (flow): The concept of current flow from positive to negative.

Convergent beam sensing mode: A special variation of diffuse mode photoelectric proximity sensing which uses additional optics to create a small, intense and well-defined image at a fixed distance from the front surface of the sensor lens. Convergent beam sensing is the choice for photoelectric sensing of transparent materials that remain within the sensor’s depth-of-field. Also called “fixed-focus proximity mode”.

Corner-cube reflector: Also called a corner-cube prism. A prism having three mutually perpendicular surfaces and a hypotenuse face. Light entering through the hypotenuse face is reflected by each of the three surfaces and emerges back through the hypotenuse face parallel to the entering beam. The light beam is returned to its source. May also be constructed from three first-surface mirrors. Corner-cube geometry is used for retroreflective materials. See “retroreflector”.

Correction factors: Suggested multiplication factors taking into account variations in the target material composition. When figuring actual sensing distance this factor should be multiplied with the nominal sensing distance.

Crosstalk (electrical): Electrical crosstalk occurs in modulated photoelectric component systems when the modulated emitter signal (which is a high-current pulsed signal) couples directly onto the receiver lead wires. This results in a “lock-on” condition of the amplifier (i.e. the amplifier recognizes a light condition regardless of the sensor’s status). Crosstalk is usually a result of improper splicing of additional remote sensor’s lead length. In component systems, remote sensors require separate shielded cables for emitter and receiver lead extension, even if the original cable length contained wires for both the emitter and the receiver.

Glossary

Crosstalk (optical): Optical crosstalk occurs when a photoelectric receiver responds to light from an adjacent emitter. This is often an unwanted situation. If crosstalk cannot be resolved by repositioning of sensors, it can often be eliminated using sensor multiplexing.

CSA: Abbreviation for Canadian Standards Association. A testing agency analogous to Underwriters Laboratories, Inc. (UL) in the United States. A product that is "CSA certified" has been type-tested and approved by the Canadian Standards Association as meeting electrical and safety codes.

Current consumption: The current consumed by the proximity switch when the output device is in the off condition.

Current sinking output: The output of a DC device that switches ground (DC common) to a load. The load is connected between the output of the device and the positive side of the power supply. The switching component is usually an open collector NPN transistor, with its emitter tied to the negative side of the supply voltage.

Current sourcing output: The output of a DC device that switches positive DC to a load. The load is connected between the output of the device and the ground (DC common) side of the power supply. The switching component is usually an open collector PNP transistor, with its emitter tied to the positive side of the supply voltage.

Damping material: Material that causes a decrease in the strength of the electromagnetic or electrical field produced by the sensing coil.

Dark operate mode (D.O. or D/O): The initiation of a photoelectric sensor's output (or of timing logic) when the receiver goes sufficiently dark. Most photoelectric sensors (or sensing systems) can be programmed for either dark operate or light operate.

Depth-of-field: The range of distance in which a sensor has a response. Used to define the response pattern of proximity-mode sensors, especially ultrasonic and photoelectric convergent beam and background suppression mode sensors. See "convergent beam sensing mode".

Diagnostic: Advanced warning of loss in signal strength due to misalignment, dust and more, prior to loss of control output signal.

Differential travel: See "hysteresis".

Diffuse sensing mode:
A photoelectric proximity sensing mode in which light from the emitter strikes a surface of an object at some arbitrary angle and is diffused from the surface at all angles. The object is detected when the receiver captures some small percentage of the diffused light. Also called the "direct reflection mode" or simply the photoelectric "proximity mode".

Digital output: An output circuit with only two operating states that are either "On" or "Off." These operating states often are called "Hi" or "Low."

DIN standard: Abbreviation for "Deutsches Institut fur Normung". A collection of German industry standards that are recognized throughout the world.

Diode: A two-layer semiconductor that allows current to flow in only one direction; from cathode to anode.

Direct current (DC): A current that flows only in one direction through a circuit. May or may not have a DC ripple component. DC sources that are unfiltered should be referred to as full-wave or half-wave rectified AC.

Divergent sensing mode: A variation of the diffuse photoelectric sensing mode in which the emitted beam and the receiver's field of view are both very wide. Divergent mode sensors have very forgiving alignment requirements, but have shorter sensing range as compared to diffuse mode sensors of the same basic design. Divergent sensors are particularly useful for sensing transparent or translucent materials or for sensing objects with irregular surfaces (e.g. webs with "flutter"). They are also used to reflectively sense objects with very small profiles, like small diameter thread or wire, at close range.

DPDT relay: Abbreviation for "Double-Pole Double-Throw". A relay with two sets of single-pole double-throw form 1C contacts that are operated simultaneously by a single action. See "SPDT relay".

Dual output: Sensor which has two outputs which may be complementary or may be of a single type (i.e. two normally open or two normally closed).

Effective beam: The "working" part of a photoelectric beam. The portion of a beam that must be completely interrupted in order for an object to be reliably sensed. Not to be confused with the actual radiation pattern of the emitter, or with the field of view of the receiver.

Effective operating distance (Sr): The operating distance of an individual proximity switch measured at stated temperature, voltage, and mounting condition.

Electromagnetic interference (EMI): Electrical "noise" which may interfere with proper operation of sensors, programmable logic controllers, counters, data recorders, and other sensitive electronic equipment. Common sources of EMI include lighting fixtures and controls, motors, generators, and contactors. EMI emissions are distributed evenly across the radio frequency spectrum. Emissions are readily conducted along cables, so EMI sources can often be found by following along wireways with a portable radio

Electromechanical relay: Conventional switching relays consisting of "hard" contacts (metal-to-metal), switched to opened or closed position by applying voltage to an electromagnetic coil. Can be constructed to reliably switch loads that demand much higher power levels than can be switched by most solid-state relays. Limited by relatively slow switching speeds and finite mechanical life.

EMC: Electromagnetic compatibility.

Emitter (photoelectric): 1. The sensor containing the light source in an opposed mode photoelectric sensing pair (see “opposed sensing mode”). 2. The light emitting device within any photoelectric sensor (e.g. LED, incandescent bulb, laser diode, etc.).

Enable: To allow an output to occur in response to an input signal. Synonymous with “interrogate” when used to describe the gating function in an inspection scheme. See “inspection logic”.

Enclosure rating: See “IP rating” and also “NEMA rating”.

Excess gain: A measurement of the amount of light energy falling on the receiver of a sensing system over and above the minimum amount of light required to operate the sensor’s amplifier. Excess gain is a specification of every photoelectric sensor. It is plotted versus sensing distance. Excess gain values are used in the sensor selection process to predict the reliability of a photoelectric sensor in a known sensing environment.

False pulse: An undesired change in the state of the output of the proximity switch that lasts for more than two milliseconds.

False pulse protection: Circuitry designed to disable the output of a sensor or sensing system until the power supply circuit has time to stabilize at the proper voltage level. Typically 100 - 300 milliseconds (this time is always specified).

False trigger: Unwanted change of state of the output usually occurring during the “Power On” or “Power Down” actions.

False trigger protection: Circuitry designed to avoid false pulses during “Power On” or “Power Down” actions.

Ferrous metal: Any metal containing iron.

Ferrule: Tip or termination end of a fiber optic cable.

FET (Field Effect Transistor): Bilateral FETs are semiconductors used as the output switch of some sensing devices for their ability to switch either AC or DC, their low on-state voltage drop, and their low off-state leakage current. Not tolerant of inrush current, typical of inductive loads.

Fiber optics: Transparent fibers of glass or plastic used for conducting and guiding light energy. Used in photoelectrics as “light pipes” to conduct sensing light into and out of a sensing area. Glass fiber optic assemblies consist of a “bundle” of small (about .002” diameter), discrete, glass optical fibers housed within a flexible sheath. Glass fiber optics are able to withstand hostile sensing environments. Plastic fiber optic assemblies are made up of either one or two acrylic monofilaments in a flexible sheath. Plastic fiber optics are the smallest photoelectric sensors. There are two basic styles of fiber optic assemblies: individual and bifurcated. Individual fiber optic assemblies guide light from an emitter to a sensing location, or to a receiver from a sensing location. Bifurcated fibers use half of their fiber area to transmit light and the other half to receive light. See “individual fiber” and “bifurcated fiber”.

Field of view: The region that is illuminated by the light source and can be seen by the receiver. Field of view is expressed in degrees but is three-dimensional.

Fixed focus: See “convergent sensing mode”.

Fixed-field diffuse mode: See “background suppression (BGS)”.

Flip-flop: An electronic circuit with two stable states (Hi and Low, On and Off, etc.). The circuit remains in one of the states until application of an external signal causes it to change to the opposite state. In sensing logic schemes, a flip-flop is a function that switches a load from “Off” to “On” and back again with each sequential input. Also known as “alternate action logic”, “ratchet logic”, or “divide-by-two logic”. Used to split production lines into two lanes.

Fluorescence: The emission by a material of light radiation at a longer wavelength as a result of the absorption of some other radiation of shorter wavelengths. For example, the emission of visible light as a result of excitation by ultraviolet light.

Flush installation (shielded): A proximity sensor can be embedded in an attenuating material so that it is flush with the active surface.

Focal length: The distance from a lens’ principal point to the corresponding focal point. Also referred to as the equivalent focal length and the effective focal length.

Foreground Suppression (FGS): A specialized version of background suppression where the background is taught to the sensor and then used basically as a reflector. This is particularly helpful in the detection of objects on a shiny background.

Free zone: The area around the proximity switch which must be kept free from any damping material.

Frequency: Is a measure of the speed at which a sensor can trigger and be ready for another input. The units are Hertz.

Gain adjustment: See “sensitivity adjustment”.

Gate: 1. A combination logic circuit having one or more input channels. 2. Used as shorthand for “interrogate”. See “inspection logic”.

Gating: The provision to apply an external signal to a sensor in order to prevent undesirable operation.

Glass fibers: Single glass optical fibers are small strands (typically .002 inch diameter) of glass with an outer cladding of glass of a different index of refraction Glass fiber assemblies are constructed of a bundle of individual glass fibers, contained and protected by a

sheath (typically a flexible armored cable). See “fiber optics”.

Gray scale: Variations of values from white, through shades of gray, to black in a digitized image with black assigned the value of zero and white the value of one.

Ground: An often misused term. In power distribution systems it refers to earth ground. It is important at high power levels mainly for safety reasons. Within a manufacturing plant, it generally refers to conduit or machine frame ground. In electronic systems, it refers to the electronic chassis or enclosure ground or to dc common (voltage reference to the negative side of a dc power supply).

Hermetic seal: An airtight seal. In photoelectrics, the lens assemblies of some sensors have hermetic seals to exclude the entrance of air and water behind the lens, thereby preventing fogging of the inner surface of the lens.

Hertz (Hz): The international unit of frequency, equal to one cycle per second. Named after the German physicist Heinrich Rudolph Hertz.

High pass filter: A gray scale processing operation that enhances high frequencies (and attenuates low frequencies.)

Holding current: 1) A specification of a load, especially an electromechanical load. The current that is drawn by a load while it is energized. Also called “sealed current” of a load. See “inrush current”. 2) The current necessary to maintain a thyristor in the “On” state.

Hysteresis: The difference, in percentage (%), of the nominal sensing distance between the operate (switch on) and release point (switch off) when the target is moving away from the sensor’s active face. Without sufficient hysteresis a proximity sensor will “chatter” (continuously switch on and off) when there is significant vibration applied to the target or sensor.

Hysteresis (H): The hysteresis is the positional difference between the activation and deactivation point for attenuating material as it is brought closer or moved away. It is required to ensure a smooth, stable switching action. It is given as a percentage of the real sensing range or in mm.

Hysteresis, switching: Meaning, “to lag behind”. An electronic design consideration for sensors such that the operate point (received light level, etc.) is not the same as the release point of the sensor output. This differential prevents the output of a sensor or sensing system from “buzzing” or “chattering” when a signal at or near the threshold level is detected.

IEC: The International Electrotechnical Commission, headquarters in Geneva, Switzerland. This organization writes and distributes recommended safety and performance standards for electrical products and components. See “IP rating”.

Impedance: The opposition in an electric circuit to the flow of alternating current (AC) at a given frequency. Impedance consists of resistance, inductive reactance, and capacitive reactance. It is measured in ohms.

Individual fiber (optic): A fiber optic assembly having one control end and one sensing end. Used for piping photoelectric light from an emitter to the sensing location or from the sensing location back to a receiver. Usually used in pairs in the opposing sensing mode, but can also be used side-by-side in the diffuse proximity mode or angled for the specular reflection or mechanical convergent mode.

Inductance: The property of an electric circuit whereby an electromotive force (emf) is induced in it by a change of current in itself or in a neighboring circuit. When a current changing at the rate of one ampere per second induces a voltage of 1 volt, the inductance of the circuit is 1 henry.

Inductive load: Electrical devices generally made of wire that is coiled to create a magnetic field to produce mechanical work when energized. Examples of inductive loads include motors, solenoids, and relays. Inductive loads exhibit inrush of current when energized that can be many times the steady state holding current. When de-energized, the magnetic field collapses, generating a high voltage transient. This transient can cause arcing across mechanical switching contacts or can cause damage to solid-state contacts. See “transient”.

Inductive proximity sensor: Sensors with an oscillator and coil that radiate an electromagnetic field that induces eddy currents on the surface of metallic objects approaching the sensor face. The eddy currents dampen the oscillator energy. This energy loss is sensed as a voltage drop, which causes a change in the sensor’s output state. Often called simply a “proximity sensor”.

Infrared (IR): Light with wavelengths generally greater than 800 nanometers (8000 Angstroms). Invisible to the eye and safe to most photographic films. Infrared LEDs used as the emitter source in photoelectric sensors offer the highest amount of excess gain. See “LED”.

Inhibit: In sensing logic schemes an inhibit signal (e.g. from an inspection sensor) cancels a timing function and/or output. See “inspection logic”.

Input: 1) The signal (voltage or current) applied to a circuit to cause the output of that circuit to change state. 2) The terminals, jack, or receptacle provided for reception of the input signal.

Input voltage: The power source required by an electric or electronic device (e.g. a self-contained sensor) in order for the device to operate properly.

Inrush current: The initial surge of current through a load when power is first applied. An important specification to consider whenever evaluating an interface. Inrush current to an inductive load (solenoid, contactor, etc.) is up to ten times the holding current.

Inspection logic: A logic scheme used in high-speed inspection applications that generally uses two sensors as inputs. One sensor, called the “product sensor” senses the product’s presence and “interrogates” the “inspection sensor”. If the inspection sensor “sees” a good product, it “inhibits” the inspection logic from rejecting the product.

Interrogate: In sensing logic schemes, an interrogate signal (e.g. from a product sensor) allows the information from one or more other inputs (e.g. an inspection sensor) to be recognized by the inspection or control logic. Also called “gate” or “enable”. See “inspection logic”.

Intrinsic safety: A design technique applied to electrical equipment (e.g. sensors and switches) and wiring for hazardous locations. The technique involves limiting electrical and thermal energy to a level below that required to ignite a specific hazardous atmosphere. Intrinsic safety design often eliminates the requirement for expensive and awkward explosion-proof enclosures.

Intrinsic safety barrier: A protective component designed to limit the voltage and current in a hazardous area. The barrier functions outside of the hazardous location to divert abnormal energy to ground.

Inverter (circuit): A circuit whose output is always in the opposite state (or phase) from the input. Also called a “NOT” circuit.

IP rating: A rating system established by IEC Publications 144 and 529 which defines the suitability of sensor and sensor system enclosures for various environments. Similar to NEMA ratings for enclosures.

Isolated output: An output that is optically separated from the input and other output and independent of the other output to a specified level.

Isolation voltage: Maximum rated voltage between isolated outputs or input and output.

Laser: An active electron device that converts input power into a narrow, intense beam of coherent visible or infrared light. The input power excites the atoms of an optical resonator to a higher energy level, and the resonator forces the excited atoms to radiate in phase. Term derived from “Light Amplification by Stimulated Emission of Radiation”.

Latch (latching logic): A logic function in which an input signal (e.g. from a sensor) locks “on” the output. The output remains “on” until a signal is applied to a second input to reset the latch. The output of a “DC latch” will immediately latch “on” again if the input signal is present when the reset signal is removed. The reset signal of an “AC latch” will cancel the output, even if the input signal remains when the reset is removed. The output will not re-latch until the reset signal is removed and then the input signal is removed and then reapplied.

Lateral approach: The approach of the target perpendicular to the reference axis.

Leakage current: The small amount of (undesirable) current that is inherent in solid-state switches when they are in the “off” state. Most commonly encountered with 2-wire sensors that require leakage current in order to remain powered in the “off” state. High leakage current values are also inherent in some triac switches. Becomes important if the resultant “off” state voltage across the load being switched is too high for the load to de-energize. (The “off” state voltage across the load is equal to the leakage current of the switch multiplied by the resistance of the load.)

LED (Light Emitting Diode): Semi-conductor that generates monochromatic light when current flows in the conductive direction. An LED is the standard light source for most photoelectric sensors.

Lens: The optical component of a photoelectric sensor that collimates or focuses emitted light rays and/or focuses incident light rays upon the receiver optoelement.

Light operate: A light operate sensor energizes an output when the light intensity on the photoelectric sensor has increased to a sufficient level.

Line voltage: The normal in-plant power line supply voltage which is usually 120 or 220 / 240 V AC.

Linear output: Refers to the output of an analog sensor that has a “straight-line” relationship to a sensing parameter (e.g. sensing distance).

Linearity: Refers to the closeness an analog output actually follows a straight line. This is usually shown as a percentage of the full scale sensing range and can be affected significantly by the reflectivity of the viewed object.

Load: A general term for a device (or a circuit) that draws power when switched by another device (or circuit).

Logic high: The higher of two voltage levels in a digital circuit.

Logic level: Refers to the state of an input to or an output from a digital circuit (not applicable to analog circuits). It is always at one of only two possible voltages: “low” being a voltage usually less than 2 volts measured with respect to ground; and “high” being a voltage of some nominal level, usually within 2 volts of the positive supply.

Logic low: The lower of two voltage levels in a digital circuit.

Luminescence: The emission of light as in phosphorescence, fluorescence, and bioluminescence, by processes that derive energy from essentially non-thermal sources such as chemical, biochemical, or crystallographic changes, the motion of subatomic particles, or the excitation of an atomic system by radiation, especially such emission distinguished from incandescence.

Mask: A pattern used to control the retention or elimination of portions of another pattern. Regions of an image at a constant value,

usually white or black, form the mask.

Maximum inrush current: The maximum current level at which the proximity sensor can be operated for a short period of time.

Maximum load current: The maximum current level at which the proximity sensor can be continuously operated.

Mechanical convergence: A less precise form of convergent sensing as compared to the optical convergent beam sensing mode. In mechanical convergence, an emitter and a receiver are simply angled toward a common point, ahead of the sensor(s). This approach to reflective sensing results in more efficient use of light energy as compared to diffuse mode sensing, and a greater depth-of-field than realized with true optical convergence. Mechanical convergence may be customized for an application by mounting the emitter and receiver of an opposed sensing pair to mechanically con-verge at the desired distance. Depth-of-field is controlled by adjusting the angle between the emitter and the receiver.

Microsecond: One millionth of a second. 1 microsecond = 0.000001 second or 0.001 millisecond.

Millisecond: One thousandth of a second. 1 millisecond = 0.001 second or 1000 microseconds. Abbreviated: ms

Minimum bending radius: The minimum radius that a fiber optic bundle can withstand without breaking the fibers.

Minimum load current: Smallest load current that must flow with connected output in order to ensure the reliable operation of 2-wire proximity sensors.

Modulation: In photoelectrics, modulation of an LED simply means to turn it on and off at a high frequency (typically several kilohertz). The secret of a modulated photoelectric sensor's superior performance is that the sensor's phototransistor and amplifier are tuned to the frequency of modulation. Only the modulated light is amplified, and all other light, which reaches the receiver, is ignored. This is analogous to a radio receiver, which tunes solidly to one station, while ignoring all of the other radio waves that are present in the room. In fact, a modulated sensor's LED is most often referred to as the transmitter or emitter and its phototransistor as the receiver.

Multiplexing: A scheme in which an electronic control circuit interrogates each sensor of an array in sequence. "True" photoelectric multiplexing enables each modulated emitter only during the time that it samples the output of the associated receiver. In this way, the chance of false response of any receiver to the wrong light source is eliminated.

NAMUR: Photoelectric NAMUR sensors are 2-wire devices which change their internal resistance relative to the light level reaching the receiver. They are designed for use with approved switching amplifiers, with intrinsically safe circuits, which convert the current changes caused by the sensor's internal resistance change into a binary output signal. NAMUR sensors are most commonly used in hazardous (explosive) sensing environments.

Nanometer (nm): Unit of length used to specify the wavelength of light energy. 1 nm = 0.000000001 meter (10 -9 meter). 1 nm = 10 Angstroms.1 nm = .001 microns. Some typical wavelengths: red LEDs are 650 nm, green LEDs are 560 nm, infrared LEDs are 880 or 940 nm. See "LED".

NEMA: National Electrical Manufacturers Association. NEMA standards are used to specify suitability of sensor and sensing system enclosures for various sensing environments.

Noise (electrical): Term used to collectively describe undesirable energy that may cause false response of sensing system logic or may be falsely recognized as a received signal by a sensor amplifier. Includes EMI (electromagnetic interference) and RFI (radio frequency interference). Common sources of EMI are lighting fixtures and controls, motors, generators, and contactors. EMI is readily coupled to and conducted along wireways. RFI generators include in-plant two-way radios, stepper motor controls, computers, and CRTs. RFI occurs most often within a narrow band of frequencies. As a result, one electronic instrument may be radically affected by presence of RF interference, while another similar instrument in the same area may appear completely immune.

Non-ferrous metal: Any metal which does not contain iron.

Non-flush installation (unshielded): A proximity sensor must be installed in such a way that a free zone is maintained.

Normally closed: An output circuit that is conducting in the rest state with power applied.

Normally closed (NC): A proximity sensor with brake function is switched in the unattenuated state (low resistance) and disabled in the attenuated state (high resistance).

Normally open: An output circuit that is not conducting in the rest state.

NPN output: A transistor available as an output switch in most DC sensors and logic modules. Usually configured with its collector open and its emitter connected to ground (DC common). In this configuration, a load is connected between the output (collector) and the positive of the DC supply. This output configuration is also called a "sinking" output. See "current sinking output".

Null: This term is used in analog sensing and control to describe the minimum voltage (or current) in an analog output range. Analog sensors have an adjustment for setting the null value.

Off delay: The adjustable or fixed time length an output pulse continues after the input signal is no longer present.

Off delay (off delay logic): Timing logic in which the output energizes immediately when an input signal is received, and remains energized as long as the input signal is present. The off-delay timing begins at the trailing edge of the input signal, keeping the output energized. If a new input signal is received during the off-delay timing, the timer is reset, and the off-delay period begins again at the trailing edge of the new input signal. Off-delay timers allow sensing controls to ignore intermittent signal losses in tracking or flow control applications.

Ohm: Unit of measurement for resistance and impedance. The resistance through which a current of one ampere will flow when one volt is applied.

Ohm's law: E = I x R. Current (I) is directly proportional to voltage (E) and inversely proportional to total resistance (R) of a circuit.

On delay (on delay logic): Timing logic in which timing begins at the leading edge of an input signal, but the output is energized only after the preset on delay time has elapsed. The output ceases immediately at the trailing edge of the input signal. If the input signal is not present for the on delay time period, no output occurs. If the input signal is removed momentarily and then reestablished, the on-delay timing starts over again from the beginning. Used to allow sensing controls to ignore short interruptions of the light beam, such as the normal flow of products past a sensor in fill-level or flow control applications.

On/off delay (on/off delay logic): Timing logic which combines on delay and off delay timing into a single function. The on delay and off delay times are often independently adjustable (in logic modules that offer timing adjustment). On/off delay logic is often used in jam and void control, high/low level control, and edge guiding applications.

One-shot (one-shot logic): Timing logic in which a timed output pulse begins at the leading edge of an input signal. The pulse is always of the same duration, regardless of the length of the input signal. The output cannot reenergize until the input signal is removed and then reapplied. A one-shot timer is useful for initiating a control function keyed to the passing of either the leading or trailing edge of a product. It is also used in "on-the-fly" inspection applications (see "inspection logic"). Also called "single-shot logic" or "pulse timer".

Opaque: A term used to describe a material that blocks the passage of light energy. "Opacity" is the relative ability of a material to obstruct the passage of light.

Open-collector: A term used to describe the NPN or PNP output of a DC device, where the collector of the output transistor is not connected to any other part of the output circuit (except through a diode for protection). Analogous to a SPST relay contact. See "NPN" and "PNP".

Operating distance, assured: Between 0 and 81% of the rated operating distance for inductive proximity switches.

Operating distance, rated: The operating distance specified by the manufacturer and used as a reference value. Also known as nominal sensing distance.

Operating margin: The ratio of electrical signal available at a given sensing range to the minimum signal.

Operating mode: See "Light Operate" and "Dark Operate".

Operating voltage (Ub): Voltage range in which the proximity sensor can function reliably.

Opposed sensing mode: See "through-beam".

Optical coupler (optical isolator): A solid-state photoelectric device combining a light-emitting diode (LED) and a phototransistor in a single package, so that when power is applied to the LED, the phototransistor conducts. This is the equivalent of a solid-state relay contact (SPST normally open) except that normally only currents of a few milliamps can flow through the phototransistor. The advantage of this type of coupling is total electrical isolation of the output from the input. Since the input and output communicate only by light, the main use is to interface two systems without the use of interconnecting lines. The result is exceptional noise immunity. Optical couplers are of great benefit when interfacing systems, which include programmable logic controllers, computers, microprocessors and instrumentation equipment.

Optical crosstalk: Optical crosstalk occurs when a photoelectric receiver responds to the signal from an adjacent emitter. Crosstalk can usually be resolved by repositioning the sensors.

OR logic: A logic function in which the presence of any of two or more defined input conditions will cause a load to energize (A or B or C = output). Usually created by wiring all outputs in parallel to a load.

Output: 1) The section of a sensor or control circuit that energizes and/or de-energizes the attached load (or input). 2) The useful energy delivered by a circuit or device.

Output function: Normally open (NO): A proximity sensor with make function is disabled in the unattenuated state (high resistance) and is switched in the attenuated state (low resistance).

Overload resistance: See also "short circuit protection". The response threshold for overload protection is greater than the value for continuous current-carrying capacity.

Parallel operation: Refers to the interconnection of two or more output devices (e.g. several sensor outputs) in parallel to a single input or load. See "OR logic".

Passive pullup: See "pullup resistor".

Peak current (Ik): Current that may flow for a specified period at a defined switching frequency without destroying the proximity sensor.

Phase shift: A process that either delays (electric) or rotates (optics)

the input signal. This is usually done by a corner-cube reflector and gives a shift of 90 degrees.

Photocell: A resistive photosensitive device in which the resistance varies in inverse proportion to the amount of incident light. The most common light-sensitive materials used are cadmium sulfide and cadmium selenide. Such devices are characterized by resistance from 1000 ohms to 1 megohm, response speed of several milliseconds, and color response roughly equivalent to that of the human eye. Also called “photoresistor”.

Photodiode: A semiconductor diode in which the reverse current varies with illumination. Characterized by linearity of its output over several magnitudes of light intensity, very fast response time, and wide range of color response.

Photoelectric sensor: Electronic device recognizing changes in light intensity and converting these changes into a change in the output state.

Photon: A particle of light. A quantum of electromagnetic energy moving at the speed of light.

Phototransistor: A photojunction device in which current flow is directly proportional to the amount of incident light. The phototransistor is characterized by impedances from 1000 ohms to 1 megohm in most low level DC circuits. Response times are inversely proportional to incident light, but moderately high light levels yield response well under 1 millisecond. Color response is poor to greens and blues but good to reds and near infrareds. Phototransistors are well matched spectrally to infrared LEDs.

Plausibility output: An output pulse that drops from high to low when the input signal is either weak or not present for a time longer than normal transmission delay but shorter than time required to cause alarm or service output.

PNP output: Proximity sensors with PNP output switch the positive potential to the load. They are also described as positive-switching or current-sourcing.

Polarized light: Light which has all component waves in the same direction of displacement. Natural light is made up of waves having a variety of displacements. Photoelectric sensors with polarizing filters emit and detect only light waves of a specific polarization, while rejecting unwanted light of other polarizations. Also, various materials “bend” light waves (alter polarization) by known amounts. This may be used to an advantage to photoelectrically detect certain materials while ignoring others.

Polarizing filter: A lens attachment consisting of a pair of polarizing filters that are oriented so that planes of polarization are at 90° to one another. Used to enable a photoelectric receiver to “see” only light of the desired polarization (from its modulated emitter), while blocking unwanted light. Used with retroreflective sensors for minimizing “proxing” effects from shiny objects.

Programmable Logic Controller (PLC): A control device, usually used in industrial control applications, that employs the hardware architecture of a computer and relay ladder diagram language. Inputs to PLCs can originate from many sources including sensors and the outputs of other logic devices. Also called “programmable controller”.

Programmable output: (N.O. or N.C.) Output which can be changed from N.O. to N.C. or N.C. to N.O. by way of a switch or jumper wire. Also known as selectable output.

Protection class: Sensors not bearing the symbol must be operated at power sources, which comply with the safety requirements for extra-low voltage as per VDE 100.

Proximity sensing mode: Direct sensing of an object by its presence in front of a sensor. For example, an object is sensed when its surface reflects a sound wave back to an ultrasonic proximity sensor. Also see “diffuse mode (photoelectric) sensing”.

Proxing: In retroreflective sensing, “proxing” is used to describe undesirable reflection of the sensing beam directly back from an object that is supposed to break the beam. When sufficient light is reflected from the object back to the sensor, the sensor thinks it is seeing the retroreflective target, and the object may pass undetected. This is a common problem encountered when attempting to retroreflectively sense highly reflective objects. There are a number of cures for proxing, including use of anti-glare (polarizing) filters, angling of the retroreflective sensor and its target, and substitution of opposed mode sensors.

Pullup resistor: A resistor connected to the output of a device to hold that output voltage higher than the input transistion level of a digital circuit. Usually a resistor connected between the output of a current sinking (NPN) device and the positive supply voltage of a logic gate.

Pulse: A sudden, fast, change of a normally constant or relatively slow changing value such as voltage, current or light intensity.

Pulse modulated: See “modulation”.

Pulse stretcher: See “one-shot”.

PVC (polyvinyl chloride): A member of the vinyl plastic resin family, with many applications, including jacketing of wire and fiber optic cables. Characterized by its high degree of flexibility and good chemical resistance.

QD: Quick Disconnect.

Radio Frequency Interference (RFI): Interference caused by electromagnetic radiation at radio frequencies to sensors or to other sensitive electronic circuitry. RFI may originate from radio control equipment, stepper motor controls, CRTs, computers, walkie-talkies, public service communications, commercial broadcast stations, or a variety of other sources. RFI occurs most often at a specific

frequency or within a specific range of frequencies. As a result, one electronic instrument may be radically affected by the presence of RF interference, while another similar instrument in the same area may appear completely immune.

Receiver: The transducer element that responds to the sensing energy. Also the name for the half of an opposed pair of photoelectric or ultrasonic sensors that receives the sensing energy from the emitter.

Reflectivity (relative): A measure of the efficiency of any material surface as a reflector of light, as compared to a Kodak white test card which is arbitrarily rated at 90% reflectivity. Relative reflectivity is of great importance in photoelectric proximity modes (diffuse, divergent, and convergent), where the more reflective an object is, the easier it is to sense.

Reflex sensing mode: Also called the retroreflective mode or "retro". A retroreflective photoelectric sensor contains both the emitter and receiver. A light beam is established between the sensor and a special retroreflective target. As in opposed sensing, an object is sensed when it interrupts this beam. Retro is the most popular mode for conveyor applications where the objects are large (boxes, cartons, etc.), where the sensing environment is relatively clean, and where scanning ranges are typically a few feet. Retro is also used for code reading applications. Automatic storage and retrieval systems and automatic conveyor routing systems use retroreflective code plates to identify locations and/or products.

Refraction: The "bending" of light rays as they pass through the boundary from a medium having one refractive index into a medium with a different refractive index. For example, as from air into water or from air into glass or plastic.

Registration mark: A mark printed on a material using a color that provides optical contrast to the material color. The mark is sensed as it moves past a photoelectric color sensor. Registration marks are used for cutoff control as in a wrapping or bagging operation, or for product positioning as in a tube end crimping process.

Relay: A switching device, operated by variations in the conditions of one circuit, which serves to make or break one or more connections in the same or another circuit. May be mechanical, as in the common electromechanical relay having an electromagnetic coil and metal contacts. Or, may be solid-state, in which switching is accomplished by a solid-state element such as a transistor or SCR. Relays are used as output switching devices for sensors and control modules, and serve to interface the sensor or module to the circuit under control.

Repeatability: A measure of the repeat accuracy of a sensor and/or timer and/or control mechanism (e.g. motor, brake, solenoid, etc.). Usually expressed as a distance or time.

Residual current (Ir): The residual current is used to supply power to the 2-wire sensors and also flows across the load if the output is disabled.

Resistance: The opposition to the flow of electric current. That property of a material which impedes electrical current and results in the dissipation of power in the form of heat. Measured in ohms.

Resolution: In presence sensing resolution is the smallest part profile dimension that will be reliably sensed. In position sensing applications it is the smallest increment of distance that can be reliably sensed. In line scanning: the projected distance between two adjacent pixels, i.e. the size of the field-of-view divided by the number of pixels in the CCD array.

Response time: The sum of the time needed for a string of electronic circuits to translate a change in light into a change of output status.

Retriggerable (one shot): One of two types of one-shot timing logic. The output pulse of a retriggerable one-shot is restarted with the reoccurrence of every input. The output will remain "on" as long as the time between consecutive inputs is shorter than the one-shot pulse time. A non-retriggerable one-shot timer must complete its output pulse before it will recognize any new input signals. Sometimes they offer an advantage in indexing or registration control applications where multiple input signals are possible during the advance of the product.

Retroreflective sensing mode: See "reflex sensing mode".

Retroreflector: A reflector used in retroreflective sensing to return the emitted light directly back to the sensor. The most efficient type have corner-cube geometry (see "corner-cube reflector"). Reflective tapes use glass beads or smaller, less efficient corner-cubes.

Reverse polarity protection: Refers to the design feature of SICK DC sensors, which protect them from damage due to accidental reverse wiring to the power supply. Sensors without reverse polarity protection may be destroyed by accidental wrong-polarity connections.

Ripple: An AC voltage component on the output of a DC power supply. Usually expressed as a percentage of the supply voltage. Ripple may be suppressed ("smoothed") with capacitor filtering. Most DC-only devices require less than about 10% ripple for reliable operation.

Ripple (%): The percentage of alternating component left on a DC signal after rectifying. Measured peak to peak.

Ripple (Upp): The DC operating voltage of the ripple voltage content (maximum permissible peak value, given in % of Ub).

Rise time (10% Levels): The time required for an analog voltage or current output value to rise from 10% of its maximum value to 90% of its maximum value.

Saturation voltage: The voltage drop appearing across a switching transistor or SCR that is fully turned "on". See "voltage drop".

SCR (silicon controlled rectifier): Also known a "reverse blocking

triode thyristor". A semiconductor device used as the output relay in many ac sensors and modules. It normally acts as an open circuit, but switches rapidly to a conducting state when an appropriate gate signal is applied.

S**elf-checking (circuitry):** A circuit having the capability to electronically verify that all of its own critical components, along with their redundant backups, are operating properly.

Self-contained sensor: A sensor that contains the sensing element, amplifier, power supply, and output switch in a single package.

Sensing distance: The distance at which an approaching target activates (changes state of) the proximity output.

Sensing face: Surface of a proximity sensor to which the sensing range relates.

Sensing range: The sensing range of a proximity sensor is the distance at which one of the measuring plates being moved axially towards the active surface triggers a signal change.

Sensing window: Glass fiber optics: the size and shape of the fiber optic bundle as it is terminated on the sensing end. Sensing windows maybe round, rectangular or other shapes. A single bundle of glass fiber optics may terminate in several sensing windows. Analog sensing: the range of distance over which the sensor will recognize an object and produce an output. The near and far limits of the sensing window are set by the null and span controls, respectively. Sensing within a window is also called "ranging".

Sensitivity adjustment: An adjustment made to a sensor's amplifier that determines the sensor's ability to discriminate between different levels of received sensing energy.

Sensing end: A term used to describe the end of any fiber optic cable at which sensing takes place (i.e. the end at which objects to be sensed are located). Sensing ends are manufactured in many mounting styles, and the sensing ends of glass fiber optic assemblies may be shaped to match the profile of the object to be sensed. See "bifurcated fiber" or "individual fiber".

Sensor alignment: Positioning of a sensor so that the maximum amount of the emitted energy reaches the receiving sensing element.

Series operation: Refers to the interconnection of two or more output devices (e.g. several sensor outputs) in series to a single load. See "AND logic".

Short circuit protection: The ability of a solid-state output device or circuit to endure operation in a shorted condition indefinitely or for a defined period of time with no damage.

Single-shot: See "one-shot".

Sinking output: See "current sinking output".

Skew angle: An alignment technique used in diffuse, retroreflective and convergent mode sensing to increase the optical contrast ratio. In diffuse and convergent sensing, it is done to reduce background reflections. The sensor is angled so that its beam strikes the background at an angle other than 90 degrees (i.e. straight on). In retroreflective sensing, skewing the sensor is done to reduce the amount of light reflected directly back from the object that is supposed to break the beam established between the sensor and its retro target.

Solid state relay: See "relay".

Sourcing output: See "current sourcing output".

Span: This term is used in analog sensing and control to describe the maximum voltage (or current) in an analog output range. Analog sensors have an adjustment for setting the span value.

SPDT: Abbreviation for "Single Pole Double Throw". Refers to a switch or an electromechanical relay having one set of form 1C contacts. One contact is open when the other is closed (complementary switching).

Specular sensing mode (specular reflection): A photoelectric sensing mode where an emitter and a receiver are mounted at equal and opposite angles from the perpendicular to a highly reflective (mirror-like) surface. The distance from the shiny surface to the sensors must remain constant. The specular sensing mode is useful in some applications where it is necessary to differentiate between a shiny and a dull surface. It is particularly useful for detecting the presence of materials, which do not offer enough height differential from their background to be recognized by a convergent or fixed-field mode sensor. A common example is sensing cloth (diffuse) on a steel sewing machine table (shiny).

SPST: Abbreviation for "Single Pole Single Throw". Refers to a switch or a relay contact (electromechanical or solid-state) with a single contact that is either normally open or normally closed.

Status indicator: The forced triggering of the output (low-resistance) is indicated by an LED. With some sensors, a second LED indicates standby.

Switching frequency (f): Maximum number of switching actions per second.

Temperature drift: Shifting of the switching point caused by a change in ambient temperature.

Threshold (of a photoelectric amplifier): The value of voltage in a DC-coupled photoelectric amplifier that causes the output of the sensor or sensing system to change state. This voltage level is directly related to the amount of light that is incident on the photoelectric receiver. The threshold is the value of received signal representing an excess gain of 1x. The sensitivity control (where one is available) adjusts the threshold voltage level.

Through-beam sensing mode: A photoelectric sensing mode in which the emitter and receiver are positioned opposite each other so that the light from the emitter shines directly at the receiver. An object then breaks the light beam that is established between the two. Opposed sensing will always result in the most reliable photoelectric sensing system, as long as the item to be detected is opaque to light. Opposed sensing is the most efficient photoelectric sensing mode and offers the highest level of optical energy to overcome lens contamination, sensor misalignment, or long scanning ranges. Also often referred to as “direct scanning” and sometimes called the “beam-break” mode.

Time delay before availability (tv): Time required by the proximity sensor to become operational after the operating voltage is applied.

Translation: Movement left or right, up or down, but not rotated; geometrical operation, which shifts the position of an image from its original position.

Transmitted beam: A sensing mode where the light source and the receiver are opposite each other and where the target breaks the beam.

UL: Abbreviation for “Underwriters Laboratory, Inc.”, a testing agency for products sold in the United States. A device that has “UL approval” has been type-tested and approved by Underwriter’s Laboratory as meeting certain electrical and/or safety codes.

UV (ultraviolet): Invisible short wavelength light energy that lies immediately beyond the violet end of the color spectrum between approximately 100 and 380 nm. Some materials “fluoresce” and produce light of visible wavelengths when excited by UV energy. This re-radiation of visible light can be detected by a “UV sensor”. See “LED”.

Voltage: The term used most often in place of “electromotive force”, “potential”, “potential difference”, or “voltage drop” to designate the electric pressure that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points.

Voltage drop: The voltage that occurs across a solid-state device when its output is driving a load or the voltage that exists across each element of a series circuit. The magnitude of the voltage drop is dependent upon the circuit demand of the load.

Wavelength: Distance traveled by light while completing one complete sine wave. Is expressed in nanometers (nm). Each color has a specific wavelength.

White paper response: A calibration procedure performed on retroreflective sensors to eliminate all response to white paper with 90% reflectance.

Window: See “sensing window”.

Wire-break protection: If one of the supply lines is broken, the output remains disabled (no operation).

Zener diode: A PN junction diode used as a voltage regulator because of its uniform breakdown characteristic when reverse biased.

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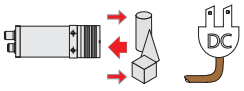
AGD 10/DCI 10

Intelligent Camera Sensor



0.8 x 0.8 in² (20 x 20 mm²)
field of view

CE

Highlights

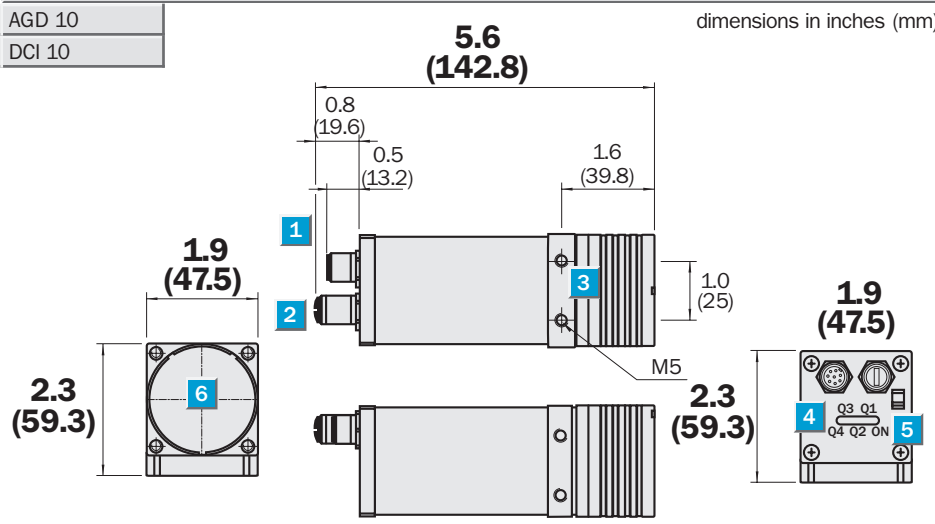
- Simple handling in operation
- High clock cycle rate for fast processes
- Sturdy evaluation procedure
- DCI 10: warning in advance if pixel number is near the tolerance limit
- Reflections can be detected on shiny objects

AGD 10/DCI 10

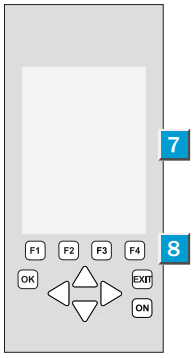
Dimensional Drawing

AGD 10
DCI 10

dimensions in inches (mm)



VSC 100 9



1 Power connection (external thread), 8-pin, M12
2 Operating part connection (internal thread), 5-pin, M12
3 Fixing hole M5
4 Switch output indicator (Q1-Q4)
5 Power indicator
6 Optical axis sender, optical axis receiver
7 VSC 100: W x H x D = 150 x 82 x 31 mm³
8 LC Display
9 Keyboard

Order information

Intelligent Camera Sensor

Type	Part no.
AGD 10-B1111	1 026 384
DCI 10-B1111	1 026 385
VSC 100	2 025 857

Mounting technology

Type	Part no.
Angle mounting (set) ICS 100/110	2 027 839
Universal bracket ICS 100/110	2 022 464

Accessories

Type	Part no.
Cable, 2 m, with receptacle M 12, 8-pin	7 024 488
Cable AGD/DCI, 2 m, with plug M 12, 5-pin	7 027 023
Connection cable for control input, 2 m, plug M 12, 4-pin	6 028 077

Technical Data

		AGD 10 -B1111	DCI 10 -B1111	VSC 100
Sensing distance/field of view	2.8 in (70 mm)/0.8 x 0.8 in² (20 x 20 mm²)	■	■	
Teach field/search field	Size can be changed	■	■	
	Position can be changed		■	
Filters/lens	Green (filter: 450…550 nm)	■	■	
Image sensor	CMOS; 512 x 512 pixel	■	■	
Light source[1]	15 x LED; focused green	■	■	
Real resolution	320 x 320 pixel	■	■	
Test mode	Pixel sum		■	
	Minimum pixel sum	■		
Supply voltage V_S [2]	24 V DC	■	■	
Residual ripple[3]	< 5 V_{PP}	■	■	
Current consumption[4]	< 450 mA	■	■	
Switching outputs	B (NPN/PNP)	■	■	
	Q1: value in tolerance range	■	■	
	Q2: value outside of tolerance	■	■	
	Q3: value near to or below lower tolerance limit		■	
	Q4: value near to or above upper tolerance limit		■	
Output current I_A max.[5]	< 100 mA	■	■	
Response time/cycle time[6]	3…6.4 ms	■	■	
Max. image frequency	Approx. 285/s	■	■	
Trigger input[7]	HIGH corresp. ≥ 10 V…28.8 V	■	■	
Trigger output for ext. lighting	TTL; LOW = active	■	■	
Connection type		■	■	
I/O + V_S	M12, 8-pin	■	■	
VSC - ICS	M12, 5-pin	■	■	■
Protection type	IP 64	■	■	
	IP 40			■
Ambient temperature	Operation 32…122°F (0…50°C)	■	■	■
	Storage -13…167°F (-25…75°C)	■	■	
	Storage -4…140°F (-20…60°C)			■
Shock load	15 g, 6 directions	■	■	
Approximate weight	12.3 oz (350 g)	■	■	
	8.5 oz (240 g)			■
Housing material	Aluminum, brass	■	■	
	Plastic			■

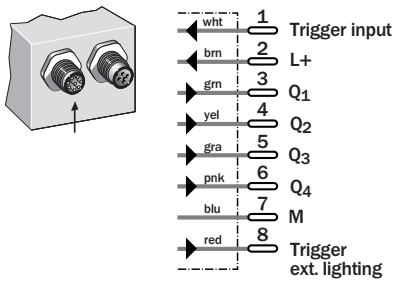
1) Average service life at room temperature 100,000 h at T_A = +25°C
2) Limit values ± 20 %
3) Must be within V_S tolerances
4) Without load
5) Amount total for all four outputs
6) Signal transit time with resistive load
7) Falling edge; pulse length ≥ 0.5 ms; reaction time = 3.5 ms

Test mode	Process[8]
Pixel sum	Check of the number of pixels at exceeding
	or falling below the limit values
Minimum pixel sum	Checking pixel number exceeding a limit

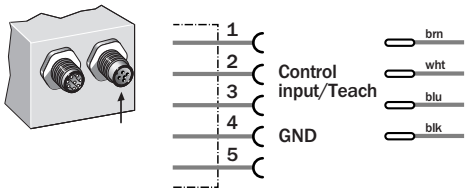
8) All procedures are used in the binary image.
A comparison is made each time between the taught-in reference image and the image to be checked.

Connection Diagram

8-pin, M12 (output)

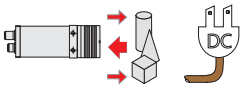


5-pin, M12 setup unit/Teach input



ICL 100 B/ICL 180 B

Back lights



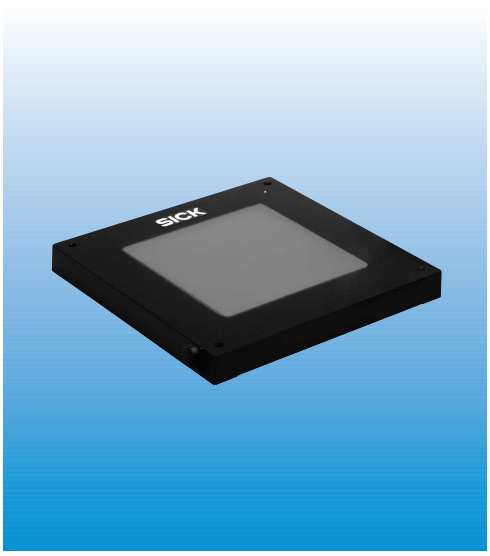
3.9 x 3.9 in²/7.1 x 7.1 in²
(100 x 100 m²/180 x 180 m²)
illuminated area

CE

Highlights

- Sturdy housing (IP 67)
- Flat housing 0.6 in/0.8 in (15 mm/20 mm)
- Intense illumination (≥ 8 W/m²)
- Enhanced edge intensity to compensate for lens characteristics (vignetting)
- Constant current control
- Trigger input

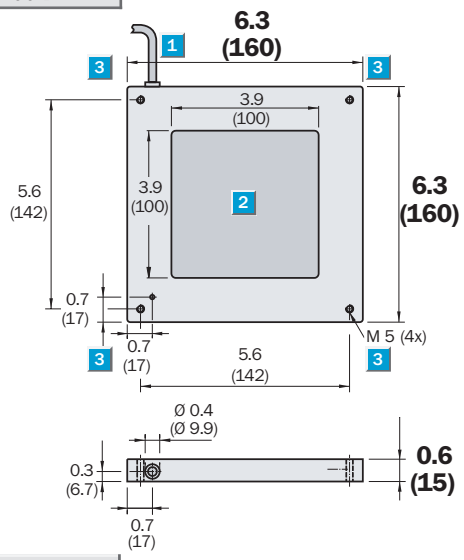
ICL 100 B/ICL 180 B



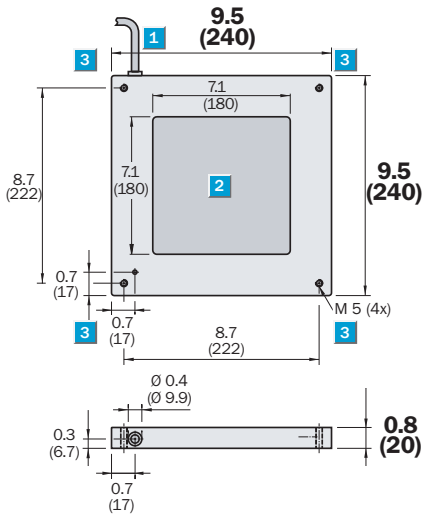
Dimensional Drawing

ICL 100 B

dimensions in inches (mm)



ICL 180 B



1 Cable with M 12 plug, 8-pin
2 Area illuminated
3 Mounting hole, M 5

Order Information

Type	Part no.
ICL 100 B 321	1 024 224
ICL 180 B 321	1 024 225

Accessories

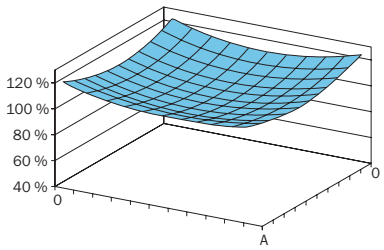
Type	Part no.
T-distributor, 8-pin, M12 (for connection to ICS)	6 026 503
Extension cable, 8-pin, M12 1 m	6 026 625

Technical Data	ICL	100 B	180 B							
Area illuminated	3.9 x 3.9 in² (100 x 100 mm²)	■								
	7.1 x 7.1 in² (180 x 180 mm²)[2]		■							
Light source	LED, 630 nm	■	■							
Emittance[1]	≥ 8 W/m²	■	■							
Higher emittance on outer regions	Approx. 20%[2]	■	■							
Degradation period of LEDs[3]	> 50,000 h[4]/> 35,000 h	■	■							
Dependency of emittance on V_S	0% of V_S = 19.2…28.8 V	■	■							
Supply voltage V_S	19.2…28.8 V DC[5]	■	■							
Ripple	5 V_{PP}	■	■							
Current consumption	Approx. 250 mA	■								
	Approx. 550 mA		■							
Trigger input	TTL, 28.8 V max.[5] , LOW = lighting on	■	■							
Connection type	M12 plug, 8-pin, L = 0.8 m[7]	■								
	M12 plug, 8-pin, L = 1.2 m[7]		■							
VDE protection class[6]	⧈	■	■							
Enclosure rating	IP 67	■	■							
Ambient temperature	Operation 32…122°F (0…50°C)	■	■							
	Storage -13…158°F (-25…70°C)	■	■							
Shock load										
Single	15 g	■	■							
Continuous	10 g	■	■							
Approximate weight	28 oz (800 g)	■								
	70 oz (2.0 kg)		■							
Vibration	± 0.35 mm at 10…58/s	■	■							
	5 g at 58…150/s	■	■							
Humidity	93% relative	■	■							

1) Emittance at distance of 0 m, mean value over entire area illuminated
2) This compensates for normal lens vignetting (see vignetting compensation)
3) Drop in intensity to 50%
4) In triggered mode at pulse interval ratio of ≤ 20%
5) Reverse-polarity protection
6) Reference voltage 50 V DC
7) Assignment, see connection diagram

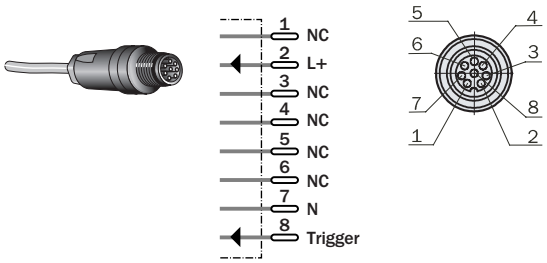
Vignetting compensation

ICL 100 B	A = 100 mm
ICL 180 B	A = 180 mm



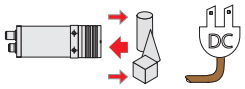
Connection Diagram

8-pin, M 12 (user output)



ICL 20 S/ICL 40 S

Direct Light



0.8 x 0.8 in²/1.4 x 1.4 in²
(20 x 20 mm²/40 x 40 mm²)
illuminated area

CE

Highlights

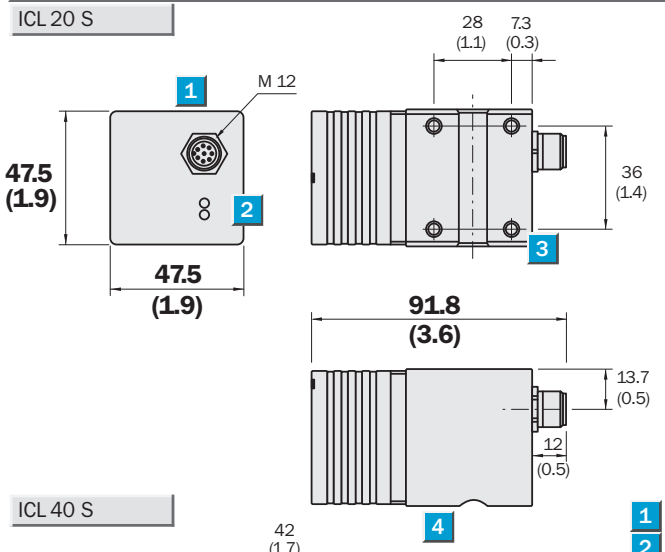
- Sturdy housing (IP 65)
- Intense illumination (approx. 50 W/m²)
- Enhanced edge intensity to compensate for lens characteristics (vignetting)
- Constant current control
- Trigger input

ICL 20 S/ICL 40 S

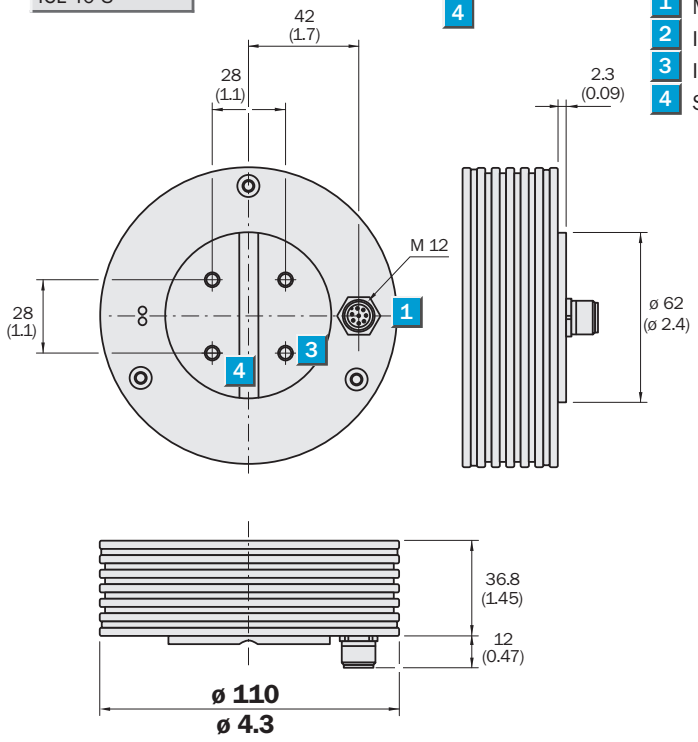
Dimensional Drawing

ICL 20 S

dimensions in inches (mm)



ICL 40 S



1 M12 plug, 8-pin
2 Indicator LED
3 Internal thread, M5 x 6
4 Slot for mounting rod

Order Information

Type	Part no.
ICL 20-S212	1 024 222
ICL 40-S212	1 024 223

Accessories

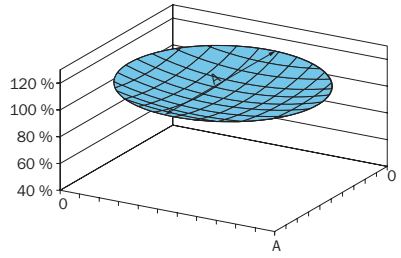
Type	Part no.
T-distributor, 8-pin, M12 (for connection to ICS)	6 026 503
Extension cable, 8-pin, M12 1 m	6 026 625
Mounting set - angled rod	2 029 022

Technical Data	ICL	20 S	40 S
Area illuminated	Ø 1.1 in² (Ø 28 mm); □ 0.8 x 0.8 in² (20 x 20 mm²)	■	
	Ø 2.0 in² (Ø 50 mm); □ 1.4 x 1.4 in² (35 x 35 mm²)		■
Nominal distance	2.8 in (70 mm)	■	
	5.5 in (140 mm)		■
Light source	LED, 525 nm	■	■
Emittance[1]	Approx. 50 W/m²	■	■
Higher emittance on outer regions	Approx. 20%[2]	■	■
Degradation period of LEDs[3]	≥ 50,000 h	■	■
Regulation of emittance on V_S	Constant at V_S = 19.2…28.8 V	■	■
Supply voltage V_S	19.2…28.8 V DC[4]	■	■
Ripple	5 V_{PP}	■	■
Current consumption	Max. 150 mA	■	
	Max. 400 mA		■
Trigger input	TTL, max. 28.8 V[4], LOW = lighting on	■	■
Connection type	M 12 plug, 8-pin[6]	■	■
VDE protection class[5]	⧈	■	■
Enclosure rating	IP 65	■	■
Ambient temperature	Operation 32…122°F (0…50°C)	■	■
	Storage -13…158°F (-25…70°C)	■	■
Shock load	Single 15 g	■	■
	Continuous 10 g	■	■
Approximate weight	8 oz (230 g)	■	
	19 oz (540 g)		■
Vibration	± 0.35 mm at 10…58/s	■	■
	5 g at 58…150/s	■	■
Humidity	93% relative	■	■

1) At nominal distance
2) This compensates for normal lens vignetting
3) Drop in intensity to 50%
4) Reverse-polarity protection
5) Reference voltage 32 V DC
6) Assignment, see connection diagram

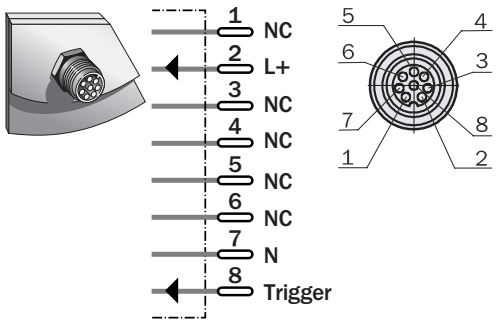
Vignetting compensation

ICL 20 S	A = 28 mm
ICL 40 S	A = 50 mm



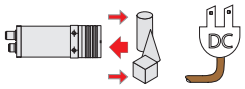
Connection Diagram

8-pin, M 12 (user output)



ICS 001, 002, 003, 009

Intelligent Camera Sensor



1.6 x 1.6, 3.2 x 3.2, 6.3 x 6.3 in² (40 x 40, 80 x 80, 160 x 160 mm²) fields of view

CE

Highlights

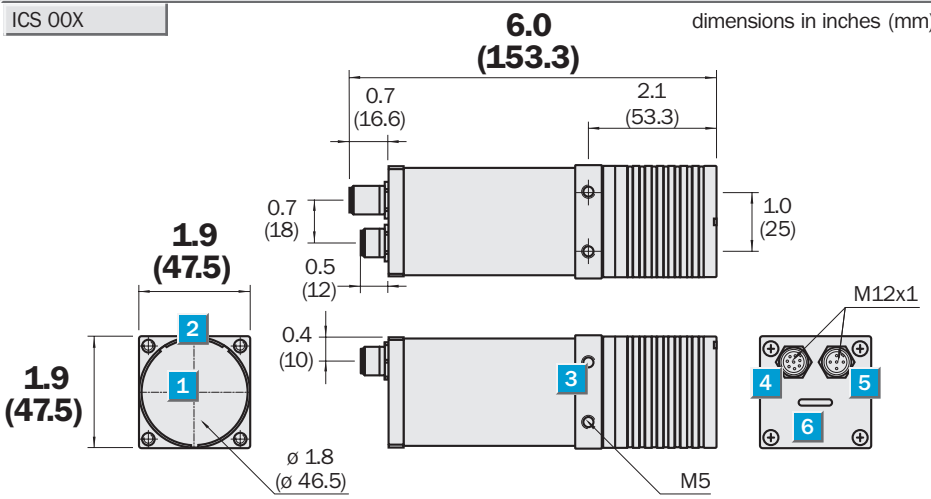
- Compact unit
- Fast system architecture
- Simple application
- Wide-ranging application field
- Presence monitoring
- Shape, position and dimension check
- Object detection
- Completeness check

ICS 001, 002, 003, 009

Dimensional Drawing

ICS 00X

dimensions in inches (mm)



VSC 100 9

1 Lens/“C” mounting thread
2 Hood
3 Fixing hole M5, 4 off
4 Output, 8-pin, M12
5 Set-up unit connection 5-pin, M12
6 Display of output switching state
7 LC Display
8 Keyboard
9 VSC 100: W x H x D = 150 x 82 x 31 mm³

Order information

Intelligent Camera Sensor

Type	Part no.
ICS 001-B1111	1 025 310
ICS 001-B2111	1 025 313
ICS 002-B1111	1 025 308
ICS 002-B2111	1 025 314
ICS 003-B2111	1 025 315
ICS 009-B0111	1 025 312

Mounting technology

Type	Part no.
Mounting bracket set	2 027 839
Rod mount. clamp	2 022 464
“C” mounting lens 1 : 1.3/25 mm	5 312 900

Adapter rings M30x1 on “C” mount

Type	Part no.
With red filter	2 029 082
With green filter	2 029 083
Without filter	4 038 866

Accessories

Type	Part no.
Cable, 2 m, with receptacles M 12, 8-pin	7 024 488
Cable ICS-VSC, 2 m, with plug M 12, 5-pin	7 027 023

Technical Data		ICS001 -B1111	ICS001- B2111	ICS002 -B1111	ICS002- B2111	ICS003 -B2111	ICS009 -B0111	VSC 100
Sensing distance/field of view	5.5 in (140 mm)/1.6 in x 1.6 in (40 mm x 40 mm²)	■	■					
	13 in (330 mm)/3.2 in x 3.2 in (80 mm x 80 mm²)			■	■			
	25.6 in (650 mm)/6.3 in x 6.3 in (160 mm x 160 mm²)					■		
	Provided by customer						■	
Filters/lens	Lens with green filter (450…550 nm)	■		■				
	Lens with red filter (610…690 nm)		■		■	■		
	Without lens (“C” mounting thread)						■	
Image sensor	CMOS; 512 x 512 pixel	■	■	■	■	■	■	
Supply voltage V_S[1]	24 V DC	■	■	■	■	■	■	
Residual ripple[2]	< 5 V_{PP}	■	■	■	■	■	■	
Current consumption[3]	< 350 mA	■	■	■	■	■	■	
Switching outputs	4 x B (NPN/PNP)	■	■	■	■	■	■	
Output current I_A max.[4]	< 100 mA	■	■	■	■	■	■	
Response time, cycle time[5]	≥ 2.5 ms	■	■	■	■	■	■	
Switching frequency max.[6]	200/s	■	■	■	■	■	■	
Trigger output for ext. light.[7]	TTL; LOW = active	■	■	■	■	■	■	
Trigger input[8]	Falling edge, HIGH = 10 V…28.8 V	■	■	■	■	■	■	
Connection type								
I/O + V_S	M12 8-pin, plug on ICS side	■	■	■	■	■	■	
Programming unit[9]	M12 5-pin, receptacle	■	■	■	■	■	■	■
Software features	4 evaluation methods (see below)	■	■	■	■	■	■	
Teach field/search field[10]	Adjustable size and position	■	■	■	■	■	■	
Autoform Teach field	Object selectable by arrow	■	■	■	■	■	■	
Number of Teach fields (test programs)	4 simultan + max. 12 in memory	■	■	■	■	■	■	
Protection class	IP 64	■	■	■	■	■	■	
	IP 40							■
Ambient temperature	Operation 32…122°F (0…50°C)	■	■	■	■	■	■	
	Storage -4…140°F (-20…60°C)							■
	Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	
Shock load	15 g, 6 directions	■	■	■	■	■	■	■
Approximate weight	8.5 oz (240 g)							■
	12.3 oz (350 g)	■	■	■	■	■	■	
Housing material	Aluminum and brass	■	■	■	■	■	■	■

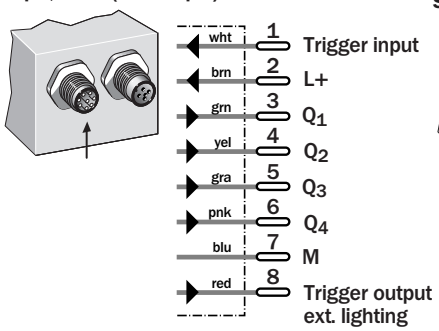
1) Limit values ± 20 %
2) Must not be in excess of or below V_S tolerances
3) Without load
4) Total amount for all four outputs
5) Signal run-time with resistive load
6) With light/dark ratio of 1:1
7) Flash length adjustable between 50 µs and 1.3 ms
8) Trigger pulse ≥ 2.5 ms
9) Cable length 2 m, PVC, Ø 5 mm, do not distort cable below 0°C
10) Contour of teach field = contour of object selected

Test mode	Process[1]	Typical applications
Shape check (pattern matching)	The patterns taught are sought in the image being checked, even when shifted	Shape, position and dimension check, object detection, presence monitoring, completeness
Multi-area evaluation	Pixels are compared with respect to number and area	Presence monitoring, completeness check
Minimum pixel sum	Checking pixel number exceeding a limit	Presence monitoring, e.g. for transparent objects with reflective surfaces, completeness monitoring, object detection with shiny surfaces[2]
Pixel sum	Comparison of the absolute number of white and black pixels	Presence monitoring, completeness check

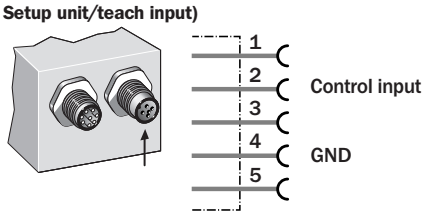
1) All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked
2) Made possible by the special resistance of the sensor against blooming using a CMOS receiver

Connection Diagram

8-pin, M 12 (user output)



5-pin, M 12
Setup unit/teach input)



ICS 011, 012, 013, 019

Intelligent Camera Sensor

1.6 x 1.6, 3.2 x 3.2, 6.3 x 6.3 in² (40 x 40, 80 x 80, 160 x 160 mm²) field of view

CE

Highlights

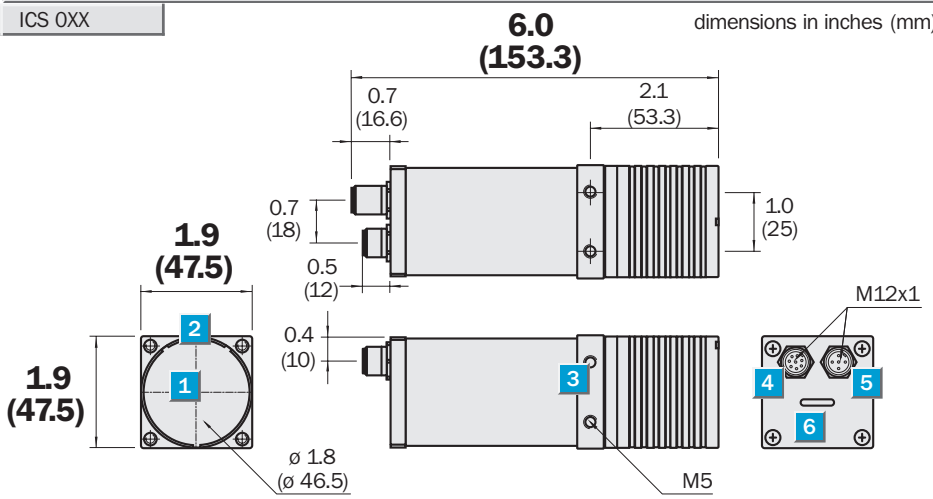
- Detection of rotated objects
- Fast system architecture
- Simple application
- Suitable for a wide range of applications
- Presence monitoring
- Shape, position and dimension check
- Object detection
- Completeness check

ICS 011, 012, 013, 019

Dimensional Drawing

ICS 0XX

dimensions in inches (mm)



VSC 100 9

1 Lens/"C"mounting thread
2 Hood
3 Fixing hole M5, 4 off
4 Output, 8-pin, M12
5 Set-up unit connection 5-pin, M12
6 Display of output switching state
7 LC Display
8 Keyboard
9 VSC 100: W x H x D = 150 x 82 x 31 mm³

Order information

Intelligent Camera Sensor

Type	Part no.
ICS 011-B1111	On request
ICS 011-B2111	On request
ICS 012-B1111	On request
ICS 012-B2111	On request
ICS 013-B2111	On request
ICS 019-B0111	On request

Mounting technology

Type	Part no.
Mounting bracket set	2 027 839
Rod mount. clamp	2 022 464
"C" mounting lens 1 : 1.3/25 mm	5 312 900

Adapter rings M30x1 on "C" mount

Type	Part no.
With red filter	2 029 082
With green filter	2 029 083
Without filter	4 038 866

Accessories

Type	Part no.
Cable, 2 m, with receptacles M 12, 8-pin	7 024 488
Cable ICS-VSC, 2 m, with plug M 12, 5-pin	7 027 023

Technical Data

		ICS011 -B1111	ICS011 -B2111	ICS012 -B1111	ICS012 -B2111	ICS013 -B2111	ICS019 -B0111	VSC 100
Sensing distance/field of view	5.5 in (140 mm)/1.6 in x 1.6 in (40 mm x 40 mm²)	■	■					
	13 in (330 mm)/3.2 in x 3.2 in (80 mm x 80 mm²)			■	■			
	25.6 in (650 mm)/6.3 in x 6.3 in (160 mm x 160 mm²)					■		
	provided by customer						■	
Image sensor	CMOS; 512 x 512 pixel	■	■	■	■	■	■	
Filters/lens	Lens with green filter (450…550 nm)	■		■				
	Lens with red filter (610…690 nm)		■		■	■		
	Without lens (“C” mounting thread)						■	
Software features	5 evaluation methods (see below)	■	■	■	■	■	■	
Teach field/search field	Adjustable size and position	■	■	■	■	■	■	
Autoform Teach field[10]	Object selectable by arrow	■	■	■	■	■	■	
Number of Teach fields (test programs)	4 simultan + max. 12 in memory	■	■	■	■	■	■	
Supply voltage V_S[1]	24 V DC	■	■	■	■	■	■	
Ripple[2]	< 5 V_{PP}	■	■	■	■	■	■	
Current consumption[3]	< 350 mA	■	■	■	■	■	■	
Switching outputs	4 x B (NPN/PNP)	■	■	■	■	■	■	
Output current I_A max.[4]	< 100 mA	■	■	■	■	■	■	
Response time/cycle time[5]	≥ 2.5 ms	■	■	■	■	■	■	
Switching frequency max.[6]	200/s	■	■	■	■	■	■	
Trigger input[8]	Falling edge, HIGH = 10 V…28.8 V	■	■	■	■	■	■	
Trigger output for ext. light[7]	TTL; LOW = active	■	■	■	■	■	■	
Connection type								
I/O + V_S	M12, 8-pin, plug on ICS side	■	■	■	■	■	■	
Programming unit[9]	M12, 5-pin, receptacle	■	■	■	■	■	■	■
Protection class	IP 64	■	■	■	■	■	■	
	IP 40							■
Ambient temperature	Operation 32…122°F (0…50°C)	■	■	■	■	■	■	
	Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	
	Storage -4…140°F (-20…60°C)							■
Shock load	15 g, 6 directions	■	■	■	■	■	■	■
Approximate weight	8.5 oz (240 g)							■
	12.3 oz (350 g)	■	■	■	■	■	■	
Housing material	Aluminum and brass	■	■	■	■	■	■	■

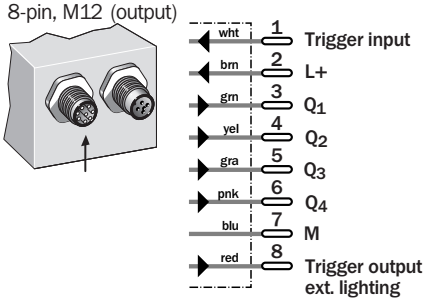
1) Limit values ± 20%
2) Must not be in excess of or below Vs tolerances
3) Without load
4) Total amount for all four outputs
5) Signal run-time with resistive load
6) With light/dark ratio of 1:1
7) Flash length adjustable between 50 µs and 1.3 ms
8) Trigger pulse ≥ 2.5 ms
9) Cable length 2 m, PVC, Ø 5 mm, do not distort cable below 0°C
10) Contour of teach field = contour of object selected

Test mode	Process [1]	Typical applications
Rotational contour check	The contours taught are sought in the image being checked, even when rotated and/or shifted	Shape, position and dimension check, object detection, presence monitoring, completeness
Comparison of shapes (pattern matching)	The patterns taught are sought in the image being checked, even when shifted	Shape, position and dimension check, object detection, presence monitoring, completeness
Multi-area evaluation	Pixels are compared with respect to number and area	Presence monitoring, completeness check
Minimum pixel sum	Checking pixel number exceeding a limit	Presence monitoring, e.g. for trans-parent objects with reflective surfaces, completeness monitoring, object detection with shiny surfaces[2]
Pixel sum	Comparison of the absolute number of white and black dots	Presence monitoring, completeness check

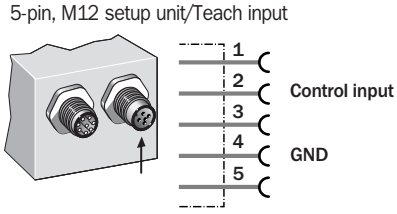
1) All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked
2) Made possible by the special resistance of the sensor against blooming using a CMOS receiver

Connection Diagram

8-pin, M12 (output)

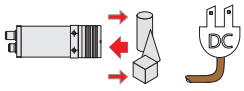


5-pin, M12 setup unit/Teach input



ICS 100, 101, L02

Intelligent Camera Sensor



0.8 x 0.8, 1.6 x 1.6, 6.3 x 6.3 in² (20 x 20, 40 x 40, 80 x 80 mm²) fields of view

CE

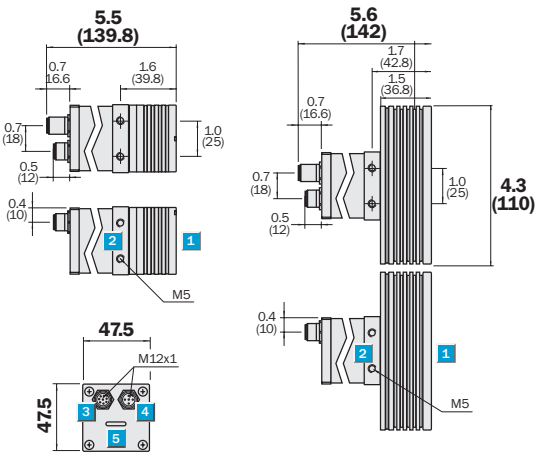
Highlights

- Suitable for very fast operations
- Reliable detection of shiny objects/surfaces
- Teach Data selectable via PLC
- Flexible use through:
  - four different evaluation methods
  - robust, durable, industrial design
- Simple setup with LCD image display

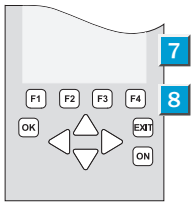
ICS 100, 101, L02

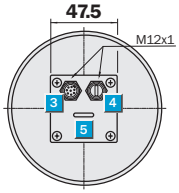
Dimensional Drawing

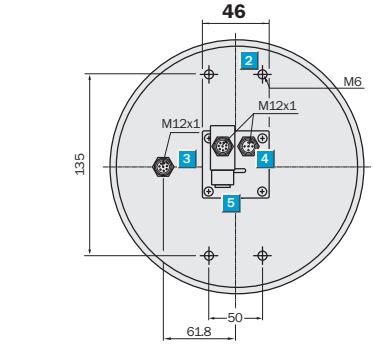
ICS 100 | ICS 101 | ICS L02 | dimensions in inches (mm)



VSC 100 9







1 Ring light/green lens combination
2 Mounting hole M5/M6 at ISC L02, 4-times
3 Output, 8-pin, M12
4 Operating unit connection, 5-pin, M12
5 Display of output switching state
6 T-Piece connector
7 LC Display
8 Keyboard
9 VSC 100: W x H x D = 150 x 82 x 31 mm³

Ordering information

Intelligent Camera Sensor

Type	Part no.
ICS 100-B1111	1 025 401
ICS 101-B1111	1 024 221
ICS L02-B1111	1 025 547
VSC 100	2 025 857

Mounting technology

Type	Part no.
Bracket mounting (set) ICS 100	2 027 839
Universal rod mount clamp ICS 100	2 022 464
Angle bracket mounting, ICS 101	2 029 925

Accessories

Type	Part no.
Cable, 2 m, with receptacles M 12, 8-pin	7 024 488
Cable ICS-VSC, 2 m, with plug M 12, 5-pin	7 027 023
Cable-control input, 2 m, M12, 4-pin	6 028 077

Technical Data

		ICS100 -B1111	ICS101 -B1111	ICSL02 -B0111	VSC 100
Sensing distance/field of view	2.8 in (70 mm)/0.8 in x 0.8 in² (20 mm x 20 mm²)	■			
	5.5 in (140 mm)/1.6 in x 1.6 in² (40 mm x 40 mm²)		■		
	13.0 in (330 mm)/6.3 in x 6.3 in² (80 mm x 80 mm²)			■	
Image sensor	CMOS; 512 x 512 pixel	■	■	■	
Flash time for LED lighting[1]	Adjustable, 50 µs to 1300 µs	■	■	■	
Color of light/filters	Green (Filter: 450…550 nm)	■	■	■	
Supply voltage V_S[2]	24 V DC	■	■	■	
Ripple[3]	< 5 V_{PP}	■	■	■	
Current consumption[4]	< 450 mA	■			
	< 600 mA		■		
	< 1.2 A			■	
Switching outputs	4 x B (NPN/PNP)	■	■	■	
Output current I_A max.[5]	< 100 mA	■	■	■	
Response time/cycle time[6]	≥ 2.5 ms	■	■	■	
Switching frequency max.[7]	200/s	■	■	■	
Trigger input[8]	Falling edge; high corresp. ≥ 10 V…28.8 V	■	■	■	
Control Input	For external Teach function and selection of saved	■	■	■	
	Teach data, high ≥ 10 V…28 V	■	■	■	
Connection type					
I/O + Vs	M12, 8-pin	■	■	■	
VSC - ICS[9]	M12, 5-pin	■	■	■	■
Teach field/search field	Adjustable size and position	■	■	■	
Autoform Teach field[10]	Pixel selectable by arrow	■	■	■	
Number of Teach fields (objects)	4 simultan + max. 12 in memory	■	■	■	
Protection class	IP 64	■	■	■	
	IP 40				■
Ambient temperature	Operation 32…122°F (0…50°C)	■	■	■	■
	Storage -13…167°F (-25…75°C)	■	■	■	
	Storage -4…140°F (-20…60°C)				■
Shock load	15 g, 6 directions	■	■	■	■
Approximate weight	8.5 oz (240 g)				■
	12.3 oz (350 g)	■			
	16.8 oz (780 g)		■		
	77 oz (2,200 g)			■	
Housing material	Aluminum and brass	■	■	■	

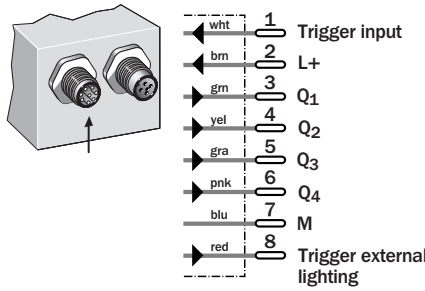
1) Average service life 50,000 h at T_A = +25°C
2) Limit values ±20 %
3) Must be within V_S tolerances
4) Without load
5) Amount total for all four outputs
6) With resistive load
7) With light/dark ratio 1:1
8) Trigger pulse ≥ 2.5 ms
9) Cable length 2 m, PVC, Ø 5 mm, do not distort cable below 0°C
10) Contour of Teach field = contour of object selected

Check Mode	Procedure [11]
Shape check (pattern matching)	The patterns taught are sought in the image being checked, even when shifted
Multi-area-evaluation	Pixels are compared with respect to number and area
Minimum pixel sum	Checking pixel number exceeding a limit
Pixel sum	Comparison of the absolute number of white and black pixels

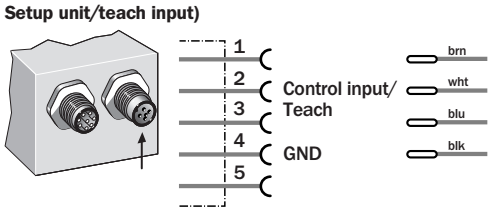
11) All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked.

Connection Diagram

8-pin, M 12 (user output)



5-pin, M 12
Setup unit/teach input)



CM 30 AC

Capacitive Proximity Sensors

0.08...0.6 in (2...16 mm)
0.16...1.0 in (4...25 mm)
sensing range

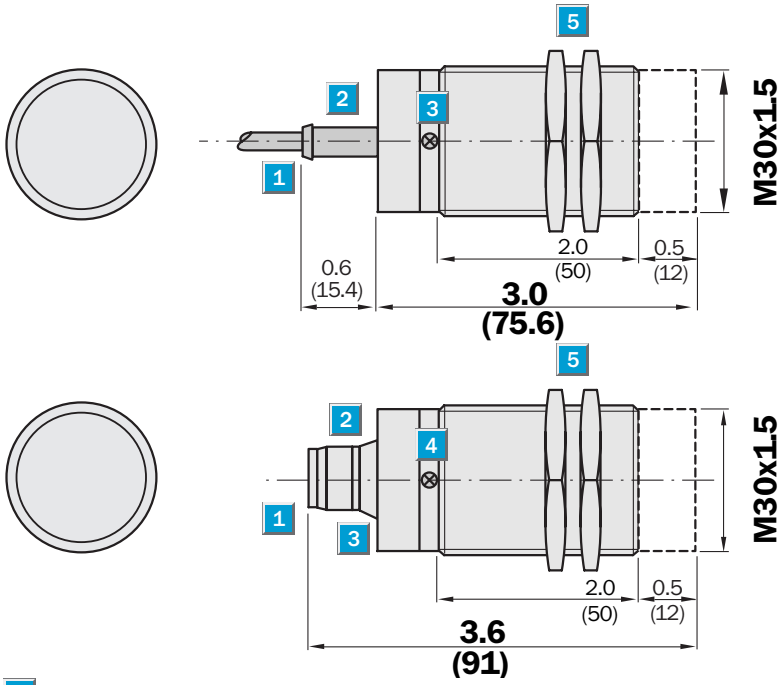
Highlights

- 2-wire, 250 V AC
- High EMC immunity
- Complementary output function
- Enclosure rating IP 67
- LED-status indicator, yellow

CM 30 AC

Dimensional Drawing

dimensions in inches (mm)



1 Cable, 2 m or connector M12, 3-pin
2 Potentiometer
3 Switch NO/NC
4 Display LED
5 Fastening nuts (2 x); width across 36 mm, plastic

Order Information	
Type	**Part no.**
CM30-16BAP-KW1	6 028 411
CM30-16BAP-KC1	6 028 412
CM30-25NAP-KW1	6 028 413
CM30-25NAP-KC1	6 028 414

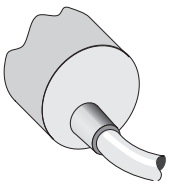
Accessories	page
Cable and connectors	909
Mounting brackets	926, 927

Electrical and Mechanical Data	CM30-	16BAP -KW1	16BAP -KC1	25NAP -KW1	25NAP -KC1					
Sensing range S_n	0.6 in (16 mm)	■	■							
	1.0 in (25 mm)			■	■					
Operating voltage U_b	20…265 V AC	■	■	■	■					
Ripple U_{pp}	≤ 10% U_b	■	■	■	■					
Voltage drop U_b[1]	≤ 10 V AC (at load ≥ 20 mA)	■	■	■	■					
Off state current[2]	≤ 10 mA	■	■	■	■					
Continuous current I_a	≤ 500 mA	■	■	■	■					
Time delay before availability t_v	≤ 100 ms	■	■	■	■					
Hysteresis H	4…20% of s_r	■	■	■	■					
Repeatability R[3]	≤ 5% of s_r	■	■	■	■					
Temperature drift	± 10% of s_r	■	■	■	■					
EMC	To EN 60 947-5-2	■	■	■	■					
Output function	NO	■	■	■	■					
	NC	■	■	■	■					
	Complementary	■	■	■	■					
Installation type	Flush	■	■							
	Non Flush			■	■					
Connection type	Cable, 2 m, PVC, 2 x 0.5 mm², oil resistant	■		■						
	Connector M12 x 1 mm		■		■					
Enclosure rating[4]	IP 67	■	■	■	■					
Switching frequency f	Max. 10/s	■	■	■	■					
Dimensions[5]	M30 x 1.5	■	■	■	■					
Reverse polarity protection	Yes	■	■	■	■					
Power-up pulse suppression	Yes	■	■	■	■					
Shock and vibration stress	30 g, 11 ms/10…55 Hz, 1 mm	■	■	■	■					
Ambient temperature T_a	-13…176°F (-25…80°C)	■	■	■	■					
Housing material	Polyester	■	■	■	■					
Tightening torque	7.5 Nm	■	■	■	■					

1) At I_a max.
2) Without load
3) U_b and T_a constant
4) To EN 60529
5) Thread diameter x pitch (mm)

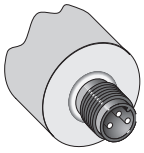
Connection Type

CM30-16BAP-KW1
CM30-25NAP-KW1

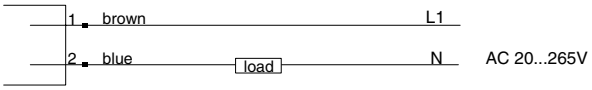


2 x 0.5 mm²

CM30-16BAP-KC1
CM30-25NAP-KC1



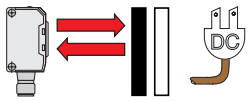
3-pin, M12



wire colors refer to standard cable, not included with quick disconnect models.

ET 2 Wash Down

Proximity/Diffuse Sensors - Background Suppression



0...2 in (0...50 mm)

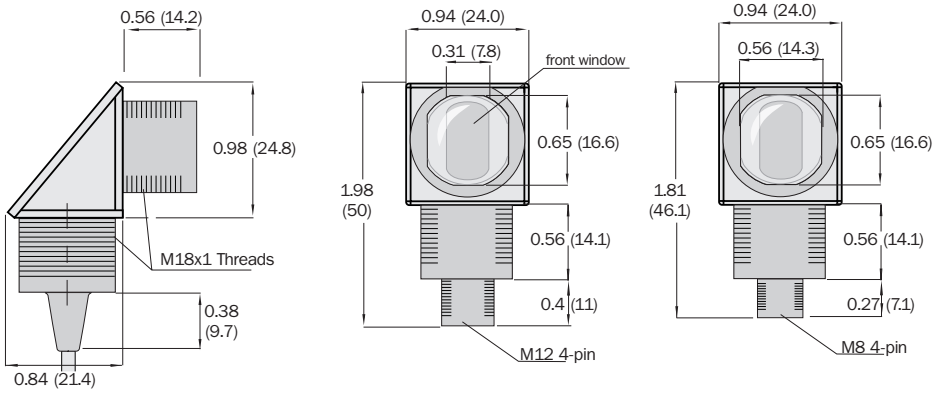
sensing range

Highlights

- ELF - economical, little, functional
- IP 67 rated for wash down applications
- Extremely compact to fit almost any application
- Universal mounting configuration for simple installation
- Unparalleled optical performance
- Electrical functionality previously available only in large sensors
- Available with M8 or M12 connector or pre-leaded cable

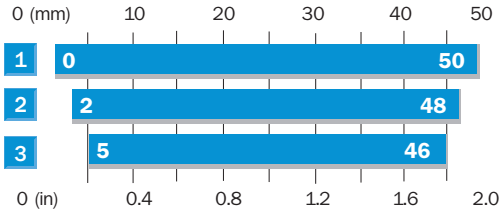
ET 2

Dimensional Drawing



dimensions in inches (mm)

Sensing Range



1	Sensing range on white , 90% reflectance
2	Sensing range on grey , 18% reflectance
3	Sensing range on black , 6% reflectance

Order Information

Type	Part no.
ET 2-P122	7 028 642
ET 2-N122	7 028 643
ET 2-E122	7 028 644
ET 2-P124	7 028 645
ET 2-N124	7 028 646
ET 2-E124	7 028 983
ET 2-P127	7 028 647
ET 2-N127	7 028 648
ET 2-E127	7 028 984

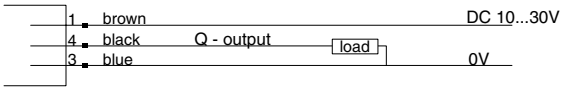
Accessories	page
Cables and connectors	908, 909
Reflectors	936
Mounting bracket 18 mm	925, 926

Technical Data	ET 2-	P122	N122	E122	P124	N124	E124	P127	N127	E127
Sensing range	0…2 in (0…50 mm)	■	■	■	■	■	■	■	■	■
Light source[1]	LED, infrared light	■	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■	■
Ripple	< 5 V_{SS}, must be within V_S tolerances	■	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■	■
Switching outputs	PNP	■			■			■		
	NPN		■	■		■	■		■	■
	Light operate	■	■		■	■		■	■	
	Dark operate			■			■			■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■	■
Connection type										
Cable[2]	2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■	■						
Connector	M12 4-pin				■	■	■			
	M8 4-pin							■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■	■
Housing material	Body, glass fiber reinforced ABS; front window, acrylic	■	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■	■
	overload and short circuit protection									
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■	■
	used near connector or lens; 15 f•lb typical									

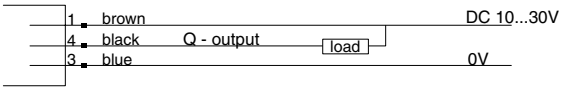
1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

Connection Diagram

PNP Models

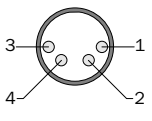


NPN Models

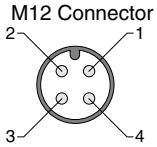


wire colors refer to standard cable, not included with quick disconnect models.

M8 Connector



M12 Connector



ET 2 Wash Down

Proximity/Diffuse Sensors - Energetic

0.04...3.9 in (1...100 mm)

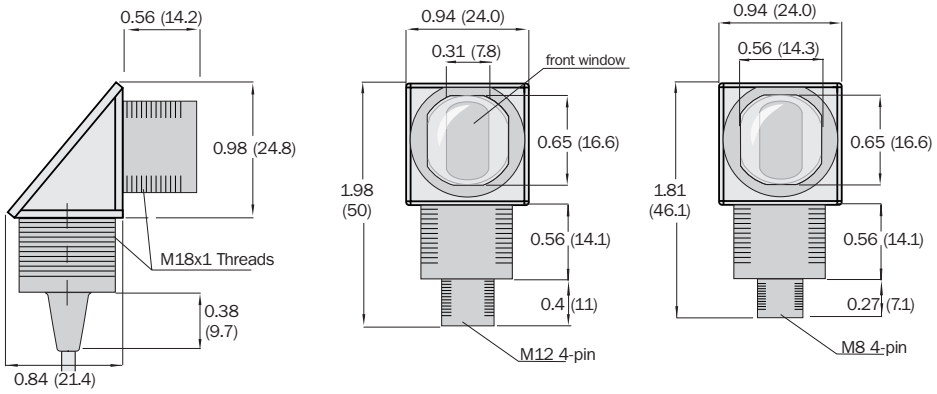
sensing range

Highlights

- ELF - economical, little, functional
- IP 67 rated for wash down applications
- Extremely compact to fit almost any application
- Universal mounting configuration for simple installation
- Unparalleled optical performance
- Electrical functionality previously available only in large sensors
- Available with M8 or M12 connector or pre-leaded cable

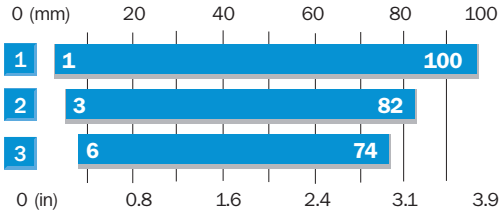
ET 2

Dimensional Drawing



dimensions in inches (mm)

Sensing Range



1	Sensing range on white , 90% reflectance
2	Sensing range on grey , 18% reflectance
3	Sensing range on black , 6% reflectance

Order Information

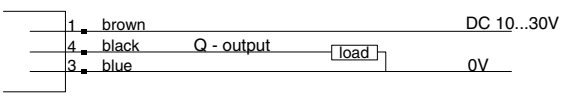
Type	Part no.
ET 2-P222	7 028 648
ET 2-N222	7 028 649
ET 2-P224	7 028 650
ET 2-N224	7 028 651
ET 2-P227	7 028 652
ET 2-N227	7 028 653

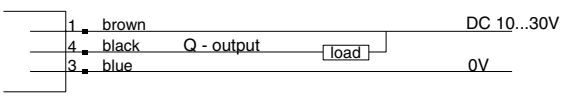
Accessories	page
Cables and connectors	908, 909
Reflectors	936
Mounting bracket 18 mm	925, 926

Technical Data	ET 2-	P222	N222	P224	N224	P227	N227
Sensing range	0.04…3.9 in (1…100 mm)	■	■	■	■	■	■
Light source[1]	LED, infrared light	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■
Ripple	< 5 V_{SS}, must be within V_S tolerances	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■
Switching outputs	PNP	■		■		■	
	NPN		■		■		■
	Light operate	■	■	■	■	■	■
	Dark operate						
Output current I_A max.	50 mA	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■
Connection type							
Cable[2]	2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■				
Connector	M12 4-pin			■	■		
	M8 4-pin					■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■
Housing material	Body, glass fiber reinforced ABS; front window, acrylic	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■
	overload and short circuit protection						
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■
	used near connector or lens; 15 f•lb typical						

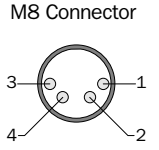
1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C

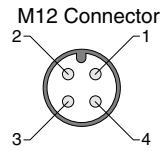
Connection Diagram





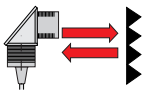
wire colors refer to standard cable, not included with quick disconnect models.





EL 2 Wash Down

Reflex/Retro-Reflective Sensors



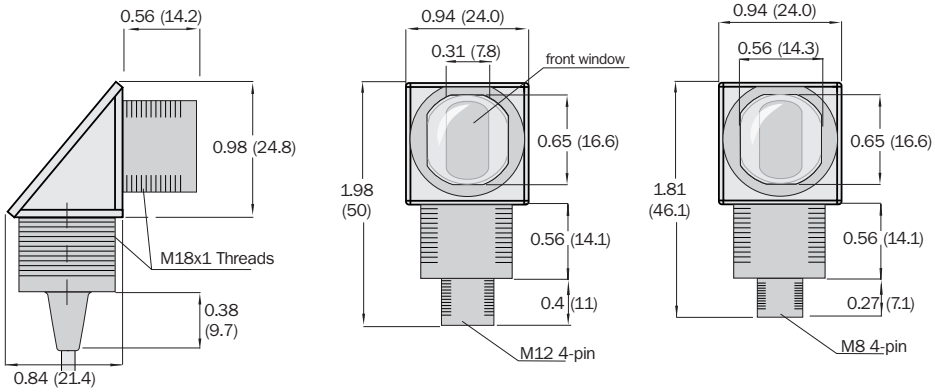

0.2…10.5 ft (0.07…3.0 m)
sensing range

Highlights

- ELF - economical, little, functional
- IP 67 rated for wash down applications
- Extremely compact to fit almost any application
- Universal mounting configuration for simple installation
- Unparalleled optical performance
- Electrical functionality previously available only in large sensors
- Available with M8 or M12 connector or pre-leaded cable

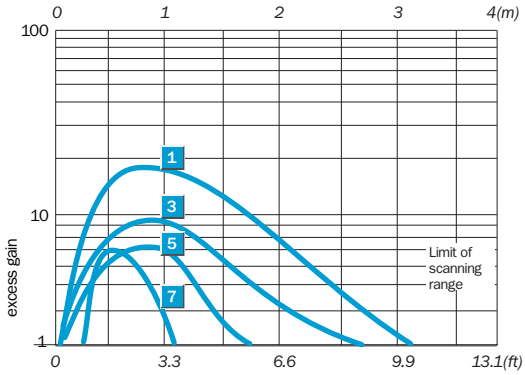
EL 2

Dimensional Drawing



dimensions in inches (mm)

Excess Gain



	Reflector Type	Sensing Range
1	PL 80 A	0.07…3.0 m
2	PL 50 A	0.07…2.0 m
3	P250	0.07…2.6 m
4	PL 40 A	0.07…1.9 m
5	PL 30 A	0.07…1.6 m
6	PL 20 A	0.07…1.5 m
7	2000X reflective tape min 50 x 50 mm²	0.2…1.0 m

Order Information

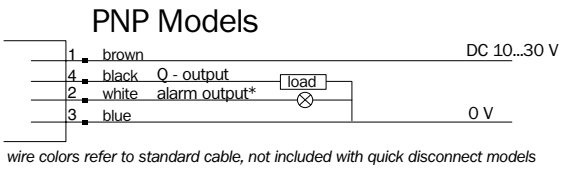
Type	Part no.
EL 2-P122	7 028 618
EL 2-F122	7 028 619
EL 2-N122	7 028 620
EL 2-E122	7 028 621
EL 2-P123	7 028 622
EL 2-F123	7 028 623
EL 2-N123	7 028 624
EL 2-E123	7 028 625
EL 2-P124	7 028 626
EL 2-F124	7 028 627
EL 2-N124	7 028 628
EL 2-E124	7 028 629
EL 2-P125	7 028 630
EL 2-F125	7 028 631
EL 2-N125	7 028 632
EL 2-E125	7 028 633
EL 2-P127	7 028 634
EL 2-F127	7 028 635
EL 2-N127	7 028 636
EL 2-E127	7 028 637
EL 2-P128	7 028 638
EL 2-F128	7 028 639
EL 2-N128	7 028 640
EL 2-E128	7 028 641

Accessories	page
Cables and connectors	908, 909
Reflectors	936
Mounting bracket 18 mm	925, 926

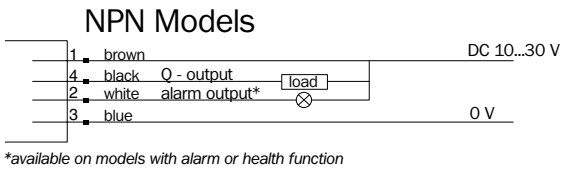
Technical Data	EL 2-	P122	F122	N122	E122	P123	F123	N123	E123
Sensing range	0.2...10 ft (0.07...3.0 m)	■	■	■	■	■	■	■	■
Light source[1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■				
	w/ alarm 4.7 x 4.7 in at 78.7 in (120 x 120 mm at 2 m)					■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■
Ripple	< 5 V_{SS}, must be within V_S tolerances	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Alarm[3]					■	■	■	■
	Light operate	■		■		■		■	
	Dark operate		■		■		■		■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■
Connection type									
Connection types	Cable[2], 2 m length; 3 conductor 28 AWG, 2.3 mm O.D.;	■	■	■	■				
	Cable[2], with alarm 4 conductor 28 AWG, 2.7 mm O.D.					■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Body, glass fiber reinforced ABS; front window, acrylic	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■
	overload and short circuit protection								
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■
	used near connector or lens; 15 f•lb typical								

1) Average service life 100,000 h at $T_A = 25°C$
2) Do not bend below 0°C
3) Inverted alarm (health) available

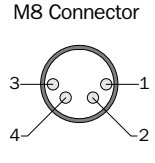
Connection Diagram

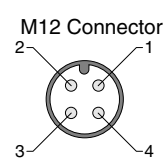


wire colors refer to standard cable, not included with quick disconnect models



**available on models with alarm or health function*

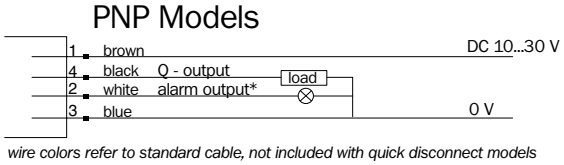




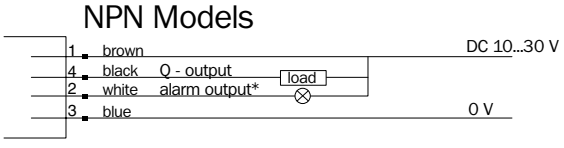
Technical Data	EL 2-	P124	F124	N124	E124	P125	F125	N125	E125
Sensing range	0.2...10 ft (0.07...3.0 m)	■	■	■	■	■	■	■	■
Light source [1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■				
	w/ alarm 4.7 x 4.7 in at 78.7 in (120 x 120 mm at 2 m)					■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■
Ripple	$< 5\ V_{SS}$, must be within V_S tolerances	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Alarm[3]					■	■	■	■
	Light operate								
	Dark operate	■		■		■		■	
Output current I_A max.	50 mA		■		■		■		■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■
Connection type	Plug, M12 4-pin	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Body, glass fiber reinforced ABS; front window, acrylic	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■
	overload and short circuit protection								
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■
	used near connector or lens; 15 f•lb typical								

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C
3) Inverted alarm (health) available

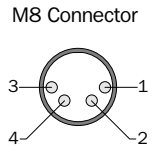
Connection Diagram

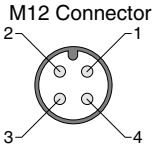


wire colors refer to standard cable, not included with quick disconnect models



**available on models with alarm or health function*

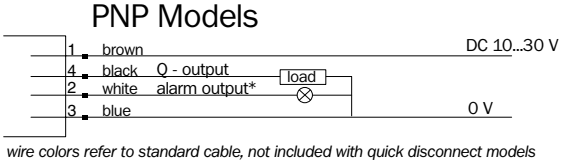




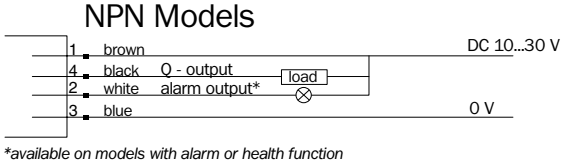
Technical Data	EL 2-	P127	F127	N127	E127	P128	F128	N128	E128
Sensing range	0.2...10 ft (0.07...3.0 m)	■	■	■	■	■	■	■	■
Light source[1]	LED, red light, polarized	■	■	■	■	■	■	■	■
Light spot	3.1 x 3.1 in at 78.7 in (80 x 80 mm at 2 m);	■	■	■	■				
	w/ alarm 4.7 x 4.7 in at 78.7 in (120 x 120 mm at 2 m)					■	■	■	■
Supply voltage V_S	10...30 V DC, limit values	■	■	■	■	■	■	■	■
Ripple	< 5 V_{SS}, must be within V_S tolerances	■	■	■	■	■	■	■	■
Current consumption	< 20 mA, without load	■	■	■	■	■	■	■	■
Switching outputs	PNP	■	■			■	■		
	NPN			■	■			■	■
	Alarm[3]					■	■	■	■
	Light operate	■		■		■		■	
	Dark operate		■		■		■		■
Output current I_A max.	50 mA	■	■	■	■	■	■	■	■
Response time	< 2.5 ms	■	■	■	■	■	■	■	■
Switching frequency	200 Hz, programmable up to 700 Hz on request	■	■	■	■	■	■	■	■
Connection type	M8 4-pin	■	■	■	■	■	■	■	■
Enclosure rating	Housing IP 67	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13...122°F (-25...50°C)	■	■	■	■	■	■	■	■
	Storage -40...158°F (-40...70°C)	■	■	■	■	■	■	■	■
Housing material	Body, glass fiber reinforced ABS; front window, acrylic	■	■	■	■	■	■	■	■
Circuit protection	Reverse polarity protection,	■	■	■	■	■	■	■	■
	overload and short circuit protection	■	■	■	■	■	■	■	■
Mounting hardware	Quantity 1, M18 x 1 nut which can be	■	■	■	■	■	■	■	■
	used near connector or lens; 15 f•lb typical								

1) Average service life 100,000 h at $T_U = 25°C$
2) Do not bend below 0°C
3) Inverted alarm (health) available

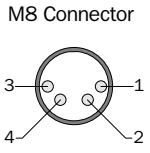
Connection Diagram

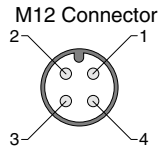


wire colors refer to standard cable, not included with quick disconnect models



**available on models with alarm or health function*





ELG Short Range

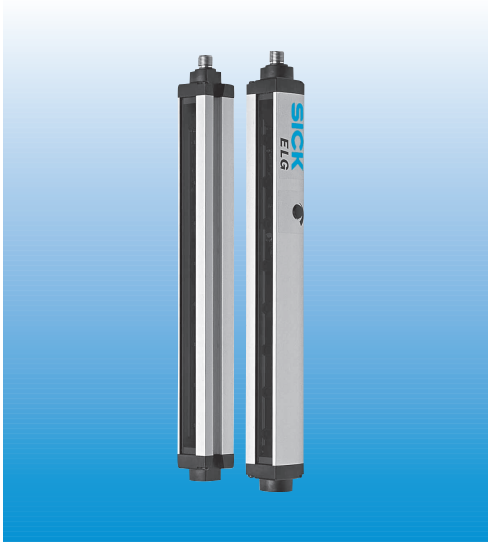
Light Grid Sensors

0...6.6 ft (0...2 m)
sensing range

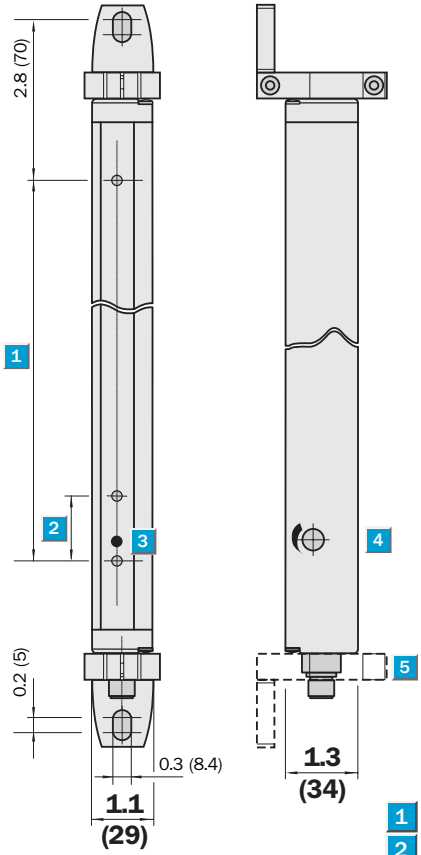
Highlights

- Industrial standard outputs
- Optical synchronization
- Compact housing
- Manual sensitivity adjustment
- High sunlight immunity

ELG



Dimensional Drawing



dimensions in inches (mm)

1 Detection height
2 Beam spacing
3 Status indicator (ELG E)/Power on (ELG S)
4 Sensitivity adjustment
5 M12 plugs, 4-pin

Optical Performance

Beam spacing	Detection height	MDO: minimum detectable object [7]		
		in front of ELG S or ELG E	at mid-point between ELG S and ELG	
30 mm	90 ... 930 mm	35 mm	35 mm	25 mm [8]

7) MDO: minimum detectable object for non-moving objects, measured in a direction parallel to ELG

8) Only ELG 3-XXXXP513 with multiple scan

Accessories	page
Connection	909, 910
Mounting systems	929

Technical Data	ELG 3-	0090	0150	0210	0330	0210	0330	0450	0570	0690	0930
Beam spacing	1.2 in (30 mm)										
Detection height	See selection table p5										
Number of beams	See selection table p5										
Sensing range	0…6.6 ft (0…2 m)										
Multiple scan	3 x (reduced MDO)										
Synchronization	Optical synchronization										
Light source	LED, infrared light										
Voltage supply V_s [1]	15…30 V DC										
Residual ripple	< 10 % within V_s tolerance										
Current consumption Sender	< 100 mA										
Current consumption Receiver [2]	< 100 mA										
Connection	M12 plug, 4-pin										
Switch output	2 x PNP output [3]: $\overline{Q}$ and Q										
Operating mode	Q: dark-/$\overline{Q}$: light-switching										
Output current I_A max.	100 mA										
Output load	Capacitive load: 100 nF/output										
	Inductive load: 1H/output										
Response time [4]	Max. 50 ms										
Initialization duration	Max. 300 ms										
High immunity against ambient light	150,000 lx (sunlight)										
VDE protection class	III										
Circuit protection [5]	A, B, C										
Enclosure rating	IP 65										
Ambient temperature	Operation -13…131°F (–25…+55 °C)										
	Storage -40…158°F (–40…+70 °C)										
Mechanical resistance	Vibration: 5 g; 10-55/s – IEC 68-2-6										
	Shock: 10 g; 16 ms – IEC 68-2-29										
Weight [6]	Approx. 350…1700 g										
Material	Aluminum anodized										

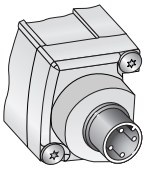
1) Limit values
2) Without load at V_s = 24 V
3) NPN also available
4) With resistive load

5) A = V_s connection, reverse polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

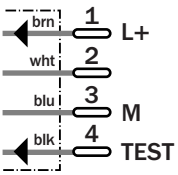
6) 350 g for 90 mm detection height, increase 160 g per 100 mm

Connection Diagram

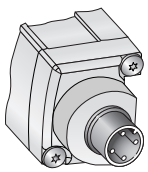
ELG S3-xxxxD511



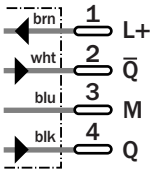
Sender
M12, 4-pin



ELG E3-xxxxP511



Receiver
M12, 4-pin



ELG Long Range

Light Grid Sensors

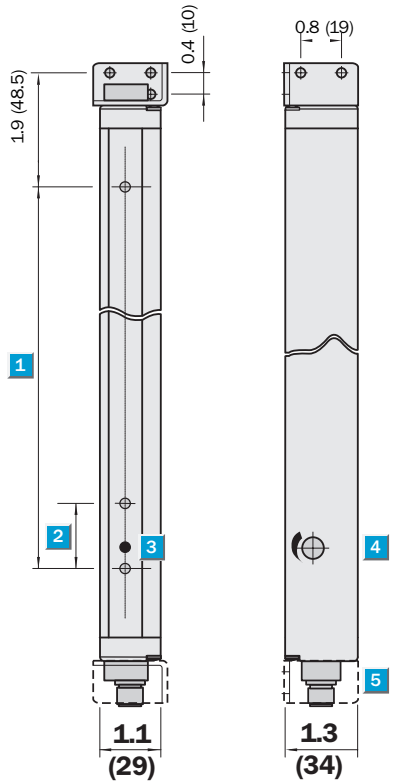
0...39 ft (0...12 m)
sensing range

Highlights

- Wide range of options
- High sunlight immunity
- Optical synchronization
- Compact housing
- Beam spacing 30 mm/60 mm
- Manual sensitivity adjustment

ELG

Dimensional Drawing



dimensions in inches (mm)

1 Detection height (see next page)
2 Beam spacing ELG 3: 30 mm/ELG 6: 60 mm
3 Status indicator (ELG E)/Power on (ELG S)
4 Sensitivity adjustment
5 M12 plugs, 4-pin

Optical Performance

Beam spacing	Detection height	MDO: minimum detectable object [7]		
		in front of ELG S or ELG E	at mid-point between ELG S and ELG E	
30 mm	210 ... 1890 mm	35 mm	35 mm	25 mm [8]
60 mm	900 ... 2460 mm	65 mm	65 mm	35 mm [8]

7) MDO: minimum detectable object for non-moving objects, measured in a direction parallel to ELG

8) Only ELG 3-xxxxP523/ELG 6-xxxxP523 with multiple scan

Accessories	page
Connection	909, 910
Mounting systems	929

Technical Data	ELG X-	0450	0570	0690	0930	1050	1410	1650	1890	2070	2370
Beam spacing	See selection table p5										
Detection height	See selection table p5										
Number of beams	See selection table p5										
Sensing Range	0…39 ft (0…12 m)										
Synchronization	Optical synchronization										
Light source	LED, infrared light										
Voltage supply V_s [1]	15…30 V DC										
Residual ripple	< 10 % within V_s tolerance										
Current consumption Sender	< 100 mA										
Current consumption Receiver [2]	< 100 mA										
Connection	M12 plug, 4-pin (cable optional)										
Switch output [3]	2 x PNP output: $\overline{Q}$ and Q										
Operating mode	Q: dark-/$\overline{Q}$: light-switching										
Output current I_A max.	100 mA										
Output load	Capacitive load: 100 nF/output										
	Inductive load: 1H/output										
Response time [4]	Max. 100 ms										
Initialization duration	Max. 300 ms										
High immunity against ambient light	150,000 lx (sunlight)										
VDE protection class	III										
Circuit protection [5]	A, B, C										
Enclosure rating	IP 65										
Ambient temperature	Operation -13…131°F (–25…+55 °C)										
	Storage -40…158°F (–40…+70 °C)										
Mechanical resistance	Vibration: 5 g; 10-55/s – IEC 68-2-6										
	Shock: 10 g; 16 ms – IEC 68-2-29										
Weight [6]	Approx. 950…3300 g										
Material	Aluminum anodized										

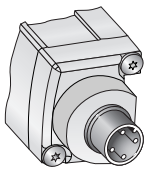
1) Limit values
2) Without load at $V_S = 24$ V
3) NPN also available
4) With resistive load

5) A = V_S connection, reverse polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression

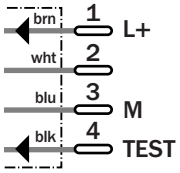
6) 950 g for 450 mm detection height, increase 160 g per 100 mm

Connection Diagram

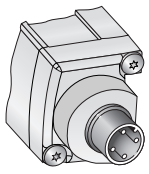
ELG S3-xxxxD521
ELG S6-xxxxD521



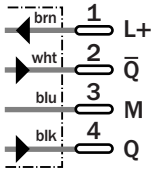
Sender
M12, 4-pin



ELG E3-xxxxP521
ELG E6-xxxxP521



Receiver
M12, 4-pin



Selection table/Order information *)

ELG short range, range = 0…2 m/beam spacing 30 mm

Type	Part no.	Height	No. of beams	Interface/Multiple scan
ELG 3-0090P513	1 025 443	90 mm	4	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 3-0150P513	1 025 578	150 mm	6	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 3-0210P513	1 025 438	210 mm	8	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 3-0330P513	1 025 576	330 mm	12	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 3-0210P511	1 025 510	210 mm	8	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0330P511	1 025 575	330 mm	12	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0450P511	1 025 490	450 mm	16	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0570P511	1 025 501	570 mm	20	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0690P511	1 025 499	690 mm	24	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0930P511	1 025 492	930 mm	32	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input

ELG long range, range = 0…12 m/beam spacing 30 mm

Type	Part no.	Height	No. of beams	Interface/Multiple scan
ELG 3-0210P521	1 025 574	210 mm	8	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0450P521	1 025 440	450 mm	16	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0690P521	1 025 568	690 mm	24	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0810P521	1 025 577	810 mm	28	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0930P521	1 025 511	930 mm	32	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1050P521	1 025 570	1050 mm	36	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1170P521	1 025 579	1170 mm	40	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1410P521	1 025 502	1410 mm	48	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1650P521	1 025 503	1650 mm	56	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1890P521	1 025 504	1890 mm	64	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-2070P521	1 025 505	2070 mm	70	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-2070P523	1 025 572	2070 mm	70	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 3-2370P521	1 025 573	2370 mm	80	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0210N521	1 025 613	210 mm	8	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0450N521	1 025 614	450 mm	16	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0690N521	1 025 615	690 mm	24	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-0930N521	1 025 616	930 mm	32	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1170N521	1 025 617	1170 mm	40	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1410N521	1 025 618	1410 mm	48	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1650N521	1 025 620	1650 mm	56	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 3-1890N521	1 025 621	1890 mm	64	NPN, 1 x $\overline{Q}$, 1 x Q, 1 Test input

ELG long range, range = 0…12 m/beam spacing 60 mm

Type	Part no.	Height	No. of beams	Interface/Multiple scan
ELG 6-0900P521	1 025 447	900 mm	16	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 6-1080P521	1 025 586	1080 mm	19	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 6-1380P521	1 025 587	1380 mm	24	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 6-1380P523	1 025 588	1380 mm	24	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 6-1860P521	1 025 589	1860 mm	32	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 6-1860P523	1 025 593	1860 mm	32	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 6-2040P523	1 025 594	2040 mm	35	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan
ELG 6-2340P521	1 025 596	2340 mm	40	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input
ELG 6-2460P523	1 024 293	2460 mm	42	PNP, 1 x $\overline{Q}$, 1 x Q, 1 Test input, 3 x multiple scan

*) Additional options on request, minimum order: 20 systems

ELG 1 Short Range

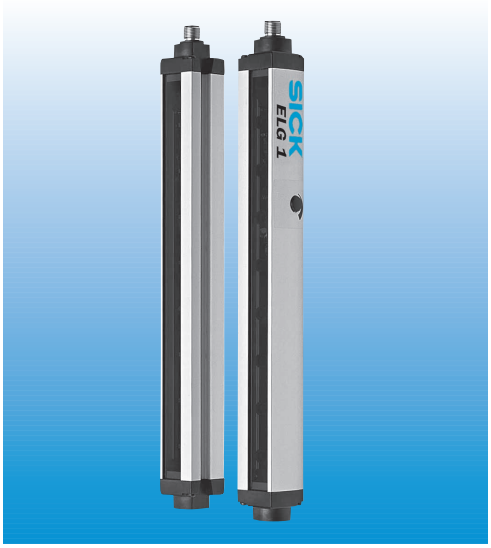
Through Beam Light Grid Sensors

0...9.8 ft (0...3 m)
sensing range

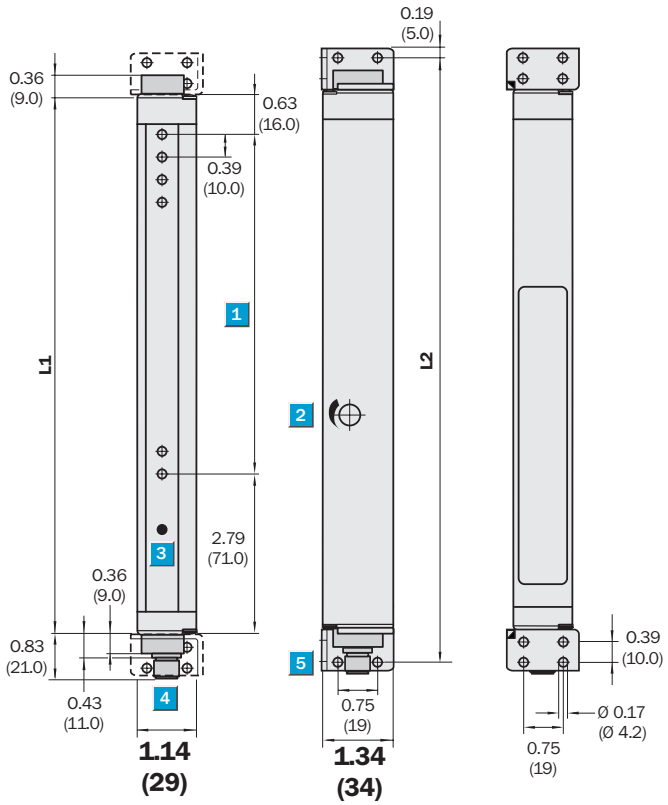
Highlights

- Beam spacing 10 mm
- Industrial standard outputs
- Optical synchronization
- Compact housing
- Mounting bracket included with delivery

ELG 1



Dimensional Drawing



dimensions in inches (mm)

Dimensions		
1	L1	L2
100 mm	187 mm	217 mm
150 mm	237 mm	267 mm

1 Detection height: 100/150 mm
2 Sensitivity adjustment
3 Status indicator (ELG E)/Power on (ELG S)
4 M12 plug, 4-pin
5 Mounting bracket (included with delivery)

Optical Performance

Beam spacing	Detection height	MDO: minimum detectable object [1]		
		in front of ELG S or ELG E	at mid-point between ELG S and ELG E	
10 mm	100/150 mm	15 mm	15 mm	10 mm [2]

1) MDO: minimum detectable object for non-moving objects, measured in a direction parallel to ELG

2) At mid-point between ELG S and ELG E with multiple scan

Order Information

Type	Part no.
ELG 1-0100P531	1 026 807
ELG 1-0150P531	1 026 741
ELG 1-0100P533	1 026 808
ELG 1-0150P533	1 026 809

Accessories

Cables and connectors
Mounting systems

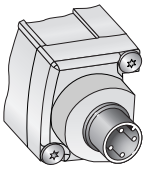
Technical Data	ELG 1-	0100 P531	0150 P531	0100 P533	0150 P533						
Beam spacing	0.4 in (10 mm)	■	■	■	■						
Detection height	3.9 in (100 mm)	■		■							
	5.9 in (150 mm)		■		■						
Number of beams	11	■		■							
	16		■		■						
Sensing range	0…9.8 ft (0…3 m)	■	■	■	■						
Multiple scan	3 x (see optical performance)			■	■						
Synchronization	Optical synchronization	■	■	■	■						
Light source	LED, infrared light	■	■	■	■						
Voltage supply V_S [1]	15…30 V DC	■	■	■	■						
Residual ripple	< 10 % within V_S tolerance	■	■	■	■						
Current consumption Sender	< 100 mA	■	■	■	■						
Current consumption Receiver [2]	< 100 mA	■	■	■	■						
Connection	M12 plug, 4-pin	■	■	■	■						
Switch output	2 x PNP output [3]: $\overline{Q}$ and Q	■	■	■	■						
Operating mode	Q: dark-/$\overline{Q}$: light-switching	■	■	■	■						
Output current I_A max.	100 mA	■	■	■	■						
Output load	Capacitive load: 100 nF	■	■	■	■						
	Inductive load: 1H	■	■	■	■						
Test input »TE«	Sender OFF: Test input to V_S	■	■	■	■						
Response time [4]	Max. 12 ms	■	■								
	Max. 36 ms			■	■						
Initialization duration after power ON	Max. 300 ms	■	■	■	■						
High immunity against ambient light	150,000 lx (sunlight)	■	■	■	■						
VDE protection class	III	■	■	■	■						
Circuit protection [5]	A, B, C	■	■	■	■						
Enclosure rating	IP 65	■	■	■	■						
Ambient temperature T_A	Operation -13…131°F (–25…+55°C)	■	■	■	■						
	Storage -40…158°F (–40…+70°C)	■	■	■	■						
Mechanical resistance	Vibration: 5 g; 10-55/s – IEC 68-2-6	■	■	■	■						
	Shock: 10 g; 16 ms – IEC 68-2-29	■	■	■	■						
Weight	Approx. 350 g	■	■	■	■						
Housing Material	Aluminum anodized	■	■	■	■						
Front Lens	PMMA	■	■	■	■						

1) Limit values
2) Without load at V_S = 24 V
3) NPN available upon request
4) With resistive load

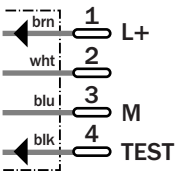
5) A = V_S connections, reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short-circuit protected
C = Interference pulse suppression

Connection Diagram

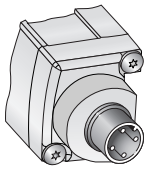
ELG S1-xxxxD53x



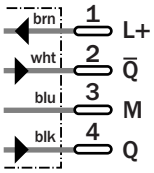
Sender
M12, 4-pin



ELG E1-xxxxP53x

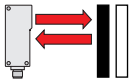


Receiver
M12, 4-pin



WT 14-2

Proximity/Diffuse Sensors - Background Blanking

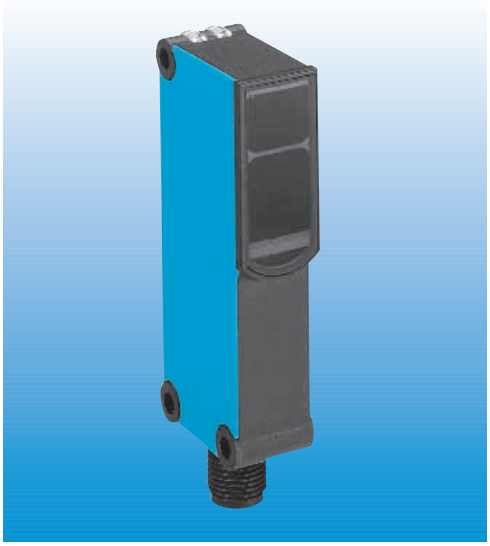



3.1...19.7 (80...500 mm)
sensing distance

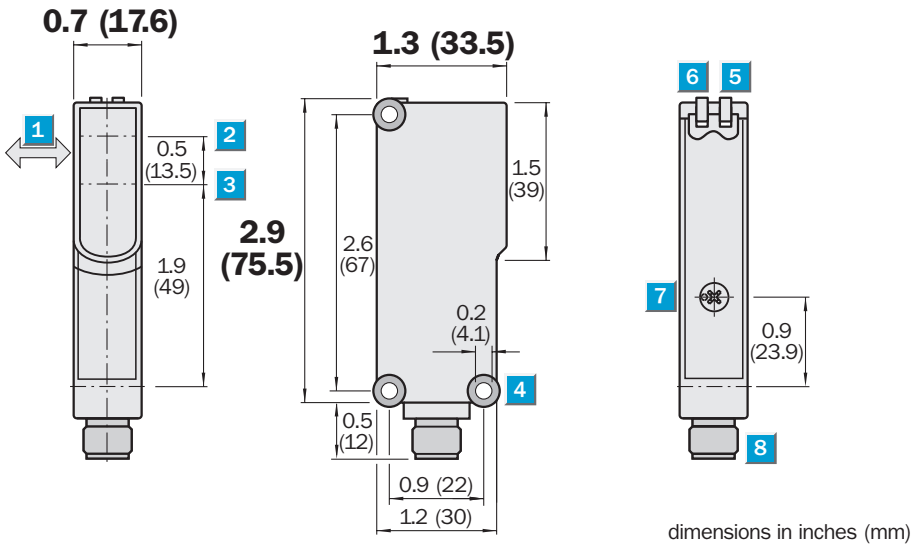
Highlights

- Infrared light
- Background blanking, adjustable
- Sturdy plastic housing

WT 14-2

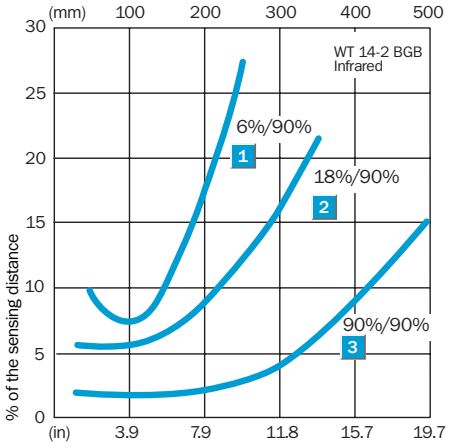


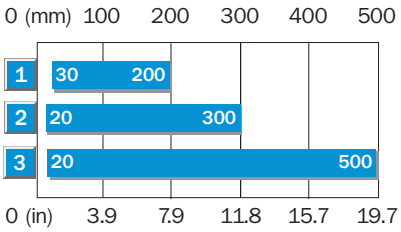
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types

1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow: signal strength indicator
6	LED, green: power on
7	Sensing range adjustment
8	Plug M12, 4-pin or 2 m cable

See Chapter Accessories
Cables and connectors
Mounting systems

Order Information

Type	Part no.
WT14-2P122	1 026 051
WT14-2P422	1 026 052
WT14-2N122	1 026 053
WT14-2N422	1 026 054

Technical Data	WT 14-2	P122	P422	N122	N422
Sensing range, typ. max. adjust.[1]	3.2…19.7 in (80…500 mm), 90% remission	■	■	■	■
Adjustment	Potentiometer, 4 turn	■	■	■	■
Light source[2]**, light type**	LED, infrared light	■	■	■	■
Light spot diameter	0.5 in at 11.8 in (14 mm at 300 mm)	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■	■
Current consumption[5]	<30 mA	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■
Switching outputs	PNP, complementary	■	■		
	NPN, complementary			■	■
Response time[6]	< 2.5 ms	■	■	■	■
Max. switching frequency[7]	200/s	■	■	■	■
Connection type	Cable[8] PVC, 2 m, 4-wire	■		■	
	M12 plug, 4-pin		■		■
VDE protection class cable[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 65	■	■	■	■
Ambient temperature	Operation -13…140°F (-25…60°C)	■	■	■	■
	Storage -40…158°F (-40…70°C)	■	■	■	■
Weight	With cable, approx 0.24 lb. (120 g)	■		■	
	With plug, approx. 0.1 lb. (40 g)		■		■
Housing material	ABS	■	■	■	■

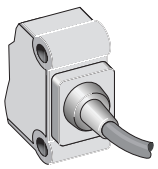
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

Adjustment via Potentiometer

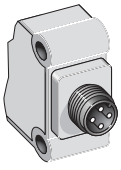
1) Position the object in the path of the beam.
2) By rotating the potentiometer to the right until the yellow LED illuminates continuously = object is positively detected.
3) If necessary, fine adjustments to the sensing distance can be made to suit the conditions of the application:
minimal rotation of the potentiometer to the right = sensing distance will be increased,
minimal rotation of the potentiometer to the left = sensing distance will be decreased.

Connection types

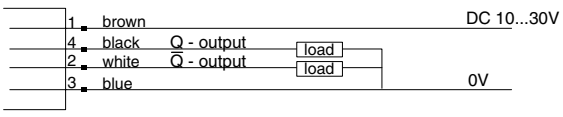
WT14-2P122
WT14-2N122



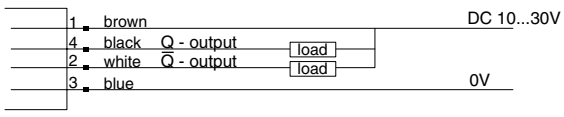
WT14-2P422
WT14-2N422



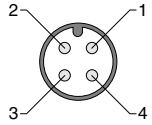
PNP Models



NPN Models



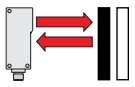
M12 Connector



wire colors refer to standard cable, not included with quick disconnect models

WT 14-2

Proximity/Diffuse Sensors - Background Blanking

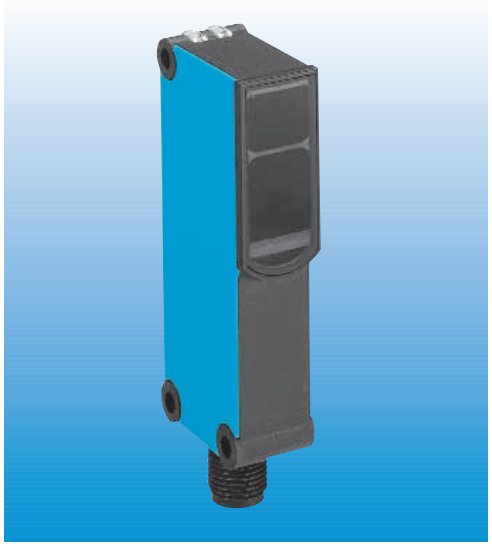



1.9...9.8 (50...250 mm)
sensing distance

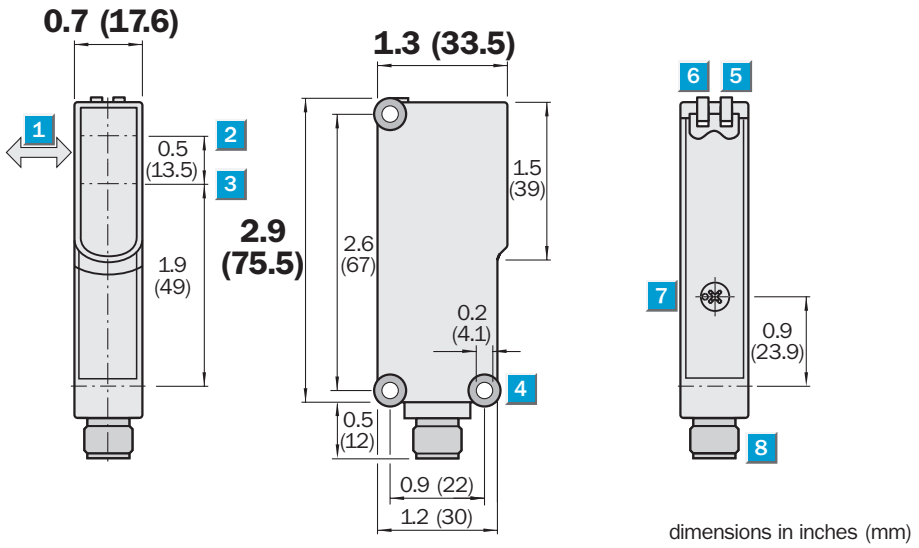
Highlights

- Red light
- Background blanking, adjustable
- Sturdy plastic housing

WT 14-2

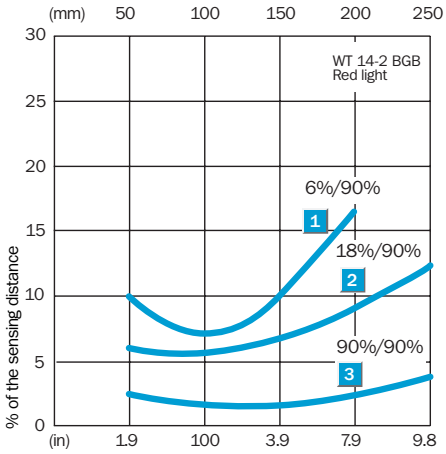


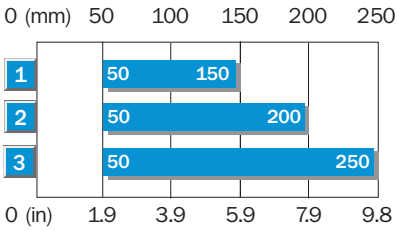
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types

1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow: signal strength indicator
6	LED, green: power on
7	Sensing range adjustment
8	Plug M12, 4-pin or 2 m cable

See Chapter Accessories
Cables and connectors
Mounting systems

Order Information

Type	Part no.
WT14-2P132	1 026 055
WT14-2P432	1 026 056
WT14-2N132	1 026 072
WT14-2N432	1 026 057

Technical Data	WT 14-2	P132	P432	N132	N432
Sensing distance, typ. max. adjust.[1]	1.9…9.8 in (50…250 mm), 90% remission	■	■	■	■
Adjustment	Potentiometer, 4 turn	■	■	■	■
Light source[2]**, light type**	LED, red light	■	■	■	■
Light spot diameter	0.4 in at 9.8 in (10 mm at 250 mm)	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■	■
Current consumption[5]	< 25 mA	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■
Switching outputs	PNP, complementary	■	■		
	NPN, complementary			■	■
Response time[6]	< 2.5 ms	■	■	■	■
Max. switching frequency[7]	200/s	■	■	■	■
Connection type	Cable[8] PVC, 2 m, 4-wire	■		■	
	M12 plug, 4-pin		■		■
VDE protection class cable[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 65	■	■	■	■
Ambient temperature	Operation -13…140°F (-25…60°C)	■	■	■	■
	Storage -40…158°F (-40…70°C)	■	■	■	■
Weight	With cable, approx 0.24 lb. (120 g)	■		■	
	With plug, approx. 0.1 lb. (40 g)		■		■
Housing material	ABS	■	■	■	■

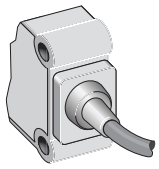
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

Adjustment via Potentiometer

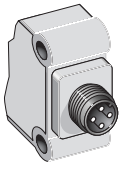
1) Position the object in the path of the beam.
2) By rotating the potentiometer to the right until the yellow LED illuminates continuously = object is positively detected.
3) If necessary, fine adjustments to the sensing distance can be made to suit the conditions of the application:
minimal rotation of the potentiometer to the right = sensing distance will be increased,
minimal rotation of the potentiometer to the left = sensing distance will be decreased.

Connection types

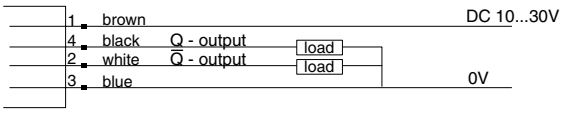
WT14-2P132
WT14-2N132



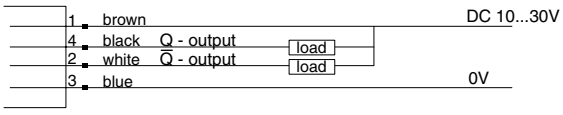
WT14-2P432
WT14-2N432

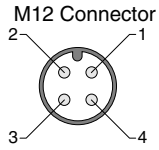


PNP Models



NPN Models





wire colors refer to standard cable, not included with quick disconnect models

WT 14-2

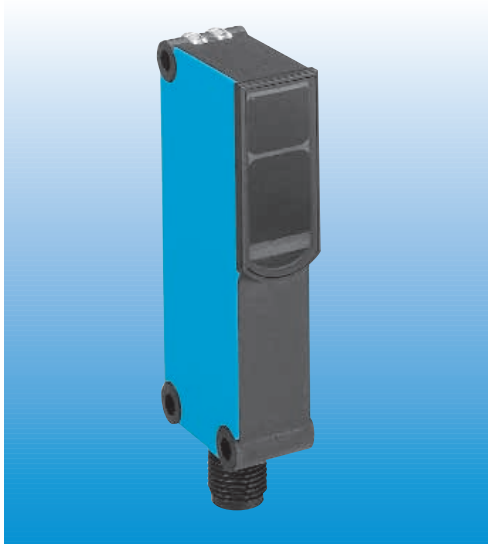
Proximity/Diffuse Sensors - Energetic

11.8…59.1 (300…1500 mm)
sensing distance

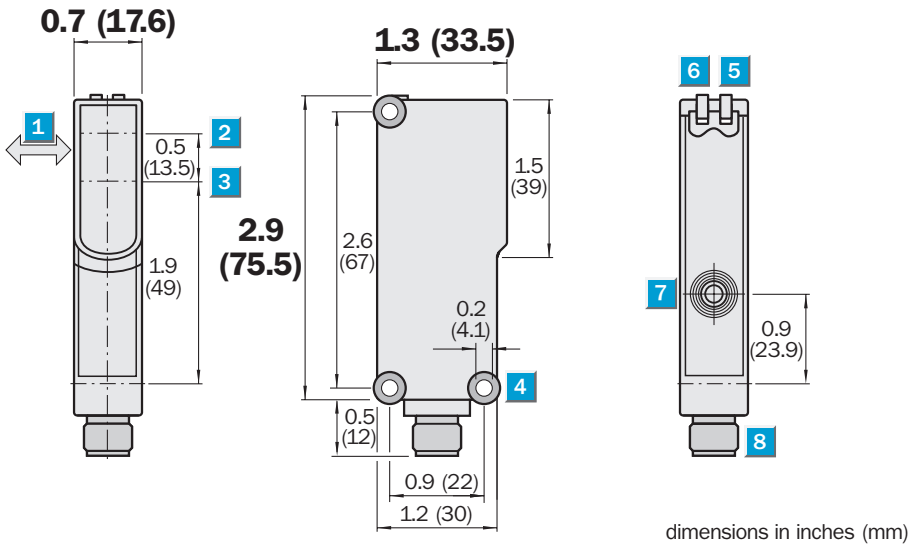
Highlights

- Infrared light
- Energetic proximity switch
- Teach-in function
- Sturdy plastic housing

WT 14-2

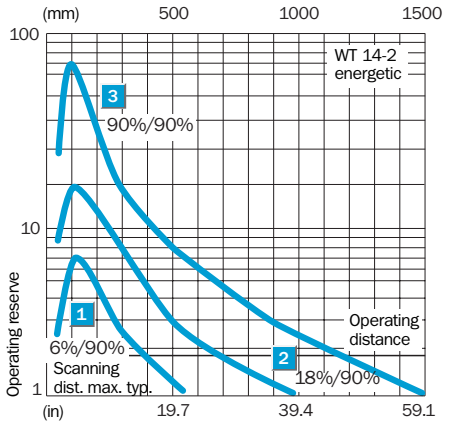


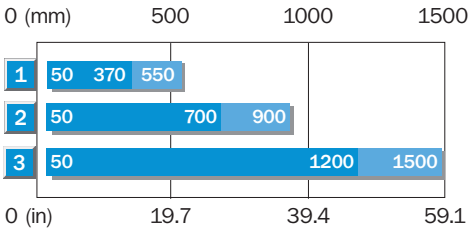
Dimensional Drawing



dimensions in inches (mm)

Sensing distance

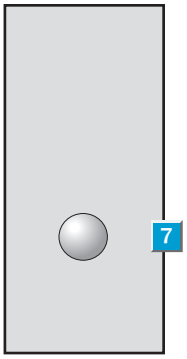




1 Sensing range on black, 6% remission
2 Sensing range on grey, 18% remission
3 Sensing range on white, 90% remission

Adjustments

All types



1 Standard direction of the material being sensed
2 Optical axis, sender
3 Optical axis, receiver
4 Mounting hole Ø 4.1 mm
5 LED, yellow: signal strength indicator
6 LED, green: power on
7 Teach-in button
8 Plug M12, 4-pin or 2 m cable

See Chapter Accessories
Cables and connectors
Mounting systems

Order Information

Type	Part no.
WT14-2P111	1 026 058
WT14-2P411	1 026 059
WT14-2N111	1 026 060
WT14-2N411	1 026 062

Technical Data	WT 14-2	P111	P411	N111	N411
Sensing distance, adjustable[1]	11.8…59.1 in (300…1500 mm), 90% remission	■	■	■	■
Adjustment	Teach-in button	■	■	■	■
Light source[2], **light type**	LED, infrared light	■	■	■	■
Light spot diameter	2.2 in at 39.4 in (56 mm at 1000 mm)	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■	■
Current consumption[5]	≤ 55 mA	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■
Switching outputs	PNP, complementary	■	■		
	NPN, complementary			■	■
Response time[6]	≤ 2.5 ms	■	■	■	■
Max. switching frequency[7]	200/s	■	■	■	■
Connection type	Cable[8] PVC, 2 m, 4-wire	■		■	
	M12 plug, 4-pin		■		■
VDE protection class cable[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 65	■	■	■	■
Ambient temperature	Operation -13…140°F (-25…60°C)	■	■	■	■
	Storage -40…158°F (-40…70°C)	■	■	■	■
Weight	With cable, approx 0.24 lb. (120 g)	■		■	
	With plug, approx. 0.1 lb. (40 g)		■		■
Housing material	ABS	■	■	■	■

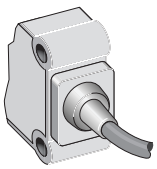
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

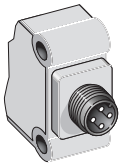
Teach-in Function

- **Programming via Teach-in button.**
- **Simple programming:**
  Position object in light beam, press button, finished;
  LED confirms the successful Teach-in procedure.
- **Teach-in value is stored.**
- **Two operating modes:**
  Default setting: Short Teach-in time (< 6 s), for standard applications;
  Approx. double reserve via switching threshold; LED lights.
  Precise setting: Long Teach-in time (> 8 s); For precise applications; Slight reserve via switching threshold; LED blinks when operating reserve > 2.

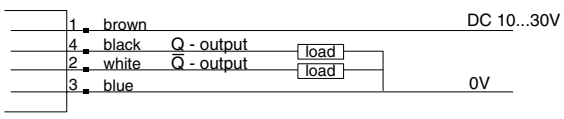
Connection types

WT14-2P111 WT14-2P411
WT14-2N111 WT14-2N411

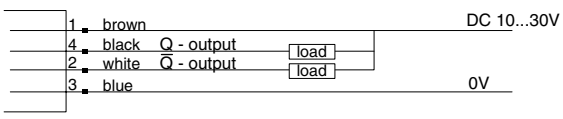


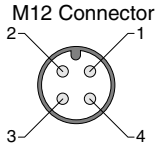


PNP Models



NPN Models

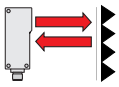




wire colors refer to standard cable, not included with quick disconnect models

WL 14-2

Reflex/Retro-Reflective Sensors

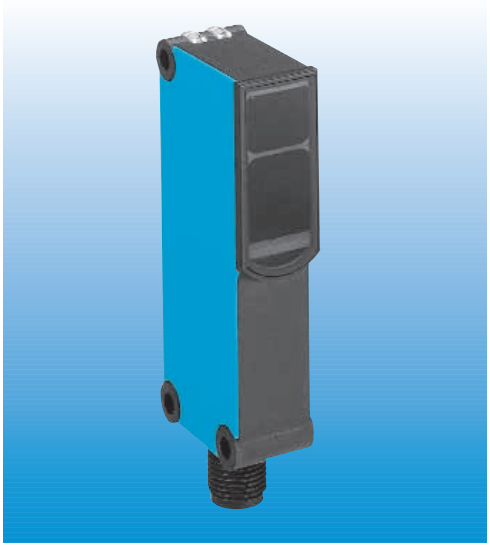



0...19.7 ft (0...6 m)
sensing range

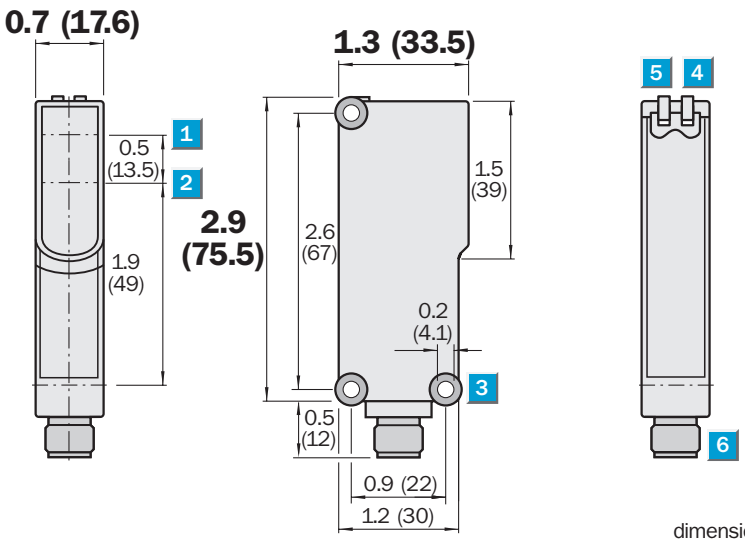
Highlights

- Red light
- Polarization filter for reliable detection of shiny or irregular objects
- Sturdy plastic housing

WT 14-2



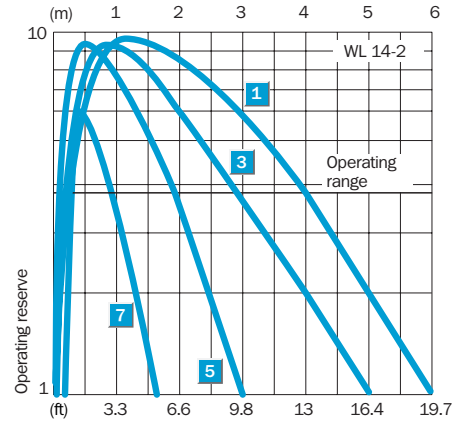
Dimensional Drawing

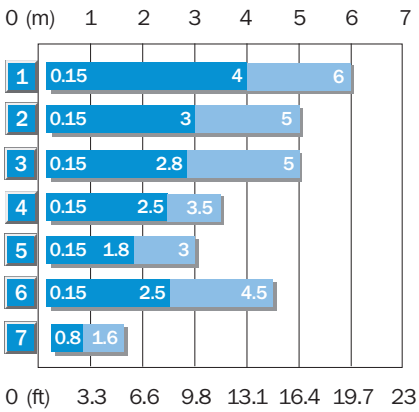


dimensions in inches (mm)

1	Optical axis, sender
2	Optical axis, receiver
3	Mounting hole Ø 4.1 mm
4	LED, yellow: signal strength indicator
5	LED, green: power on
6	Plug M12, 4-pin or 2 m cable

Sensing distance





	Reflector type	Operating range
1	PL 80 A	0.15...4 m
2	PL 50 A	0.15...3 m
3	PL 40 A	0.15...2.8 m
4	PL 30 A	0.15...2.5 m
5	PL 20 A	0.15...1.8 m
6	P 975	0.15...2.5 m
7	Reflective tape Diamond Grade	0.3...0.8 m

Order Information

Type	Part no.
WL14-2P130	1 026 050
WL14-2P430	1 026 049
WL14-2N130	1 026 047
WT14-2N430	1 026 048

See Chapter Accessories

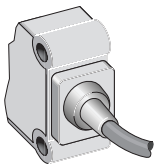
- Cables and connectors
- Mounting systems
- Reflectors

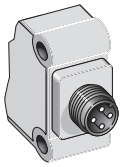
Technical Data	WL 14-2	P130	P430	N130	N430
Sensing range, typ max/on reflector	19.7 ft (6 m)/PL 80 A	■	■	■	■
Light source[1], light type	LED, red light	■	■	■	■
Opening angle	2°	■	■	■	■
Light spot diameter	5.5 in at 13.1 ft (140 mm at 4 m)	■	■	■	■
Polarizing filter	Yes	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■
Residual ripple[3]	≤ 5 V_{PP}	■	■	■	■
Current consumption[4]	≤ 35 mA	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■
Switching outputs	PNP, complementary	■	■		
	NPN, complementary			■	■
Response time[5]	≤ 2.5 ms	■	■	■	■
Max. switching frequency[6]	200/s	■	■	■	■
Connection type	Cable[7] PVC, 2 m, 4-wire	■		■	
	M12 plug, 4-pin		■		■
VDE protection class cable[8]	□	■	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■	■
Enclosure rating	IP 65	■	■	■	■
Ambient temperature	Operation -13…140°F (-25…60°C)	■	■	■	■
	Storage -40…158°F (-40…70°C)	■	■	■	■
Weight	With cable, approx 0.24 lb. (120 g)	■		■	
	With plug, approx. 0.1 lb. (40 g)		■		■
Housing material	ABS	■	■	■	■

1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

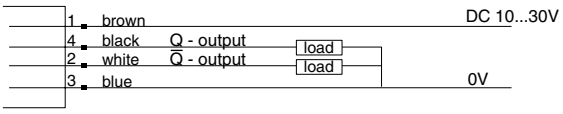
Connection types

WL14-2P130 | WL14-2P430
WL14-2N130 | WL14-2N430

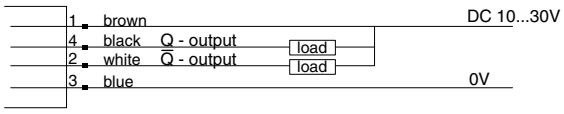




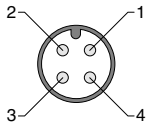
PNP Models



NPN Models



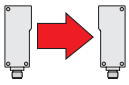
M12 Connector



wire colors refer to standard cable, not included with quick disconnect models

WS/WE 14-2

Through Beam Sensors

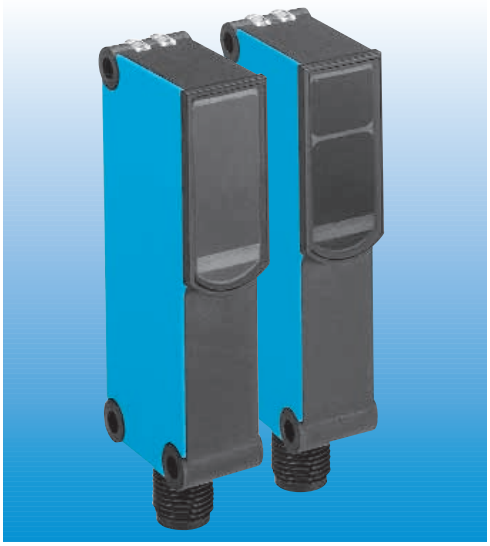



0...49.2 ft (0...15 m)
sensing range

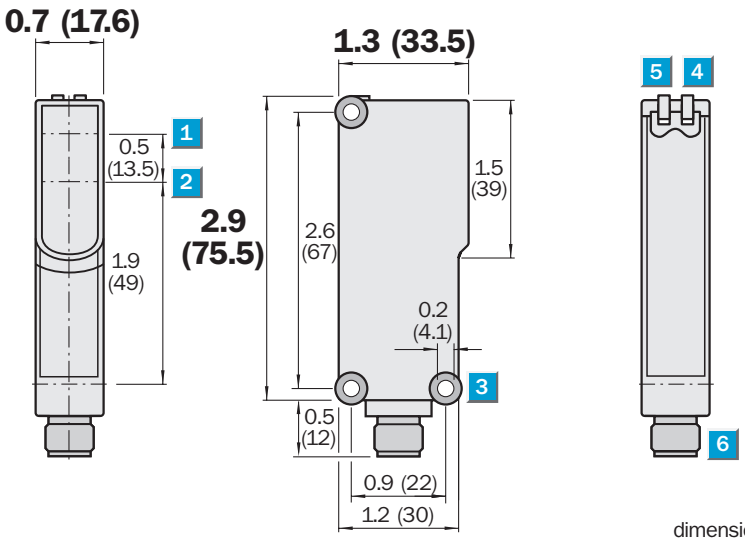
Highlights

- Red light
- Test input for system diagnostics
- Sturdy plastic housing

WS/WE 14-2



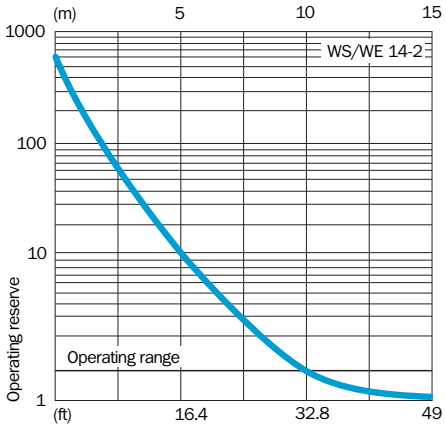
Dimensional Drawing

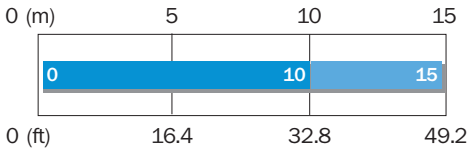


dimensions in inches (mm)

1	Optical axis, sender (only WS)
2	Optical axis, receiver (only WE)
3	Mounting hole Ø 4.1 mm
4	LED, yellow: signal strength indicator
5	LED, green: power on
6	Plug M12, 4-pin or 2 m cable

Sensing distance





Order Information

Type	Part no.
WS/WE14-2P130	1 026 430
WS/WE14-2P430	1 026 431
WS/WE14-2N130	1 026 432
WS/WE14-2N430	1 026 433

See Chapter Accessories

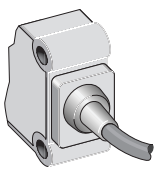
- Cables and connectors
- Mounting systems

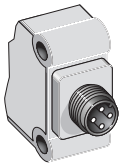
Technical Data	WS/WE 14-2	P130	P430	N130	N430
Sensing range, typ. max.	0…48.2 ft (0…15 m)	■	■	■	■
Light source[1], light type	LED, red light	■	■	■	■
Light spot diameter	11.8 in at 32.8 ft (300 mm at 10 m)	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■
Residual ripple[3]	≤ 5 V_{PP}	■	■	■	■
Current consumption[4]	≤ 60 mA	■	■	■	■
Sender	≤ 35 mA	■	■	■	■
Receiver	≤ 25 mA	■	■	■	■
Output current V_S	< 100 mA	■	■	■	■
Switching outputs	PNP, complementary	■	■		
	NPN, complementary			■	■
Response time[5]	≤ 2.5 ms	■	■	■	■
Max. switching frequency[6]	200/s	■	■	■	■
Test »TE« sender off	TE to 0 V	■	■	■	■
Connection type	Cable[7] PVC, 2 m, 3-/4-wire	■		■	
	M12 plug, 4-pin		■		■
VDE protection class cable[8]	□	■	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■	■
Enclosure rating	IP 65	■	■	■	■
Ambient temperature	Operation -13…140°F (-25…60°C)	■	■	■	■
	Storage -40…158°F (-40…70°C)	■	■	■	■
Weight	With cable, approx 0.24 lb. (120 g), each piece		■		■
	With plug, approx. 0.1 lb. (40 g), each piece	■		■	
Housing material	ABS	■	■	■	■

1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Outputs Q and $\overline{Q}$ short circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

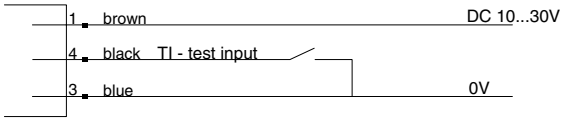
Connection types

WS/WE 14-2 P130 | WS/WE 14-2 P430
WS/WE 14-2 N130 | WS/WE 14-2 N430

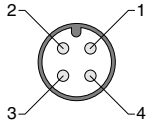




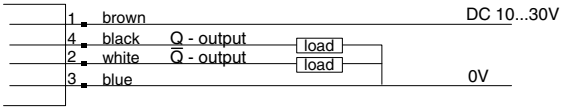
Sender, All Models



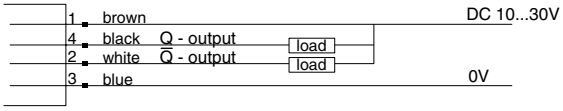
M12 Connector



Receiver, PNP Models



Receiver, NPN Models



wire colors refer to standard cable, not included with quick disconnect models

WT 18-3

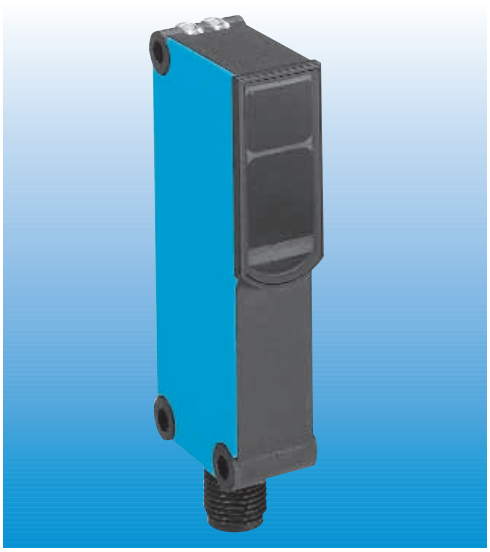
Proximity/Diffuse Sensors-Background Suppression

1.9...23.6 in (50...600 mm)
sensing distance

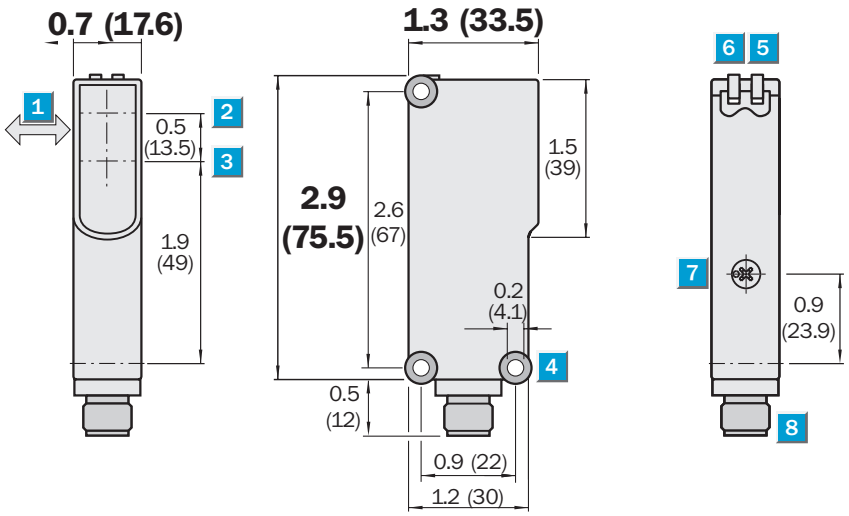
Highlights

- Precise background suppression; suitable for demanding applications
- Sensing range adjustable via potentiometer
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40...140°F (-40...60°C)

WT 18-3

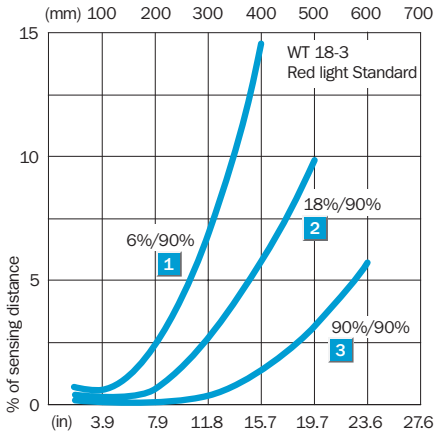


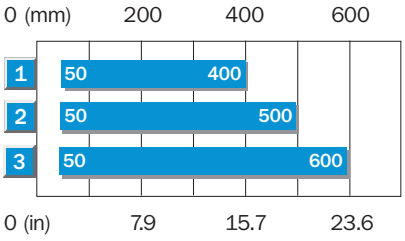
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types

1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow; signal strength indicator
6	LED, green; power on indicator
7	Sensing range adjustment
8	Plug M12, 4-pin or 2 m cable

Order Information

Type	Part no.
WT18-3P130	1 025 895
WT18-3P430	1 025 896
WT18-3N130	1 025 897
WT18-3N430	1 025 898

See Chapter Accessories

Cables and connectors

Mounting systems

Technical Data	WT 18-3	P130	P430	N130	N430
Sensing distance, adjustable[1]	1.9…23.6 in (50…600 mm), 90% remission	■	■	■	■
Visible range [1]	0.4…23.6 in (10…600 mm)	■	■	■	■
Adjustment	Potentiometer, 4 turn	■	■	■	■
Light source[2], **light type**	LED, visible red light	■	■	■	■
Light spot diameter	0.6 in at 11.8 in (15 mm at 300 mm)	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■	■
Current consumption[5]	< 40 mA	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■
Switching outputs	PNP, complementary	■	■		
	NPN, complementary			■	■
Response time[6]	< 700 µs	■	■	■	■
Switching frequency max.[7]	700/s	■	■	■	■
Connection types	Cable [8], 2 m, 4 wire	■		■	
	M12 plug, 4-pin		■		■
VDE protection class cable[9]	□	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■
Enclosure rating	IP 67	■	■	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■	■	■
	Storage -40…167°F (-40…75°C)	■	■	■	■
Weight	With cable, 2 m, approx. 0.3 lb. (120 g)	■		■	
	With M12 plug, approx. 0.1 lb. (40 g)		■		■
Housing material	ABS	■	■	■	■

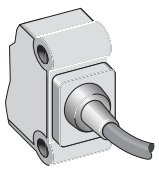
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

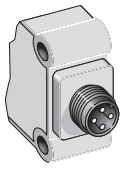
Adjustment via Potentiometer

1) Position the object in the path of the beam.
2) By rotating the potentiometer to the right until the yellow LED illuminates continuously = object is positively detected.
3) If necessary, fine adjustments to the sensing distance can be made to suit the conditions of the application:
minimal rotation of the potentiometer to the right = sensing distance will be increased,
minimal rotation of the potentiometer to the left = sensing distance will be decreased.

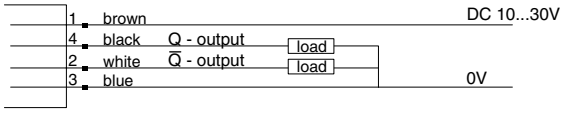
Connection types

WT18-3P130	WT18-3P430
WT18-3N130	WT18-3N430

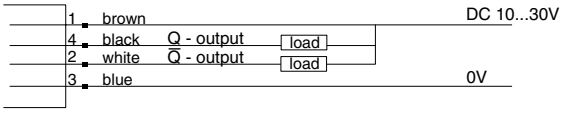




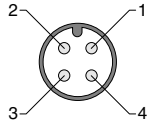
PNP Models



NPN Models



M12 Connector



wire colors refer to standard cable, not included with quick disconnect models

WT 18-3

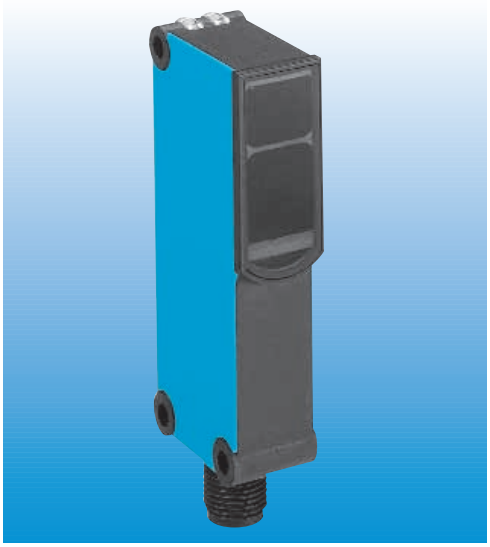
Proximity/Diffuse Sensors-Background Suppression

1.9…23.6 in (50…600 mm)
sensing distance

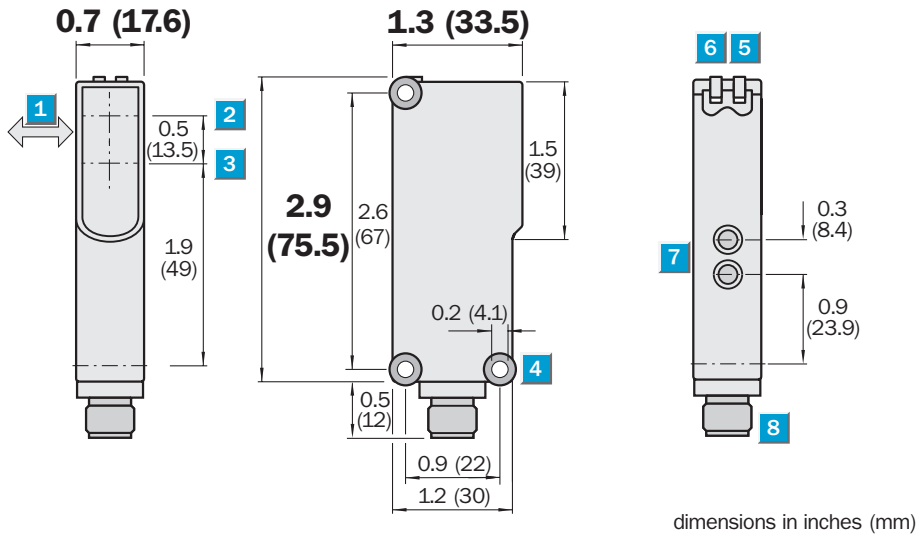
Highlights

- Precise background suppression; suitable for demanding applications
- Sensing range adjustable by Teach-in using double Teach buttons.
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40…140°F (-40…60°C)

WT 18-3

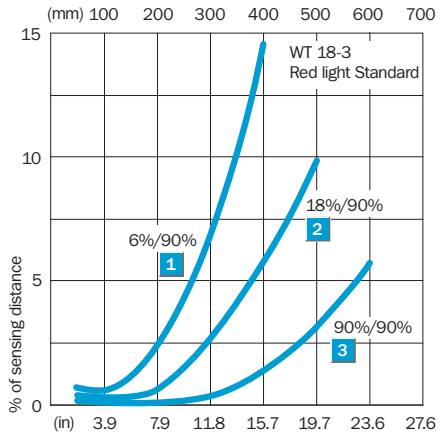


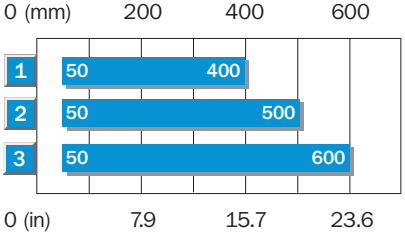
Dimensional Drawing



dimensions in inches (mm)

Sensing distance

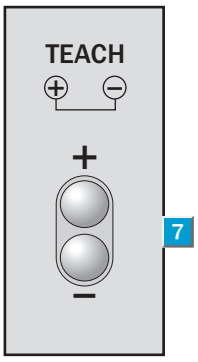




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range distance on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow; signal strength indicator
6	LED indicator, green; power on indicator
7	Sensing range adjustment, double Teach button
8	Plug M12, 4-pin or 2 m cable

Order Information

Type	Part no.
WT18-3P131	1 026 034
WT18-3P431	1 026 032
WT18-3N431	1 026 035

See Chapter Accessories

Cables and connectors
Mounting systems

Technical Data	WT 18-3	P131	P431	N431
Sensing distance, adjustable[1]	1.9…23.6 in (50…600 mm), 90% remission	■	■	■
Visible range [1]	0.4…23.6 in (10…600 mm)	■	■	■
Adjustment	Teach-in, via double teach buttons	■	■	■
Light source[2], **light type**	LED, visible red light	■	■	■
Light spot diameter	0.6 in at 11.8 in (15 mm at 300 mm)	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■
Current consumption[5]	< 40 mA	■	■	■
Output current I_A max.	< 100 mA	■	■	■
Switching outputs	PNP, complementary	■	■	■
	NPN, complementary	■	■	
Response time[6]	< 700 µs			■
Switching frequency max.[7]	700/s	■	■	■
Connection types	Cable [8], 2 m, 4-wire	■	■	■
	M12 plug, 4-pin	■		
VDE protection class cable[9]	□		■	■
Circuit protection[10]	A, B, C, D	■	■	■
Enclosure rating	IP 67	■	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■	■
	Storage -40…167°F (-40…75°C)	■	■	■
Weight	With cable, 2 m, approx. 0.3 lb. (120 g)	■		
	With M12 plug, approx. 0.1 lb. (40 g)		■	■
Housing material	ABS	■	■	■

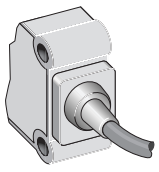
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

Teach-in procedure via the double Teach buttons

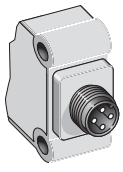
1) Position the object in the path of the beam.
2) Press both buttons simultaneously **(for approx. 2 seconds)** until the yellow LED flashes = object in focus. In the event of button activation of less than 2 seconds, the Teach command is not effective, therefore providing no protection against further unwanted manipulation.
3) Release buttons; yellow LED illuminates continuously = object is positively detected.
4) Fine adjustments can be made to the sensing distance, when required by the application:
Pressing the "+" button **(approx. 0.5 sec)** = sensing distance will be increased.
Pressing the "-" button **(approx. 0.5 sec)** = sensing distance will be decreased.
In the event of button activation less than 0.5 sec, no change to the sensing distance is made.
Upon activation of the button, the yellow LED flashes.
5) The Teach-in sensing distance is stored in the memory.

Connection types

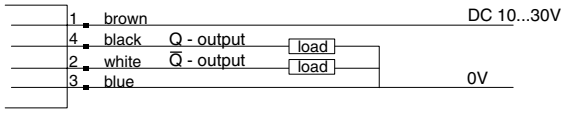
WT18-3P131



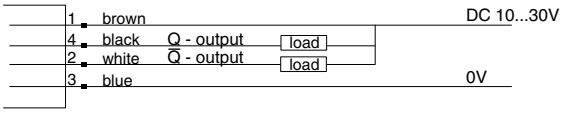
WT18-3P431
WT18-3N431

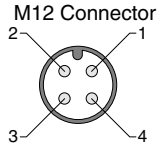


PNP Models



NPN Models





wire colors refer to standard cable, not included with quick disconnect models

WT 18-3

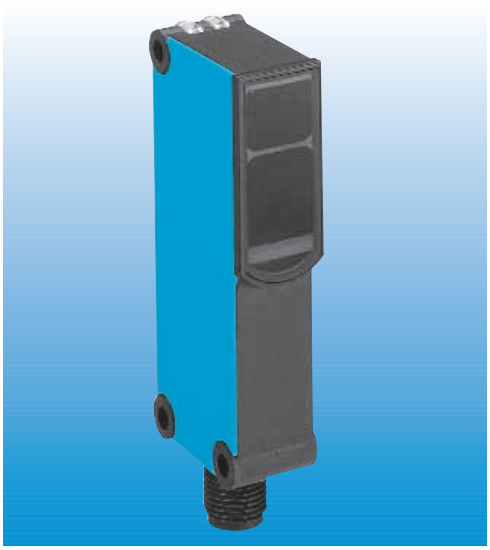
Proximity/Diffuse Sensors-Background Suppression

1.9...27.6 in (50...700 mm)
sensing distance

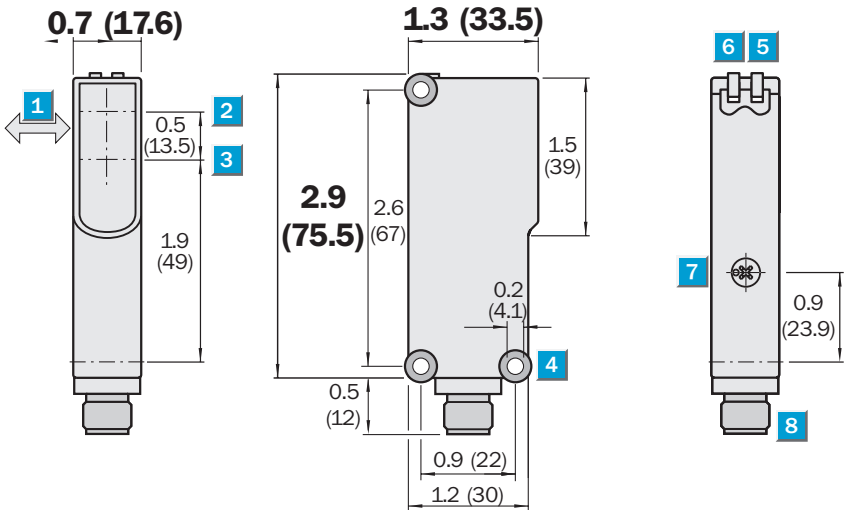
Highlights

- Precise background suppression; suitable for demanding applications
- Sensing range adjustable via potentiometer
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40...140°F (-40...60°C)

WT 18-3

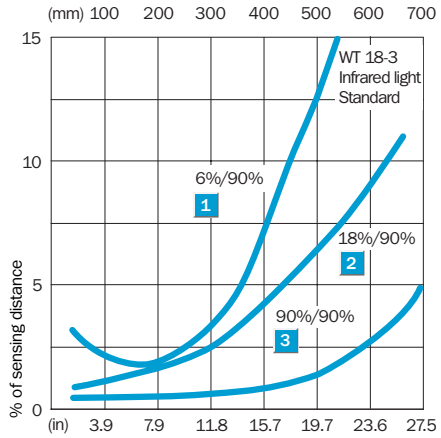


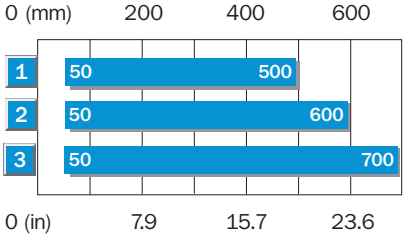
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types

1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow; signal strength indicator
6	LED, green; power on indicator
7	Sensing distance adjustment
8	Plug M12, 4-pin or 2 m cable or square plug, 6-pin

Order Information

Type	Part no.
WT18-3P110	1 025 887
WT18-3P410	1 025 889
WT18-3P610	1 025 890
WT18-3N110	1 025 891
WT18-3N410	1 025 893
WT18-3N610	1 025 894

See Chapter Accessories
Cables and connectors
Mounting systems

Technical Data	WT 18-3	P110	P410	P610	N110	N410	N610
Sensing distance, adjustable[1]	1.9…27.6 in (50…700 mm), 90% remission	■	■	■	■	■	■
Visible range [1]	0.4…27.6 in (10…700 mm)	■	■	■	■	■	■
Adjustment	Potentiometer, 4 turn	■	■	■	■	■	■
Light source[2], **light type**	LED, infrared light	■	■	■	■	■	■
Light spot diameter	0.8 in at 15.7 in (20 mm at 400 mm)	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■	■	■	■
Current consumption[5]	< 55 mA	■	■	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■	■	■
Switching outputs	PNP, complementary	■	■	■			
	NPN, complementary				■	■	■
Response time[6]	< 700 µs	■	■	■	■	■	■
Switching frequency max.[7]	700/s	■	■	■	■	■	■
Connection types	Cable [8], 2 m, 4 wire	■			■		
	M12 plug, 4-pin		■			■	
	Square plug, 6-pin			■			■
VDE protection class cable[9]	□	■	■	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■	■	■	■	■
	Storage -40…167°F (-40…75°C)	■	■	■	■	■	■
Weight	With cable, 2 m, approx. 0.3 lb. (120 g)	■			■		
	With M12 plug, approx. 0.1 lb. (40 g)		■			■	
	With square plug, approx. 0.1 lb (40 g)			■			■
Housing material	ABS	■	■	■	■	■	■

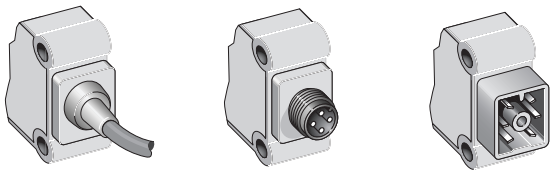
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

Adjustment via Potentiometer

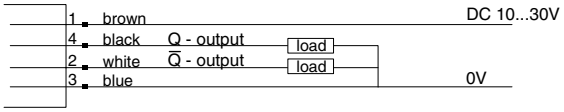
1) Position the object in the path of the beam.
2) By rotating the potentiometer to the right until the yellow LED illuminates continuously = object is positively detected.
3) If necessary, fine adjustments to the sensing distance can be made to suit the conditions of the application:
minimal rotation of the potentiometer to the right = sensing distance will be increased,
minimal rotation of the potentiometer to the left = sensing distance will be decreased.

Connection types

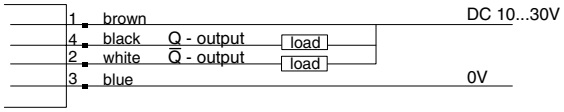
WT18-3P110 | WT18-3P410 | WT18-3P610
WT18-3N110 | WT18-3N410 | WT18-3N610



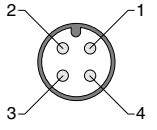
PNP Models



NPN Models

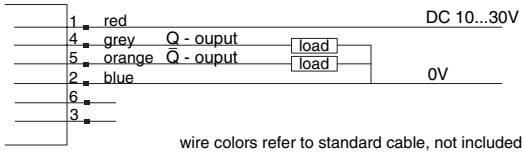


M12 Connector



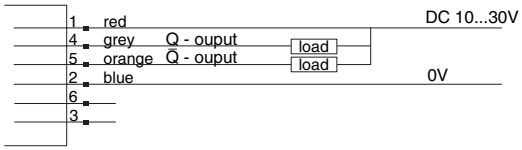
wire colors refer to standard cable, not included with quick disconnect models

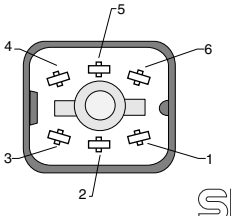
PNP



wire colors refer to standard cable, not included

NPN





SICK

WT 18-3

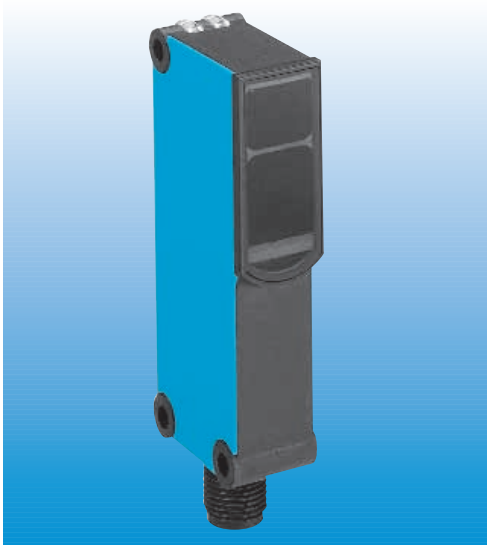
Proximity/Diffuse Sensors-Background Suppression

1.9...27.6 in (50...700 mm)
sensing distance

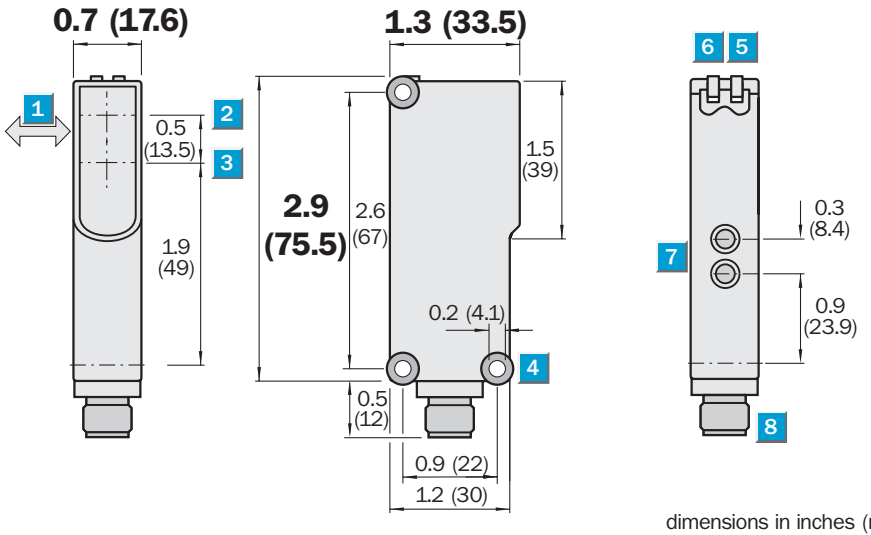
Highlights

- Precise background suppression; suitable for demanding applications
- Sensing range adjustable by Teach-in using double Teach buttons
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40...140°F (-40...60°C)

WT 18-3

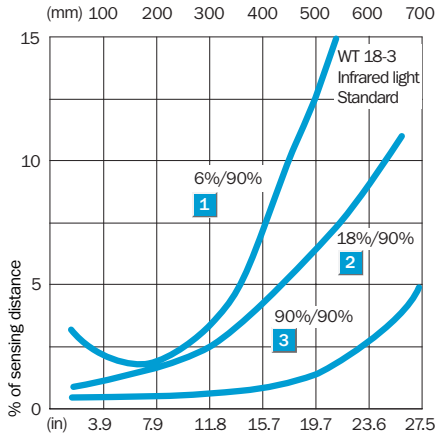


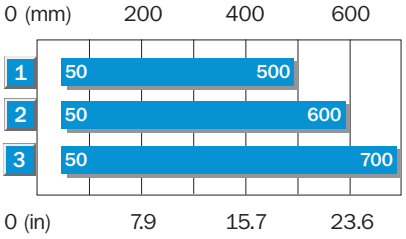
Dimensional Drawing



dimensions in inches (mm)

Sensing distance

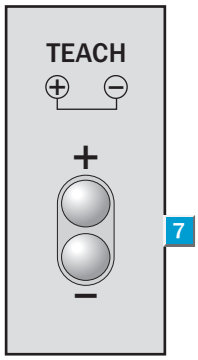




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types



1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow; signal strength indicator
6	LED, green; power on indicator
7	Sensing range adjustment, double Teach button
8	Plug M12, 4-pin or 2 m cable

Order Information

Type	Part no.
WT18-3P111	1 026 033
WT18-3P411	1 026 031

See Chapter Accessories

Cables and connectors

Mounting systems

Technical Data	WT 18-3	P111	P411
Sensing distance, adjustable[1]	1.9…27.6 in (50…700 mm), 90% remission	■	■
Visible range [1]	0.4…27.6 in (10…700 mm)	■	■
Adjustment	Teach-in, via double teach buttons	■	■
Fine Adjustment	Manuel via “+” and “-” button	■	■
Light source[2], **light type**	LED, infrared light	■	■
Light spot diameter	0.8 in at 15.7 in (20 mm at 400 mm)	■	■
Supply voltage V_S	10…30 V DC[3]	■	■
Residual ripple[4]	< 5 V_{PP}	■	■
Current consumption[5]	< 55 mA	■	■
Output current I_A max.	< 100 mA	■	■
Switching outputs	PNP, complementary	■	■
	NPN, complementary	■	■
Response time[6]	< 700 µs	■	■
Switching frequency max.[7]	700/s	■	■
Connection types	Cable [8], 2 m, 4 wire	■	
	M12 plug, 4-pin		■
VDE protection class cable[9]	⊡	■	■
Circuit protection[10]	A, B, C, D	■	■
Enclosure rating	IP 67	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■
	Storage -40…167°F (-40…75°C)	■	■
Weight	With cable, 2 m, approx. 0.3 lb. (120 g)	■	
	With M12 plug, approx. 0.1 lb. (40 g)		■
Housing material	ABS	■	■

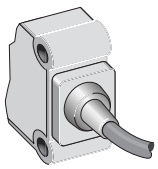
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

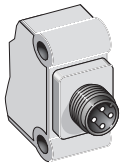
Teach-in procedure via the double Teach buttons

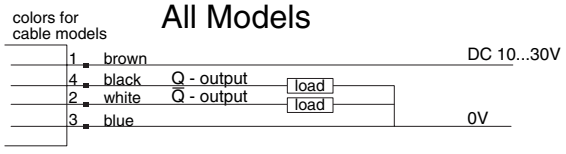
1) Position the object in the path of the beam.
2) Press both buttons simultaneously **(for approx. 2 seconds)** until the yellow LED flashes = object in focus. In the event of button activation of less than 2 seconds, the Teach command is not effective, therefore providing no protection against further unwanted manipulation.
3) Release buttons; yellow LED illuminates continuously = object is positively detected.
4) Fine adjustments can be made to the sensing distance, when required by the application:
Pressing the “+” button **(approx. 0.5 sec)** = sensing distance will be increased.
Pressing the “-” button **(approx. 0.5 sec)** = sensing distance will be decreased.
In the event of button activation less than 0.5 sec, no change to the sensing distance is made.
Upon activation of the button, the yellow LED flashes.
5) The Teach-in sensing distance is stored in the memory.

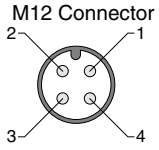
Connection types

WT18-3P111 | WT18-3P411





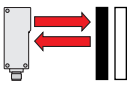




wire colors refer to standard cable, not included with quick disconnect models

WT 18-3

Proximity/Diffuse Sensors-Background Suppression

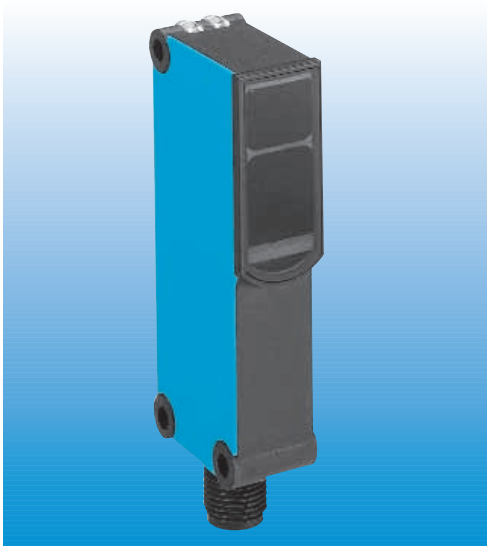



1.9...39.4 in (50...1000 mm)
sensing distance

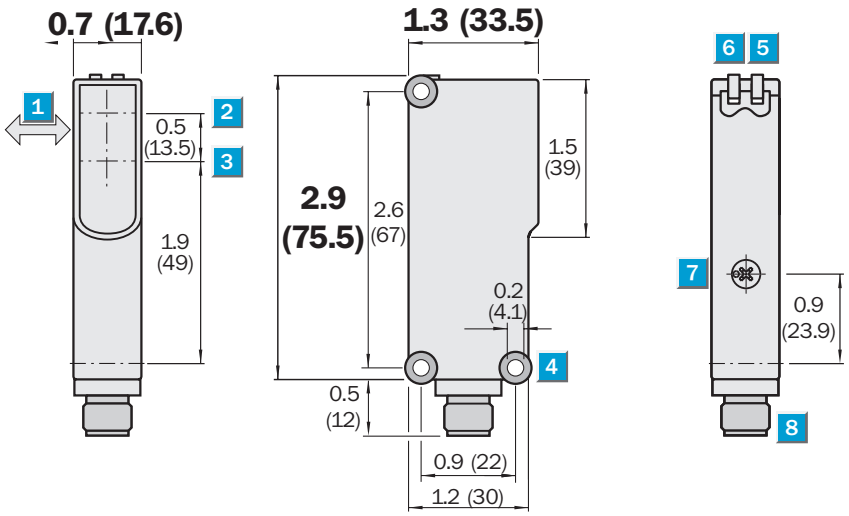
Highlights

- Precise background suppression; suitable for demanding applications
- Sensing range adjustable via potentiometer
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40...140°F (-40...60°C)

WT 18-3

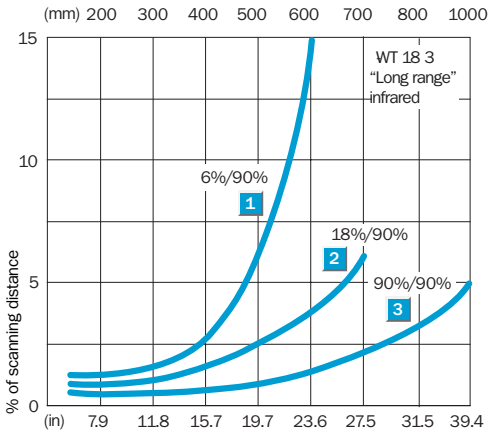


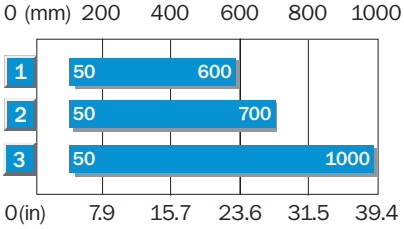
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
3	Sensing range on white, 90% remission

Adjustments

All types

1	Standard direction of the material being sensed
2	Optical axis, sender
3	Optical axis, receiver
4	Mounting hole Ø 4.1 mm
5	LED, yellow; signal strength indicator
6	LED, green; power on indicator
7	Sensing range adjustment
8	Plug M12, 4-pin or 2 m cable

Order Information

Type	Part no.
WT18-3P120	1 025 904
WT18-3P420	1 025 905

See Chapter Accessories

Cables and connectors

Mounting systems

Technical Data	WT 18-3	P120	P420
Sensing distance, adjustable[1]	1.9…39.4 in (50…1000 mm), 90% remission	■	■
Visible range [1]	0.4…39.4 in (10…1000 mm)	■	■
Adjustment	Potentiometer, 4 turn	■	■
Light source[2], **light type**	LED, infrared light	■	■
Light spot diameter	1.2 in at 23.6 in (30 mm at 600 mm)	■	■
Supply voltage V_S	10…30 V DC[3]	■	■
Residual ripple[4]	< 5 V_{PP}	■	■
Current consumption[5]	< 55 mA	■	■
Output current I_A max.	< 100 mA	■	■
Switching outputs	PNP, complementary	■	■
Response time[6]	< 700 µs	■	■
Switching frequency max.[7]	700/s	■	■
Connection types	Cable [8], 2 m, 4 wire	■	
	M12 plug, 4-pin		■
VDE protection class cable[9]	□	■	■
Circuit protection[10]	A, B, C, D	■	■
Enclosure rating	IP 67	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■
	Storage -40…167°F (-40…75°C)	■	■
Weight	With cable, 2 m, approx. 0.3 lb. (120 g)	■	
	With M12 plug, approx. 0.1 lb. (40 g)		■
Housing material	ABS	■	■

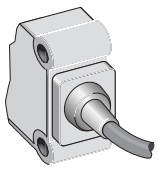
1) Object with 90% remission (according to standard white DIN 5033)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) Must be within V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

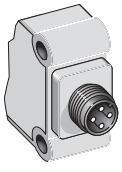
Adjustment via Potentiometer

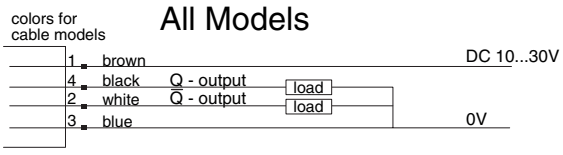
1) Position the object in the path of the beam.
2) By rotating the potentiometer to the right until the yellow LED illuminates continuously = object is positively detected.
3) If necessary, fine adjustments to the sensing distance can be made to suit the conditions of the application:
minimal rotation of the potentiometer to the right = sensing distance will be increased,
minimal rotation of the potentiometer to the left = sensing distance will be decreased.

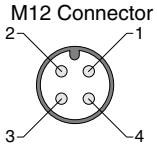
Connection types

WT18-3P120 | WT18-3P420





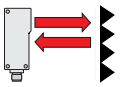




wire colors refer to standard cable, not included with quick disconnect models

WL 18-3

Reflex/Retro-Reflective Sensors

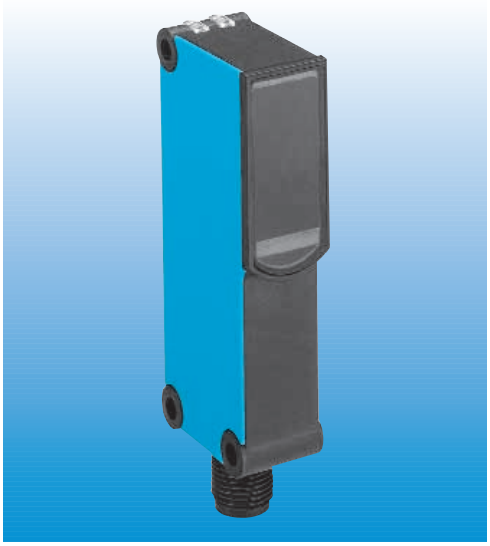



0...23 ft (0...7 m)
sensing range

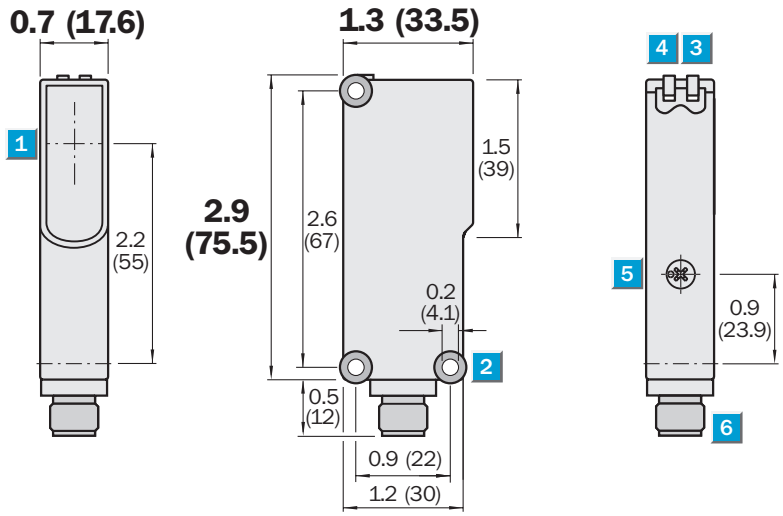
Highlights

- Autocollimation optics; reliable target detection
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40...140°F (-40...60°C)
- Test input for system diagnosis (optional)

WL 18-3

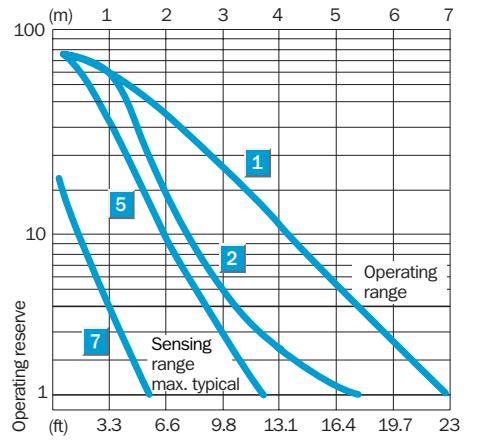


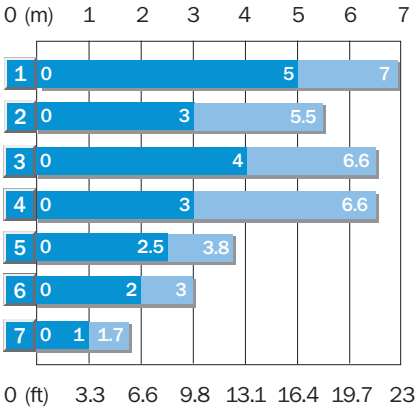
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





Adjustments

All types

1 Middle of optical axis
2 Mounting holes Ø 4.1 mm
3 LED yellow; signal strength indicator
4 LED green; power on indicator
5 Sensitivity control; Potentiometer 270°
6 Plug M12, 4-pin or cable 2 m
or square plug 6-pin

See Chapter Accessories

- Cables and connectors
- Mounting systems
- Reflectors

	Reflector type	Operating range
1	PL 80 A	0...5.0 m
2	P 975	0...3.0 m
3	PL 50 A	0...4.0 m
4	PL 40 A	0...3.0 m
5	PL 30 A	0...2.5 m
6	PL 20 A	0...2.0 m
7	Reflective tape Diamond Grade	0...1.0 m

Order Information

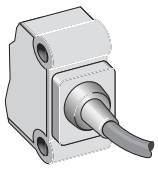
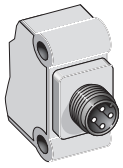
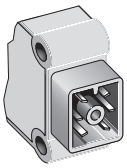
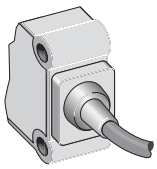
Type	Part no.
WL18-3P130	1 025 909
WL18-3P430	1 025 911
WL18-3P630	1 025 912
WL18-3P730	1 025 029
WL18-3N130	1 025 913
WL18-3N430	1 025 915
WL18-3N630	1 025 916
WL18-3N730	1 026 030

Technical Data	WT 18-3	P130	P430	P630	P730	N130	N430	N630	N730
Sensing range, max. typ./on reflector	23 ft (7 m)/PL 80 A	■	■	■	■	■	■	■	■
Sensitivity	Adjustable, via Potentiometer	■	■	■	■	■	■	■	■
Light source[1], light type	LED, visible red light	■	■	■	■	■	■	■	■
Angle of dispersion	4°	■	■	■	■	■	■	■	■
Light spot diameter	1.6 in @ 6.6 ft (40 mm @ 2m)	■	■	■	■	■	■	■	■
Polarizing filter	Yes	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Residual ripple[4]	< 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[5]	< 40 mA	■	■	■	■	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, complementary	■	■	■	■				
	NPN, complementary					■	■	■	■
Response time[5]	< 500 µs	■	■	■	■	■	■	■	■
Switching frequency max.[6]	1000/s	■	■	■	■	■	■	■	■
Test Input »TE«	PNP: Sender off; TE to 0 V			■	■				
	NPN: Sender off; TE to V+							■	■
Connection types	Cable[7], 2 m, 4-wire	■				■			
	M12 plug, 4-pin		■				■		
	Square plug, 6-pin			■				■	
	Cable, 2 m, 5-wire				■				■
VDE protection class cable[8]	□	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■	■	■	■	■	■	■
	Storage -40…167°F (-40…75°C)	■	■	■	■	■	■	■	■
Weight	With cable, 2 m, approx. 0.3 lb. (120 g)	■			■	■			■
	With M12 plug, approx. 0.1 lb. (40 g)		■				■		
	With square plug, ca. 0.1 lb (40 g)			■				■	
Housing material	ABS	■	■	■	■	■	■	■	■

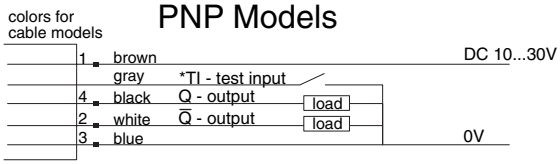
1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

Connection types

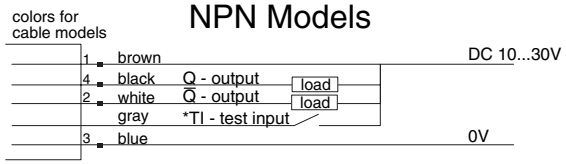
WL18-3P130	WL18-3P430	WL18-3P630	WL18-3P730
WL18-3N130	WL18-3N430	WL18-3N630	WL18-3N730

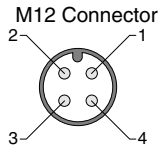





PNP Models



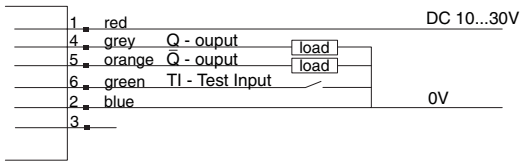
NPN Models



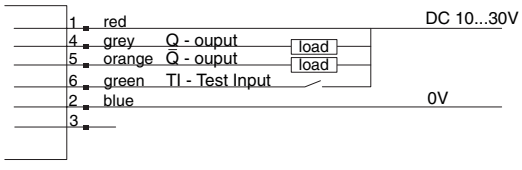


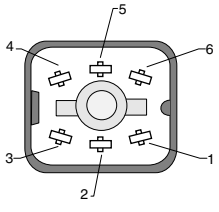
*test input available on cable models only
wire colors refer to standard cable, not included with quick disconnect models

PNP



NPN

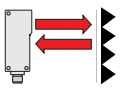




SICK

WL 18-3

Reflex/Retro-Reflective Sensors

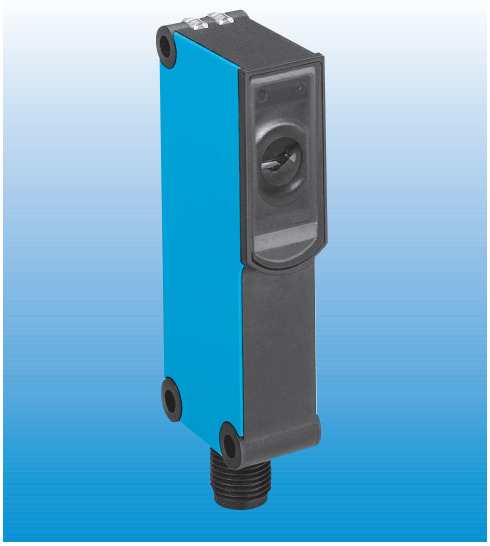



0...23 ft (0...7 m)
sensing range

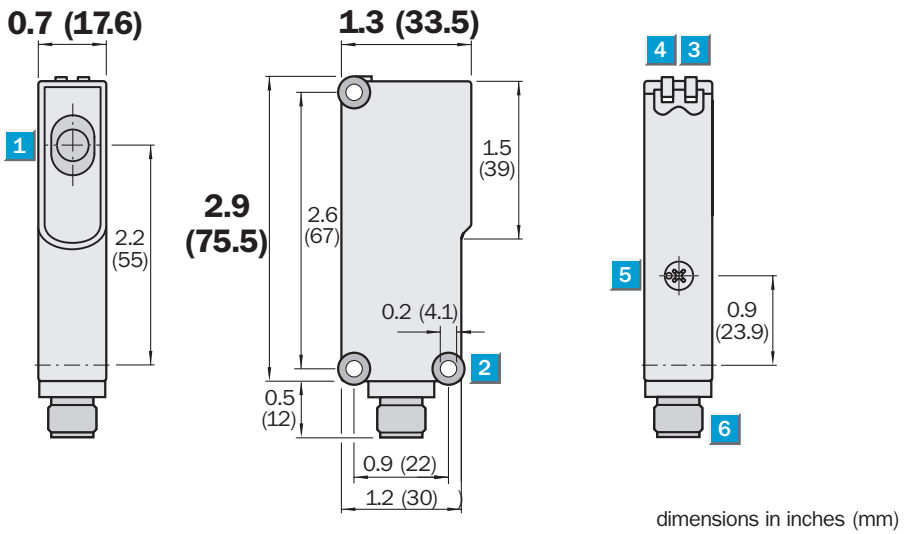
Highlights

- Autocollimation optics; reliable target detection
- Insensitive to external light sources (HF lamps)
- Crosstalk immunity
- Operating temperature range -40...140°F (-40...60°C)
- Non-polarized

WL 18-3

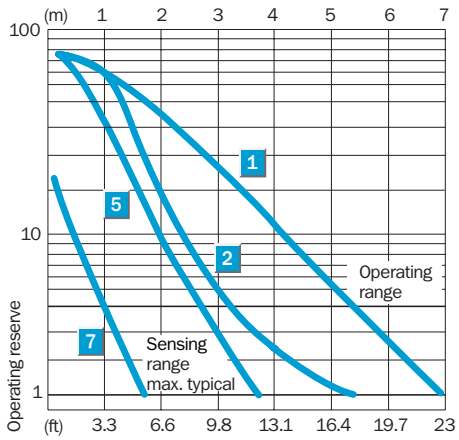


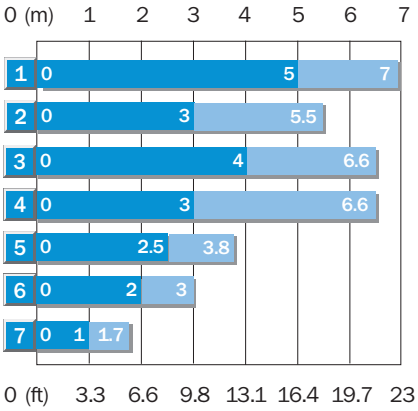
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





Adjustments

All types

1	Middle of optical axis
2	Mounting holes Ø 4.1 mm
3	LED yellow; signal strength indicator
4	LED green; power on indicator
5	Sensitivity control; Potentiometer 270°
6	Plug M12, 4-pin or cable 2 m or square plug 6-pin

See Chapter Accessories

- Cables and connectors
- Mounting systems
- Reflectors

	Reflector type	Operating range
1	PL 80 A	0...5.0 m
2	P 975	0...3.0 m
3	PL 50 A	0...4.0 m
4	PL 40 A	0...3.0 m
5	PL 30 A	0...2.5 m
6	PL 20 A	0...2.0 m
7	Reflective tape Diamond Grade	0...1.0 m

Order Information

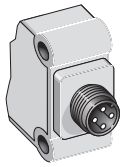
Type	Part no.
WL18-3P480	1 025 917
WL18-3P680	1 025 918

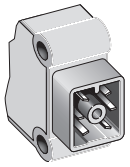
Technical Data	WL 18-3	P480	P680
Sensing range, max. typ./on reflector	23 ft (7 m)/PL 80 A	■	■
Sensitivity	Adjustable, via Potentiometer	■	■
Light source[1], light type	LED, visible red light	■	■
Angle of dispersion	4°	■	■
Light spot diameter	1.6 in @ 6.6 ft (40 mm @ 2 m)	■	■
Polarizing filter	No	■	■
Supply voltage V_S	10…30 V DC[2]	■	■
Residual ripple[3]	< 5 V_{PP}	■	■
Current consumption[4]	< 40 mA	■	■
Output current I_A max.	< 100 mA	■	■
Switching outputs	PNP, complementary	■	■
Response time[5]	< 500 µs	■	■
Switching frequency max.[6]	1000/s	■	■
Test Input »TE«	PNP: Sender off; TE to 0 V		■
Connection types	M12 plug, 4-pin	■	
	Square plug, 6-pin		■
VDE protection class cable[7]	□	■	■
Circuit protection[8]	A, B, C, D	■	■
Enclosure rating	IP 67	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■
	Storage -40…167°F (-40…75°C)	■	■
Weight	With M12 plug, approx. 0.1 lb. (40 g)	■	
	With square plug, ca. 0.1 lb (40 g)		■
Housing material	ABS	■	■

1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Reference voltage 50 V DC
8) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

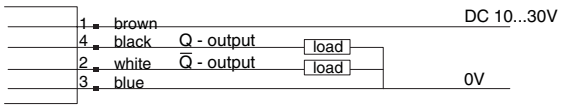
Connection types

WL18-3P480 | WL18-3P680

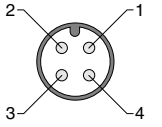




PNP Models

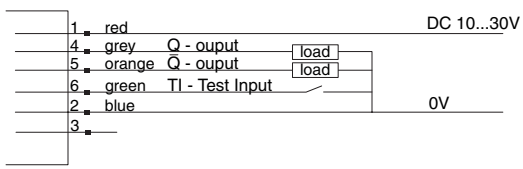


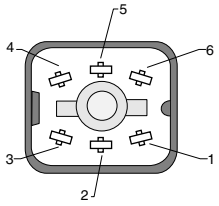
M12 Connector



*test input available on cable models only
wire colors refer to standard cable, not included with quick disconnect models

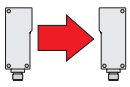
PNP





WS/WE 18-3

Through Beam Sensors

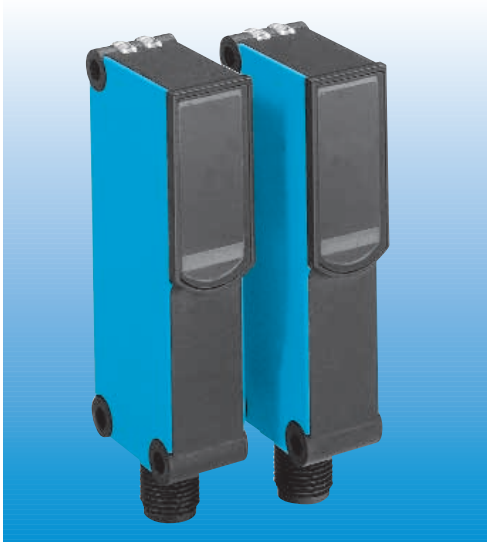



65.6 ft (20 m)
sensing range

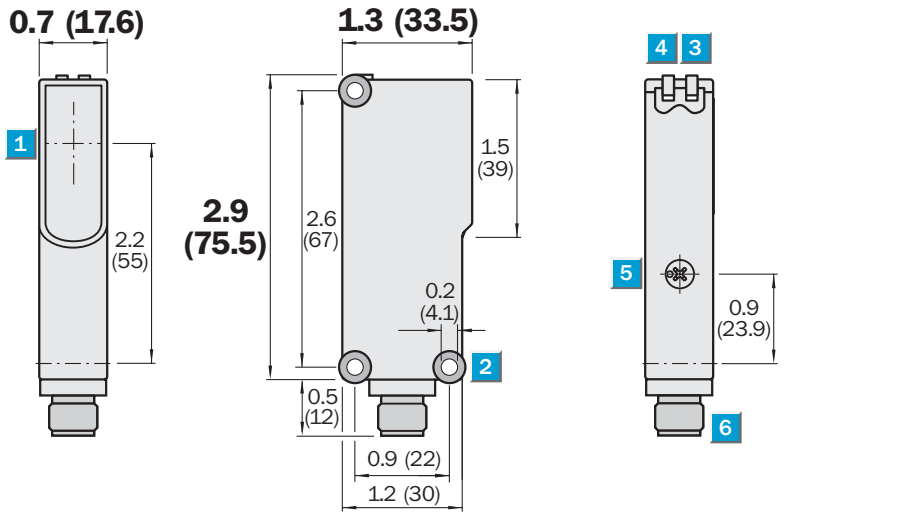
Highlights

- Insensitive to external light sources (HF lamps)
- Operating temperature range -40…140°F (-40…60°C)
- Test input for system diagnosis
- Rugged plastic housing

WS/WE 18-3

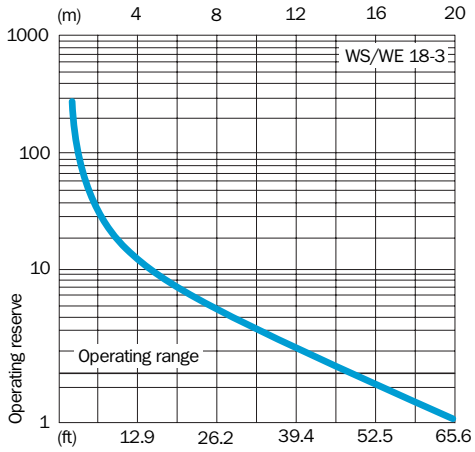


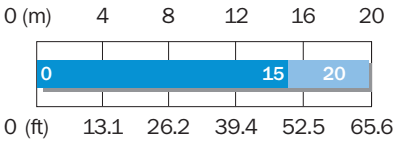
Dimensional Drawing



dimensions in inches (mm)

Sensing distance





Adjustments

All types

1 Middle of optical axis
2 Mounting holes Ø 4.1 mm
3 LED yellow; signal strength indicator
4 LED green; power on indicator
5 Sensitivity control; Potentiometer 270°
6 Plug M12, 4-pin or cable 2 m
or square plug 6-pin

See Chapter Accessories
Cables and connectors
Mounting systems

Order Information

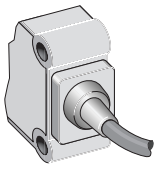
Type	Part no.
WS/WE18-3P130	1 025 922
WS/WE18-3P430	1 025 923
WS/WE18-3P630	1 025 924
WS/WE18-3N130	1 025 925
WS/WE18-3N630	1 025 926

Technical Data	WS/WE 18-3	P130	P430	P630	N130	N360
Sensing range, max. typ.	0…65.6 ft (0…20 m)	■	■	■	■	■
Sensitivity	Adjustable, via Potentiometer 270°	■	■	■	■	■
Light source[1] **, light type**	LED, visible red light	■	■	■	■	■
Light spot diameter	17.7 in at 49.2 ft (450 mm at 15 m)	■	■	■	■	■
Angle of dispersion	Approx. 1.5°	■	■	■	■	■
Angle of reception	Approx. 2°	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■
Residual ripple[3]	< 5 V_{PP}	■	■	■	■	■
Current consumption[4]	Sender < 45 mA	■	■	■	■	■
	Receiver < 35 mA	■	■	■	■	■
Output current I_A max.	< 100 mA	■	■	■	■	■
Switching outputs	PNP, complementary	■	■	■		
	NPN, complementary				■	■
Response time[5]	<500 µs	■	■	■	■	■
Switching frequency max.[6]	1000/s	■	■	■	■	■
Test Input »TE« Sender off	TE to 0 V (WS)	■	■	■	■	■
Connection types	Cable[7], 2 m, 4 wire	■			■	
	M12 plug, 4-pin		■			
	Square plug, 6-pin			■		■
VDE protection class cable[8]	□	■	■	■	■	■
Circuit protection[9]	A, B, C, D	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■
Ambient temperature	Operation -40…140°F (-40…60°C)	■	■	■	■	■
	Storage -40…167°F (-40…75°C)	■	■	■	■	■
Weight	With cable, 2 m, approx 0.24 lb. (120 g)	■			■	
	With M12 plug, approx. 0.1 lb. (40 g)		■			
	With square plug, ca. 0.1 lb (40 g)			■		■
Housing material	ABS	■	■	■	■	■

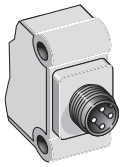
1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) Must be within V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
D = Operation in short-circuit protected network max. 8 A

Connection types

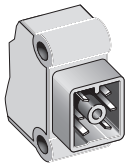
WS/WE18-3P130
WS/WE18-3N130



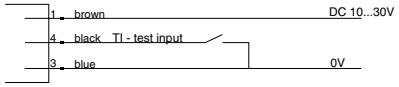
WS/WE18-3P430



WS/WE18-3P630
WS/WE18-3N630

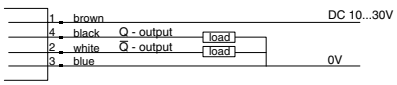


Sender

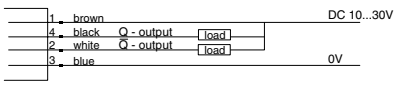


Receiver

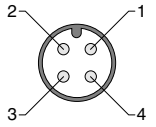
PNP Models



NPN Models

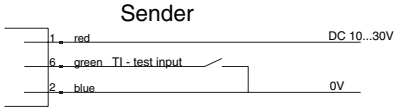


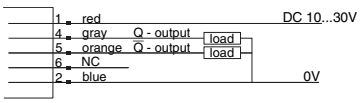
M12 Connector

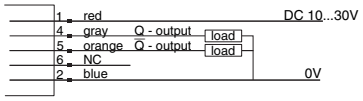


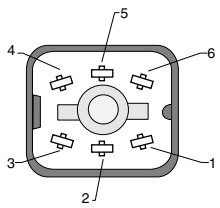
wire colors refer to standard cable, not included with quick disconnect models

Sender









FSR 600

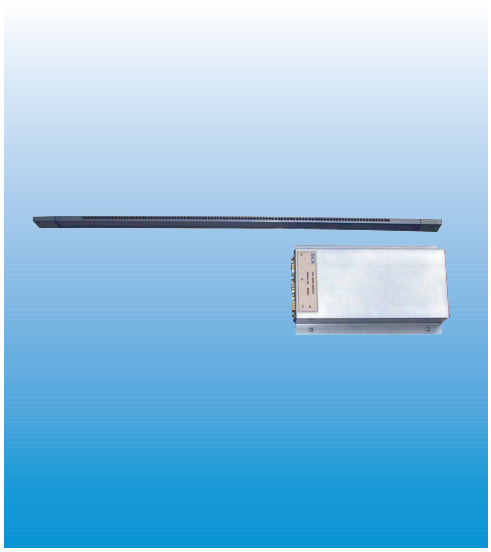
Flat Surface Recognition Sensor

0...0.8 in (0...20 mm)
sensing range

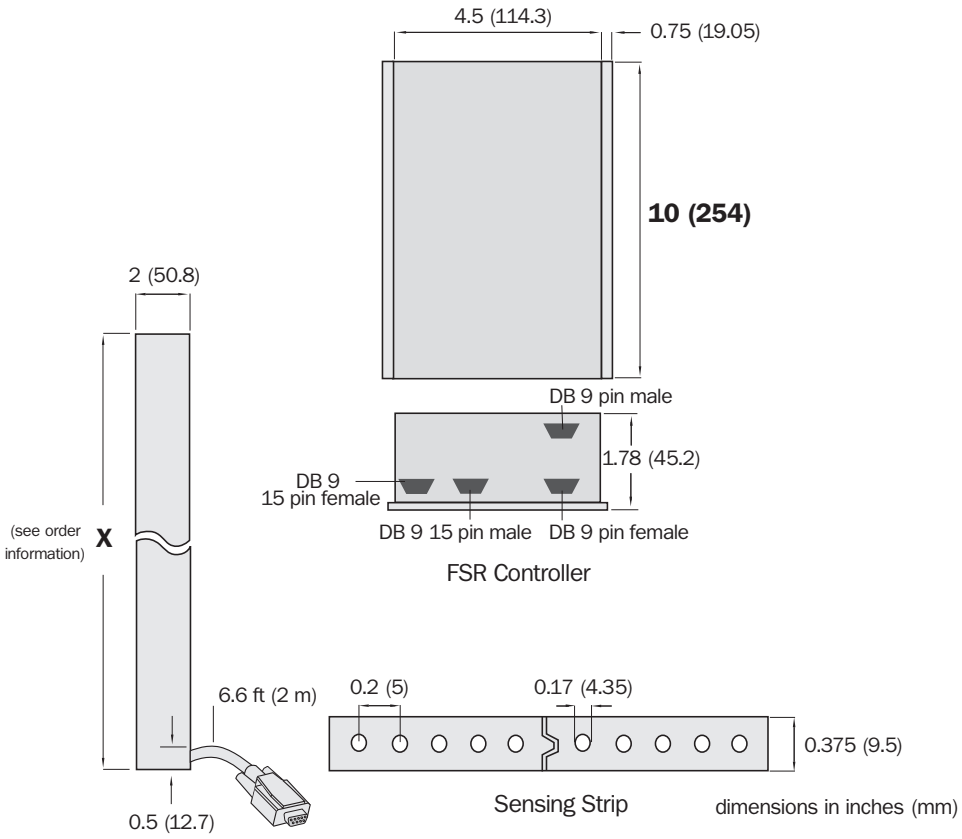
Highlights

- Accurate package detection up to 650 ft/min
- Rugged aluminum housing
- Two status LEDs
- Accurate 0.2 in (5 mm) spacing
- RS 232, RS 422, CAN OPEN and PNP/NPN output types
- Easy to set up, install, and service

FSR 600



Dimensional Drawing



Order Information		
Type	**Part no.**	**X Dim**
FSR 600-0495	7 027 945	20 in (508) mm
FSR 600-0655	7 027 946	26.4 in (671.5) mm
FSR 600-0745	7 027 947	30 in (762) mm
FSR 600-0905	7 027 948	36.3 in (921.2) mm
FSR 600 Controller*	7 027 922	N/A

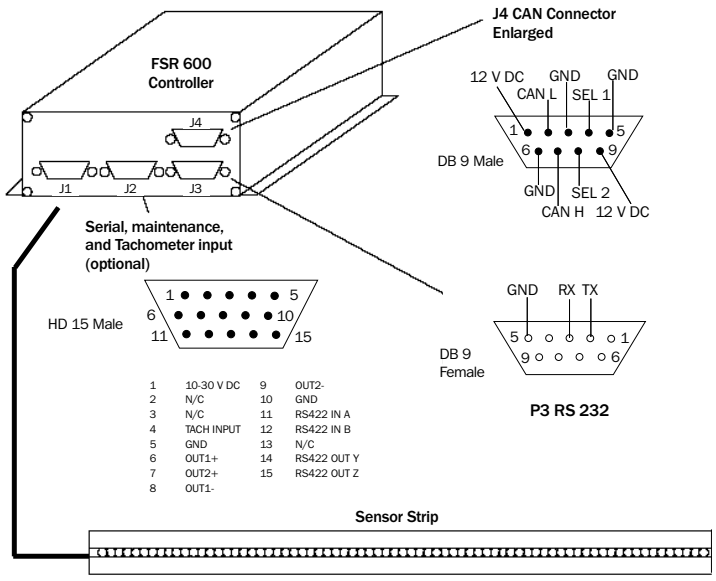
* Required for operation

Accessories	page
Tachometer	xx
LED lighting	xx
Control enclosure w/user interface	xx

Technical Data	FSR 600-	0495	0655	0745	0905					
Sensing range	0…0.8 in (0…20 mm)									
Beam spacing/resolution	0.2 in (5 mm)									
Number of photo receivers/										
Detection area	100									
	132									
	150									
	182									
Scan time	1.5 ms									
Detection distance	0.4 in (10 mm)									
Ambient or direct light required[1]	300…30000 Lux									
Supply voltage V_S	10…30 V DC[2]									
Ripple[3]	5 V_{ss}									
Current consumption	Varies based on length of array L 3 mA per receiver									
Status LEDs	Red = fault									
	Amber = presence									
Switching outputs	PNP/NPN configureable; 2 PNP, 2 NPN									
Output current I_A max.	100 mA									
	NPN ON: ≤20 V; PNP ON: V - (2.5 V_S)									
	NPN OFF: =V_S; PNP OFF: approx. 0 V									
Output type	PNP									
	NPN									
	RS 232									
	RS 422									
	CAN BUS Open									
Inputs	1 tachometer in									
Lighting	External									
Connection type	HD 15-pin female to FSR (J1)									
	HD 15 Teach-in, 2 switching, RS 422 (J2)									
	DB 9-pin female, RS 232 (J3)									
	DB 9 to CAN BUS (J4)									
Enclosure rating	IP 54 Sensor									
	IP 40 Controller									
Ambient temperature T_A	Operation -14…131°F (-10...55°C)									
	Storage -13…149°F (-25...65°C)									
Housing material	Anodized aluminum									

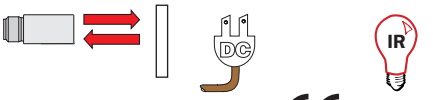
1) Direct overhead lighting preferred
2) Limit values
3) May not extend or fall short of V_S tolerances

Connection Diagram



MHT15

Proximity Diffuse Sensors - Energetic



0.4...13.8 in (10...350 mm)
sensing distance

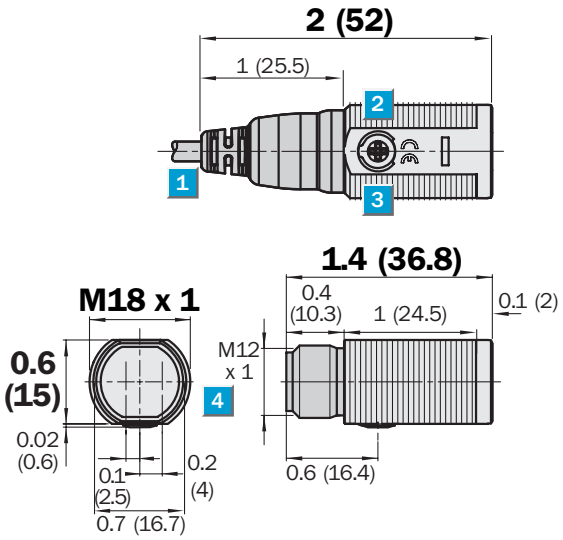
Class 2
LISTED 87LL

Highlights

- Long sensing range
- Adjustable sensitivity
- Indicator LED shows output and operating reserve
- Straight optic axis
- Mounting accessories included - M18 nuts and patented snap ring

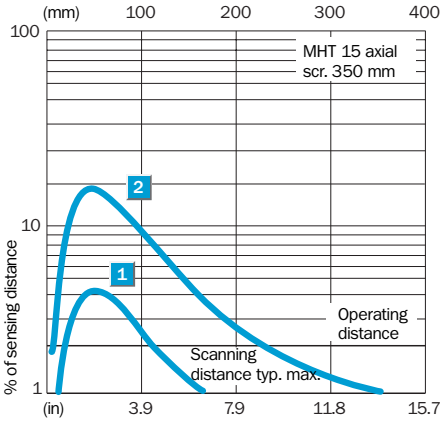
MHT15

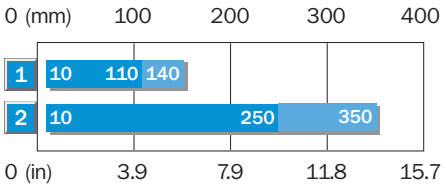
Dimensional Drawing



dimensions in inches (mm)

Sensing Distance

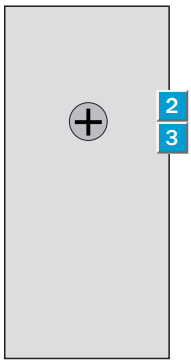




1 Sensing range on grey, 18% remission
2 Sensing range on white, 90% remission

Adjustments

All types



1 Connector cable 2 m
2 Sensitivity control 270°
3 Yellow LED indicator,
-lights continuously:
Light reception > reserve factor 1.3
-blinks:
Light reception < reserve factor 1.3,
but light reception > switching threshold 1
4 M12 plug, 3-pin

See Chapter Accessories
Cables and connectors
Mounting systems

Order Information

Type	Part no.
MHT15-N2247	1026106
MHT15-N3247	1026107
MHT15-N2347	1026108
MHT15-N3347	1026109
MHT15-P2247	1026110
MHT15-P3247	1026111
MHT15-P2347	1026112
MHT15-P3347	1026113

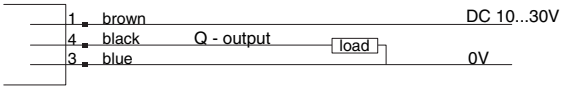
Technical Data		MHT15	P2247	P3247	P2347	P3347	N2247	N3247	N2347	N3347
Sensing range SD, typ. max.[1]		0.4…13.8 in (10…350 mm)	■	■	■	■	■	■	■	■
Operating range SD[1]		0.4…9.8 in (10…250 mm)	■	■	■	■	■	■	■	■
Light spot diameter		Approx. 1.9 in at 13.8 in (50 mm at 350 mm)	■	■	■	■	■	■	■	■
Angle of dispersion sender		Approx. 4.5°	■	■	■	■	■	■	■	■
Light source[2], **light type**		LED infrared, 950 nm	■	■	■	■	■	■	■	■
Optical axis		Axial	■	■	■	■	■	■	■	■
Sensitivity adjustable		Potentiometer 270°	■	■	■	■	■	■	■	■
Light reception indicator		Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
		Reserve factor > 1.3	■	■	■	■	■	■	■	■
		Blinks: reserve factor > 1.0…< 1.3	■	■	■	■	■	■	■	■
Supply voltage V_S		10…30 V DC[3]	■	■	■	■	■	■	■	■
Residual ripple[4]		≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[5]		≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs		Q: PNP	■	■	■	■				
		Q: NPN					■	■	■	■
Signal voltage HIGH		V_S - 2.9 V	■	■	■	■				
		V_S					■	■	■	■
Signal voltage LOW		Approx. 0 V	■	■	■	■				
		≤ 2.9 V					■	■	■	■
Switching mode		Light-switching			■	■			■	■
		Dark-switching	■	■			■	■		
Output current I_A max.		≤100 mA	■	■	■	■	■	■	■	■
Response time[6]		≤ 1.25 ms	■	■	■	■	■	■	■	■
Max. switching frequency[7]		400/s	■	■	■	■	■	■	■	■
Connection type	plug	M12, 3-pin		■		■		■		■
	cable[8]	PUR, 2 m, 3 x 0.14 mm², Ø 3.6 mm	■		■		■		■	
VDE protection class cable[9]		□	■	■	■	■	■	■	■	■
Enclosure rating		IP 67	■	■	■	■	■	■	■	■
Circuit protection[10]		A, B, C	■	■	■	■	■	■	■	■
Ambient temperature		Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
		Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	■	■
Weight		With plug, approx 0.01 lb. (7 g)		■		■		■		■
		With cable, approx. 0.2 lb. (90 g)	■		■		■		■	
Housing material		Housing: ABS	■	■	■	■	■	■	■	■
		Optic: PMMA	■	■	■	■	■	■	■	■

1) Object with 90% remission (based on standard white DIN 5033)
3.9 x 3.9 in (100 x 100 mm)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

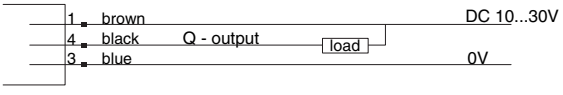
Connection types

MHT15-N3247	MHT15-N2247
MHT15-N3347	MHT15-N2347
MHT15-P3247	MHT15-P2247
MHT15-P3347	MHT15-P2347

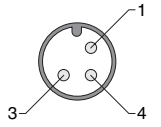
PNP Models



NPN Models



M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHT15

Proximity/Diffuse Sensors - Energetic

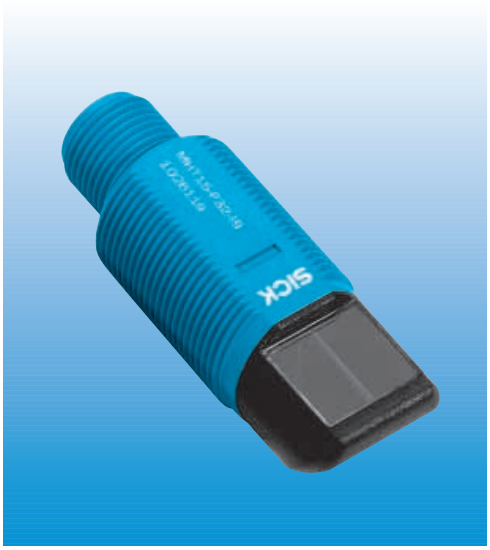
0.4...9.8 in (10...250 mm)
sensing distance

Class 2
LISTED 87LL

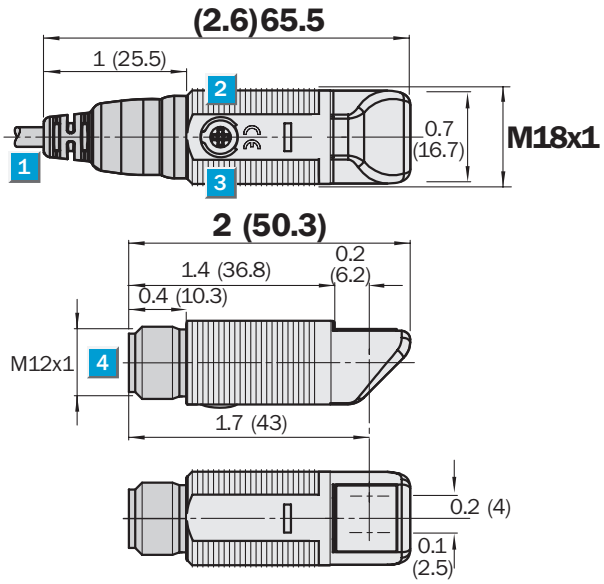
Highlights

- Long sensing range
- Adjustable sensitivity
- Indicator LED shows output and operating reserve
- Right-angle optic axis
- Mounting accessories included - M18 nuts and patented snap ring

MHT15

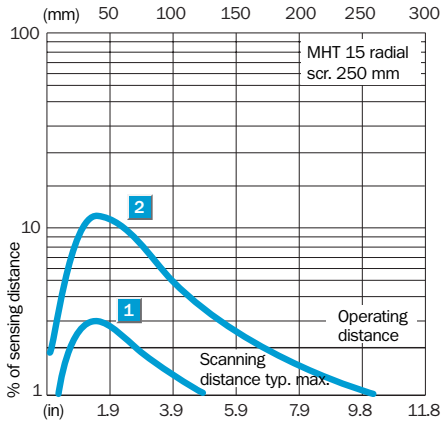


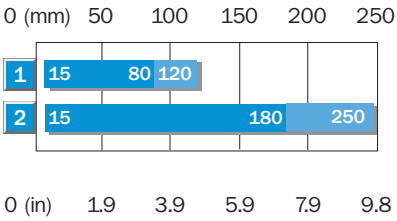
Dimensional Drawing



dimensions in inches (mm)

Sensing Distance

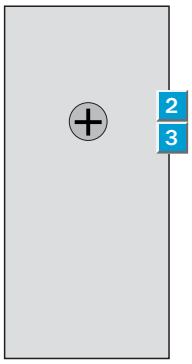




1	Sensing range on grey, 18% remission
2	Sensing range on white, 90% remission

Adjustments

All types



1	Connector cable 2 m
2	Sensitivity control 270°
3	Yellow LED indicator, -lights continuously: Light reception > reserve factor 1.3 -blinks: Light reception < reserve factor 1.3, but light reception > switching threshold 1
4	M12 plug, 3-pin

See Chapter Accessories

Cables and connectors

Mounting systems

Order Information

Type	Part no.
MHT15-N2249	1026114
MHT15-N3249	1026115
MHT15-N2349	1026116
MHT15-N3349	1026117
MHT15-P2249	1026118
MHT15-P3249	1026119
MHT15-P2349	1026120
MHT15-P3349	1026121

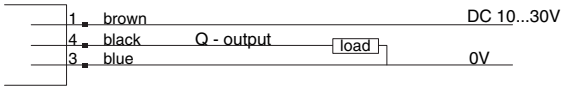
Technical Data		MHT15	P2249	P3249	P2349	P3349	N2249	N3249	N2349	N3349
Sensing range SD, typ. max.[1]		0.6…9.8 in (15…250 mm)	■	■	■	■	■	■	■	■
Operating range SD[1]		0.6…7.1 in (15…180 mm)	■	■	■	■	■	■	■	■
Light spot diameter		Approx. 1.6 in at 9.8 in (40 mm at 250 mm)	■	■	■	■	■	■	■	■
Angle of dispersion sender		Approx. 4.5°	■	■	■	■	■	■	■	■
Light source[2], **light type**		LED infrared, 950 nm	■	■	■	■	■	■	■	■
Optical axis		Radial (90°)	■	■	■	■	■	■	■	■
Sensitivity adjustable		Potentiometer 270°	■	■	■	■	■	■	■	■
Light reception indicator		Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
		Reserve factor > 1.3	■	■	■	■	■	■	■	■
		Blinks: reserve factor > 1.0…< 1.3	■	■	■	■	■	■	■	■
Supply voltage V_S		10…30 V DC[3]	■	■	■	■	■	■	■	■
Residual ripple[4]		≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[5]		≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs		Q: PNP	■	■	■	■				
		Q: NPN					■	■	■	■
Signal voltage HIGH		V_S - 2.9 V	■	■	■	■				
		V_S					■	■	■	■
Signal voltage LOW		Approx. 0 V	■	■	■	■				
		≤ 2.9 V					■	■	■	■
Switching mode		Light-switching			■	■			■	■
		Dark-switching	■	■			■	■		
Output current I_A max.		≤100 mA	■	■	■	■	■	■	■	■
Response time[6]		≤ 1.25 ms	■	■	■	■	■	■	■	■
Max. switching frequency[7]		400/s	■	■	■	■	■	■	■	■
Connection type	plug	M12, 3-pin		■		■		■		■
	cable[8]	PUR, 2 m, 3 x 0.14 mm², Ø 3.6 mm	■		■		■		■	
VDE protection class cable[9]		□	■	■	■	■	■	■	■	■
Enclosure rating		IP 67	■	■	■	■	■	■	■	■
Circuit protection[10]		A, B, C	■	■	■	■	■	■	■	■
Ambient temperature		Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
		Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	■	■
Weight		With plug, approx 0.01 lb. (8 g)		■		■		■		■
		With cable, approx. 0.2 lb. (91 g)	■		■		■		■	
Housing material		Housing: ABS	■	■	■	■	■	■	■	■
		Optic: PMMA	■	■	■	■	■	■	■	■

1) Object with 90% remission (based on standard white DIN 5033)
3.9 x 3.9 in (100 x 100 mm)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

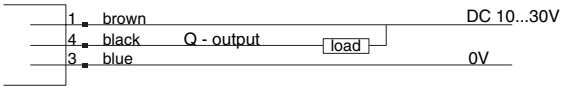
Connection types

MHT15-N3249	MHT15-N2249
MHT15-N3349	MHT15-N2349
MHT15-P3249	MHT15-P2249
MHT15-P3349	MHT15-P2349

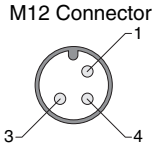
PNP Models



NPN Models



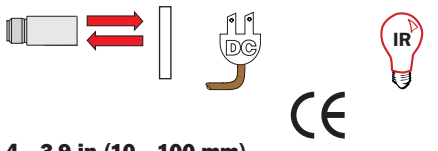
M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHT15

Proximity/Diffuse Sensors - Energetic



0.4...3.9 in (10...100 mm)
sensing distance

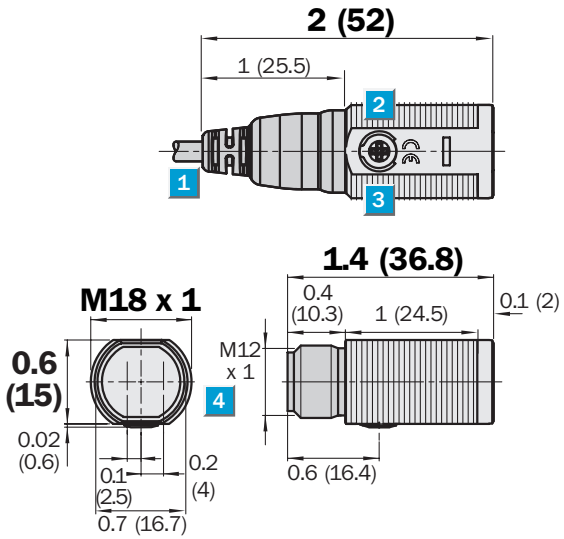
Class 2
LISTED 87LL

Highlights

- Standard sensing range
- Adjustable sensitivity
- Indicator LED shows output and operating reserve
- Straight optic axis
- Mounting accessories included - M18 nuts and patented snap ring

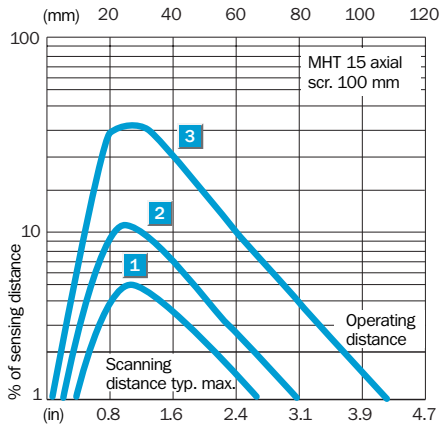
MHT15

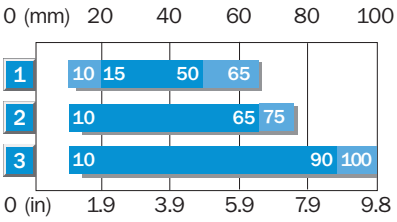
Dimensional Drawing



dimensions in inches (mm)

Sensing Distance

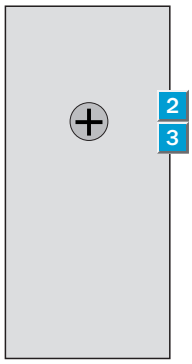




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
2	Sensing range on white, 90% remission

Adjustments

All types



1	Connector cable 2 m
2	Sensitivity control 270°
3	Yellow LED indicator, -lights continuously: Light reception > reserve factor 1.3 -blinks: Light reception < reserve factor 1.3, but light reception > switching threshold 1
4	M12 plug, 3-pin

See Chapter Accessories

Cables and connectors

Mounting systems

Order Information

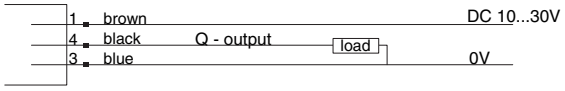
Type	Part no.
MHT15-N2217	1026090
MHT15-N3217	1026091
MHT15-N2317	1026092
MHT15-N3317	1026093
MHT15-P2217	1026094
MHT15-P3217	1026095
MHT15-P2317	1026096
MHT15-P3317	1026097

Technical Data	MHT15	P2217	P3217	P2317	P3317	N2217	N3217	N2317	N3317
Sensing range SD, typ. max.[1]	0.4…3.9 in (10…100 mm)								
Operating range SD[1]	0.4…3.5 in (10…90 mm)								
Light spot diameter	Approx. .08 in at 3.9 in (20 mm at 100 mm)								
Angle of dispersion sender	Approx. 4.5°								
Light source[2], **light type**	LED infrared, 950 nm								
Optical axis	Axial								
Sensitivity adjustable	Potentiometer 270°								
Light reception indicator	Yellow LED: lights continuously:								
	Reserve factor > 1.3								
	Blinks: reserve factor > 1.0…< 1.3								
Supply voltage V_S	10…30 V DC[3]								
Residual ripple[4]	≤ 5 V_{PP}								
Current consumption[5]	≤ 30 mA								
Switching outputs	Q: PNP								
	Q: NPN								
Signal voltage HIGH	V_S - 2.9 V								
	V_S								
Signal voltage LOW	Approx. 0 V								
	≤ 2.9 V								
Switching mode	Light-switching								
	Dark-switching								
Output current I_A max.	≤100 mA								
Response time[6]	≤ 1.25 ms								
Max. switching frequency[7]	400/s								
Connection type plug	M12, 3-pin								
cable[8]	PUR, 2 m, 3 x 0.14 mm², Ø 3.6 mm								
VDE protection class cable[9]	□								
Enclosure rating	IP 67								
Circuit protection[10]	A, B, C								
Ambient temperature	Operation -13…131°F (-25…55°C)								
	Storage -13…158°F (-25…70°C)								
Weight	With plug, approx 0.01 lb. (7 g)								
	With cable, approx. 0.2 lb. (90 g)								
Housing material	Housing: ABS								
	Optic: PMMA								

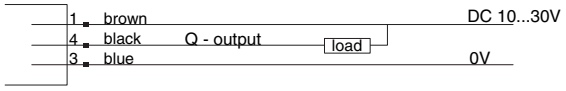
1) Object with 90% remission (based on standard white DIN 5033) 3.9 x 3.9 in (100 x 100 mm)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

Connection types	
MHT15-N3217	MHT15-N2217
MHT15-N3317	MHT15-N2317
MHT15-P3217	MHT15-P2217
MHT15-P3317	MHT15-P2317

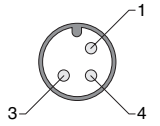
PNP Models



NPN Models



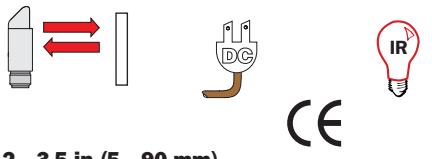
M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHT15

Proximity/Diffuse Sensors - Energetic



0.2...3.5 in (5...90 mm)
sensing distance

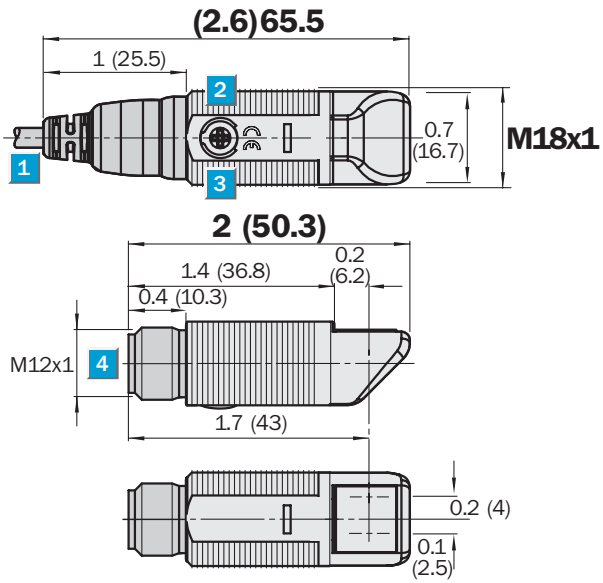
Class 2
LISTED 87LL

Highlights

- Standard sensing range
- Adjustable sensitivity
- Indicator LED shows output and operating reserve
- Right-angle optic axis
- Mounting accessories included - M18 nuts and patented snap ring

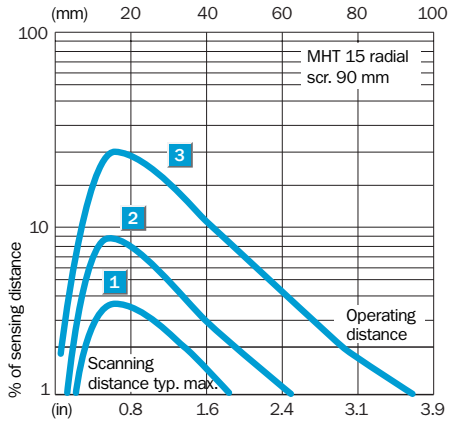
MHT15

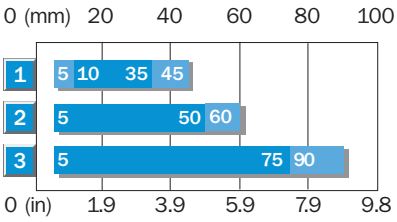
Dimensional Drawing



dimensions in inches (mm)

Sensing Distance

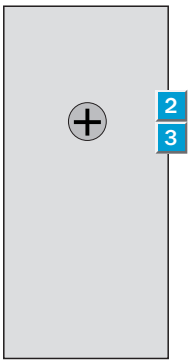




1	Sensing range on black, 6% remission
2	Sensing range on grey, 18% remission
2	Sensing range on white, 90% remission

Adjustments

All types



1	Connector cable 2 m
2	Sensitivity control 270°
3	Yellow LED indicator, -lights continuously: Light reception > reserve factor 1.3 -blinks: Light reception < reserve factor 1.3, but light reception > switching threshold 1
4	M12 plug, 3-pin

See Chapter Accessories

Cables and connectors

Mounting systems

Order Information

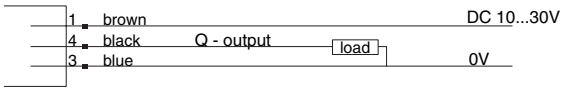
Type	Part no.
MHT15-N2219	1026098
MHT15-N3219	1026099
MHT15-N2319	1026100
MHT15-N3319	1026 101
MHT15-P2219	1026102
MHT15-P3219	1026103
MHT15-P2319	1026104
MHT15-P3319	1026105

Technical Data	MHT15	P2219	P3219	P2319	P3319	N2219	N3219	N2319	N3319
Sensing range SD, typ. max.[1]	0.2…3.5 in (5…90 mm)	■	■	■	■	■	■	■	■
Operating range SD[4]	0.2…2.9 in (5…75 mm)	■	■	■	■	■	■	■	■
Light spot diameter	Approx. .09 in at 3.5 in (25 mm at 90 mm)	■	■	■	■	■	■	■	■
Angle of dispersion sender	Approx. 5°	■	■	■	■	■	■	■	■
Optical axis	Radial (90°)	■	■	■	■	■	■	■	■
Light source[2], **light type**	LED infrared, 950 nm	■	■	■	■	■	■	■	■
Optical axis	Radial (90°)	■	■	■	■	■	■	■	■
Sensitivity adjustable	Potentiometer 270°	■	■	■	■	■	■	■	■
Light reception indicator	Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
	Reserve factor > 1.3	■	■	■	■	■	■	■	■
	Blinks: reserve factor > 1.0…< 1.3	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■	■	■	■	■
Residual ripple[4]	≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■				
Switching outputs	Q: PNP					■	■	■	■
	Q: NPN	■	■	■	■				
Signal voltage HIGH	V_S - 2.9 V					■	■	■	■
	V_S	■	■	■	■				
Signal voltage LOW	Approx. 0 V					■	■	■	■
	≤ 2.9 V			■	■			■	■
Switching mode	Light-switching	■	■			■	■		
	Dark-switching	■	■	■	■	■	■	■	■
Output current I_A max.	≤100 mA	■	■	■	■	■	■	■	■
Response time[6]	≤ 1.25 ms	■	■	■	■	■	■	■	■
Max. switching frequency[7]	400/s		■		■		■		■
Connection type plug	M12, 3-pin	■		■		■		■	
cable[8]	PUR, 2 m, 3 x 0.14 mm², Ø 3.6 mm	■	■	■	■	■	■	■	■
VDE protection class cable[9]	□	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[10]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature	Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -13…158°F (-25…70°C)		■		■		■		■
Weight	With plug, approx 0.01 lb. (8 g)	■		■		■		■	
	With cable, approx. 0.2 lb. (91 g)	■	■	■	■	■	■	■	■
Housing material	Housing: ABS	■	■	■	■	■	■	■	■
	Optic: PMMA								

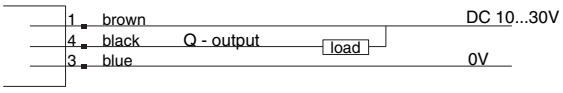
1) Object with 90% remission (based on standard white DIN 5033)
3.9 x 3.9 in (100 x 100 mm)
2) Average service life 100,000 h at T_A=77°F (25°C)
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) Do not bend below 32°F (0°C)
9) Reference voltage 50 V DC
10) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

Connection types	
MHT15-N3219	MHT15-N2219
MHT15-N3319	MHT15-N2319
MHT15-P3219	MHT15-P2219
MHT15-P3319	MHT15-P2319

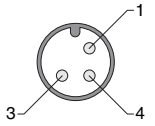
PNP Models



NPN Models



M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHL15

Reflex/Retro Reflective Sensors

0.1…16.4 ft (0.035…5 m) (PL 80 A)

sensing range

Class 2

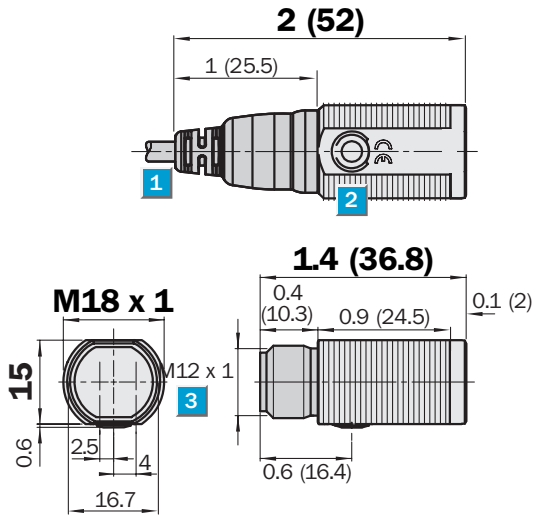
LISTED 87LL

Highlights

- Long sensing range
- Polarizing filter for reliable detection of shiny surfaces
- Indicator LED shows output and operating reserve
- Straight optic axis
- Mounting accessories included - M18 nuts and patented snap ring

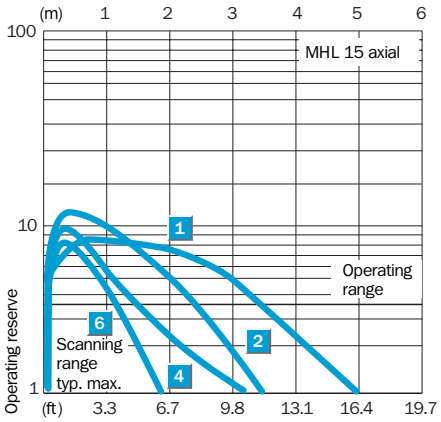
MHL15

Dimensional Drawing



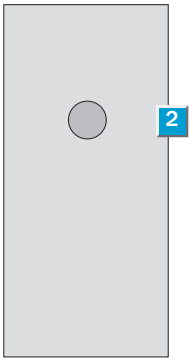
dimensions in inches (mm)

Sensing Distance

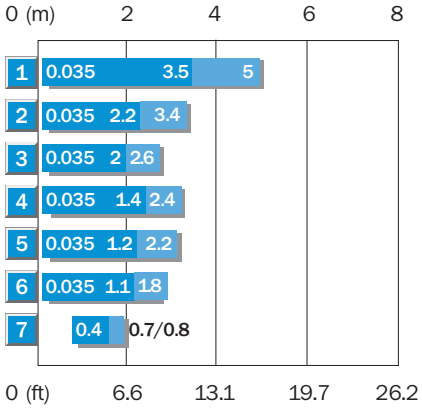


Adjustments

All types



1 Connector cable 2 m
2 Yellow LED indicator,
-lights continuously:
Light reception > reserve factor 1.3
-blinks:
Light reception < reserve factor 1.3,
but light reception > switching threshold 1
3 M12 plug, 3-pin



	Reflector type	Operating range
1	PL 80 A	0.035…3.5 m
2	P 250	0.035…2.2 m
3	P 975	0.035…2.0 m
4	PL 50 A/PL 40 A	0.035…1.4 m
5	PL 30 A/PL 31 A	0.035…1.2 m
6	PL 20 A	0.035…1.1 m
7	Reflective tape Diamond Grade 50 mm x 50 mm	0.4…0.7 m

See Chapter Accessories

Cables and connectors
Mounting systems
Reflectors

Order Information

Type	Part no.
MHT15-N2236	1026122
MHT15-N3236	1026123
MHT15-N2336	1026124
MHT15-N3336	1026125
MHT15-P2236	1026126
MHT15-P3236	1026127
MHT15-P2336	1026128
MHT15-P3336	1026129

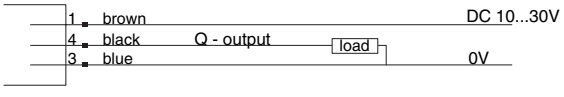
Technical Data	MHL15	P2236	P3236	P2336	P3336	N2236	N3236	N2336	N3336
Sensing range SR, typ. max./reflect.	0.1…16.4 ft (0.035…5 m) (PL 80 A)	■	■	■	■	■	■	■	■
Operating range	0.2…2.9 in (0.035…3.5 m) (PL 80 A)	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 3.1 in at 11.5 ft (80 mm at 3.5 m)	■	■	■	■	■	■	■	■
Angle of dispersion sender	Approx. 1.5°	■	■	■	■	■	■	■	■
Optical axis	Axial	■	■	■	■	■	■	■	■
Light source[1], light type	LED red light, with pol. filter, 650 nm	■	■	■	■	■	■	■	■
Light reception indicator	Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
	Reserve factor > 1.5	■	■	■	■	■	■	■	■
	Blinks: reserve factor > 1.0…< 1.5	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Residual ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	Q: PNP	■	■	■	■				
	Q: NPN					■	■	■	■
Signal voltage HIGH	V_S - 2.9 V	■	■	■	■				
	V_S					■	■	■	■
Signal voltage LOW	Approx. 0 V	■	■	■	■				
	≤ 2.9 V					■	■	■	■
Switching mode	Light-switching			■	■			■	■
	Dark-switching	■	■			■	■		
Output current I_A max.	≤100 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 1.25 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	400/s	■	■	■	■	■	■	■	■
Connection type plug	M12, 3-pin		■		■		■		■
cable[7]	PUR, 2 m, 3 x 0.14 mm², Ø 3.6 mm	■		■		■		■	
VDE protection class cable[8]	□	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	■	■
Weight	With plug, approx 0.01 lb. (7 g)		■		■		■		■
	With cable, approx. 0.2 lb. (90 g)	■		■		■		■	
Housing material	Housing: ABS	■	■	■	■	■	■	■	■
	Optic: PMMA	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

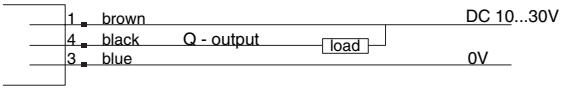
Connection types

MHL15-N3236	MHL15-N2236
MHL15-N3336	MHL15-N2336
MHL15-P3236	MHL15-P2236
MHL15-P3336	MHL15-P2336

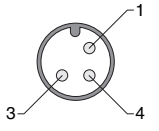
PNP Models



NPN Models



M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHL15

Reflex/Retro Reflective Sensors

0.1…14.8 ft (0.035…4.5 m) (PL 80 A)

sensing range

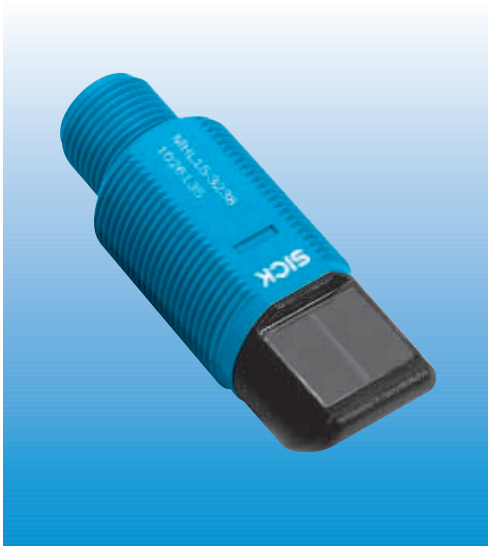
Class 2

LISTED 87LL

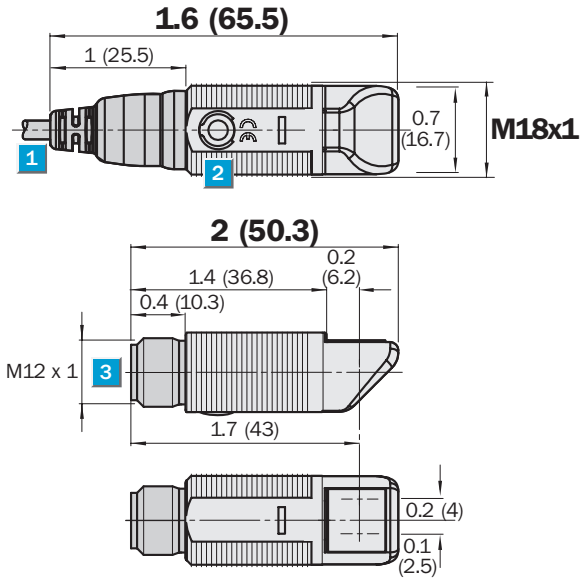
Highlights

- Long sensing range
- Polarizing filter for reliable detection of shiny surfaces
- Indicator LED shows output and operating reserve
- Right-angle optic axis
- Mounting accessories included - M18 nuts and patented snap ring

MHL15

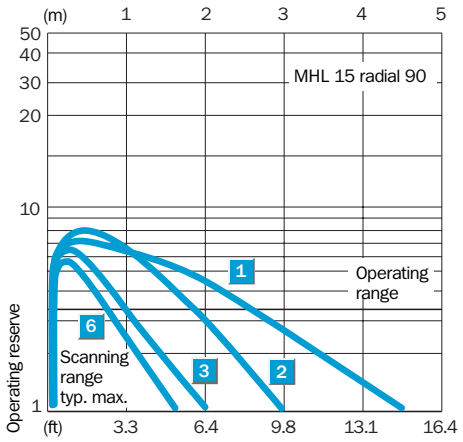


Dimensional Drawing



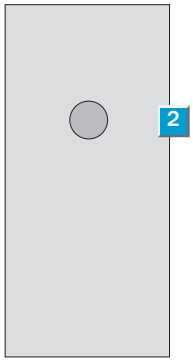
dimensions in inches (mm)

Sensing Distance

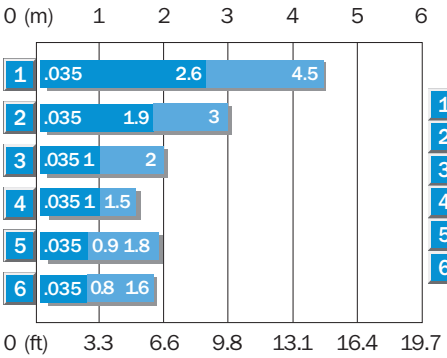


Adjustments

All types



1 Connector cable 2 m
2 Yellow LED indicator,
-lights continuously:
Light reception > reserve factor 1.5
-blinks:
Light reception < reserve factor 1.5,
but light reception > switching threshold 1
3 M12 plug, 3-pin



	Reflector type	Operating range
1	PL 80 A	0.035…2.6 m
2	P 250	0.035…1.9 m
3	PL 50 A/PL 40 A	0.035…1.0 m
4	P 975	0.035…1.0 m
5	PL 30 A/PL 31 A	0.035…0.9 m
6	PL 20 A	0.035…0.8 m

See Chapter Accessories

- Cables and connectors
- Mounting systems
- Reflectors

Order Information

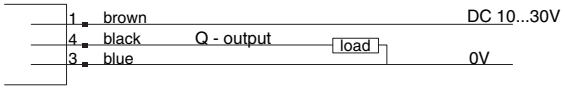
Type	Part no.
MHL15-N2238	1026130
MHL15-N3238	1026131
MHL15-N2338	1026132
MHL15-N3338	1026133
MHL15-P2238	1026134
MHL15-P3238	1026135
MHL15-P2338	1026136
MHL15-P3338	1026137

Technical Data	MHL15	P2238	P3238	P2338	P3338	N2238	N3238	N2338	N3338
Sensing range SR, typ. max.	0.1…14.8 ft (0.035…4.5 m) (PL 80 A)	■	■	■	■	■	■	■	■
Operating range	0.2…8.5 ft (0.035…2.6 m) (PL 80 A)	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 2.4 in at 8.5 ft (60 mm at 2.6 m)	■	■	■	■	■	■	■	■
Angle of dispersion sender	Approx. 1.5°	■	■	■	■	■	■	■	■
Optical axis	Radial (90°)	■	■	■	■	■	■	■	■
Light source[1], light type	LED red light, with pol. filter, 650 nm	■	■	■	■	■	■	■	■
Light reception indicator	Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
	Reserve factor > 1.5	■	■	■	■	■	■	■	■
	Blinks: reserve factor > 1.0…< 1.5	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Residual ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	Q: PNP	■	■	■	■				
	Q: NPN					■	■	■	■
Signal voltage HIGH	V_S - 2.9 V	■	■	■	■				
	V_S					■	■	■	■
Signal voltage LOW	Approx. 0 V	■	■	■	■				
	≤ 2.9 V					■	■	■	■
Switching mode	Light-switching			■	■			■	■
	Dark-switching	■	■			■	■		
Output current I_A max.	≤100 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 1.25 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	400/s	■	■	■	■	■	■	■	■
Connection type plug	M12, 3-pin		■		■		■		■
cable[7]	PUR, 2 m, 3 x 0.14 mm², Ø 3.6 mm	■		■		■		■	
VDE protection class cable[8]	□	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	■	■
Weight With plug,	approx 0.01 lb. (8 g)		■		■		■		■
With cable,	approx. 0.2 lb. (91 g)	■		■		■		■	
Housing material	Housing: ABS	■	■	■	■	■	■	■	■
	Optic: PMMA	■	■	■	■	■	■	■	■

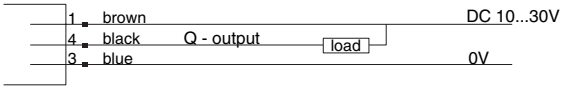
1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

Connection types	
MHL15-N3238	MHL15-N2238
MHL15-N3338	MHL15-N2338
MHL15-P3238	MHL15-P2238
MHL15-P3338	MHL15-P2338

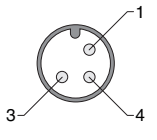
PNP Models



NPN Models



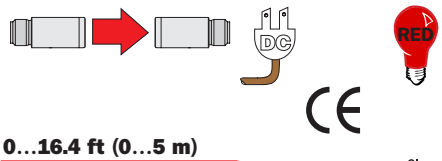
M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHSE15

Through Beam Sensors



0...16.4 ft (0...5 m)
sensing range

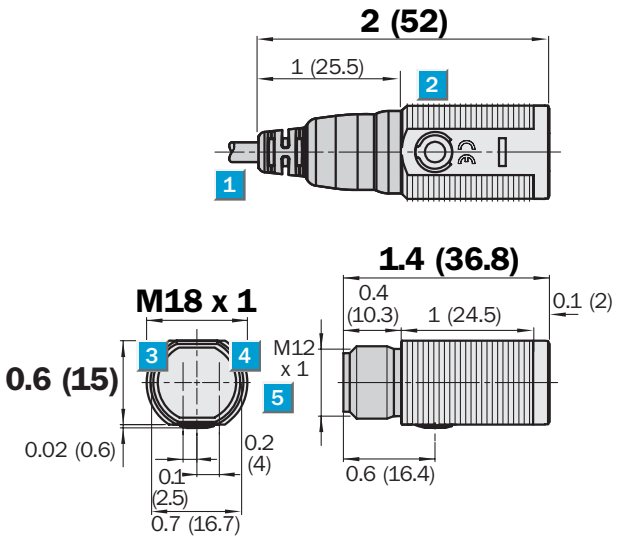
Class 2
LISTED 87LL

Highlights

- Long sensing range
- Indicator LED shows output and operating reserve
- Straight optic axis
- Mounting accessories included - M18 nuts and patented snap ring

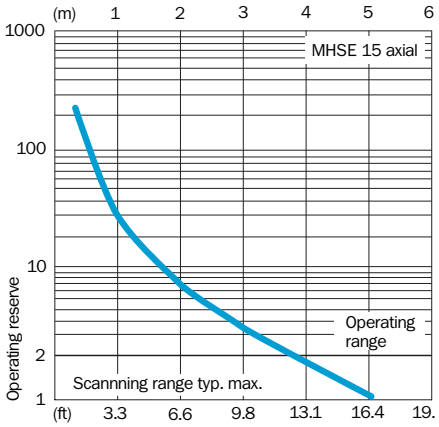
MHSE15

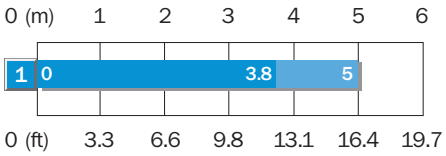
Dimensional Drawing



dimensions in inches (mm)

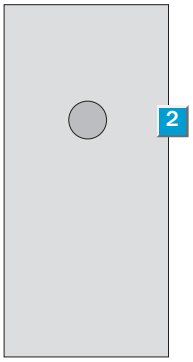
Sensing Distance





Adjustments

All types



1 Connector cable 2 m
2 Yellow LED indicator, (only receiver MHE 15)
-lights continuously:
Light reception > switching threshold 1
3 Axis of sender
4 Axis of receiver
5 M12 plug, 3-pin

See Chapter Accessories

Cables and connectors
Mounting systems

Order Information

Type	Part no.[1]
MHSE15-N2236	1026138
MHSE15-N3236	1026139
MHSE15-N2336	1026140
MHSE15-N3336	1026141
MHSE15-P2236	1026142
MHSE15-P3236	1026143
MHSE15-P2336	1026144
MHSE15-P3336	1026145

[1] Order number includes sender and receiver (pair)

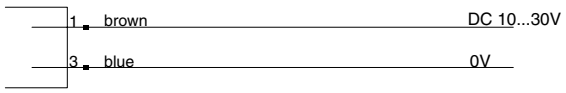
Technical Data	MHSE15	P2236	P3236	P2336	P3336	N2236	N3236	N2336	N3336
Sensing range SR, typ. max./reflect	0…16.4 ft (0…5 m)	■	■	■	■	■	■	■	■
Operating range	0…12.5 ft (0…3.8 m)	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 2.6 in at 13.1 ft (65 mm at 4 m)	■	■	■	■	■	■	■	■
Angle of dispersion sender	Approx. 1.5°	■	■	■	■	■	■	■	■
Optical axis	Axial	■	■	■	■	■	■	■	■
Light source[1], light type	LED red light, 650 nm	■	■	■	■	■	■	■	■
Light reception indicator	Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
	Light reception > switching threshold 1	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Residual ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	Q: PNP	■	■	■	■				
	Q: NPN					■	■	■	■
Signal voltage HIGH	V_S - 2.9 V	■	■	■	■				
	V_S					■	■	■	■
Signal voltage LOW	Approx. 0 V	■	■	■	■				
	≤ 2.9 V					■	■	■	■
Switching mode	Light-switching			■	■			■	■
	Dark-switching	■	■			■	■		
Output current I_A max.	≤100 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 1.4 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	350/s	■	■	■	■	■	■	■	■
Connection type plug	M12, 3-pin		■		■		■		■
cable[7] sender	PUR, 2 m, 2x0.14 mm², Ø 3.6 mm	■		■		■		■	
cable[7] receiver	PUR, 2 m, 3x0.14 mm², Ø 3.6 mm	■		■		■		■	
VDE protection class cable[8]	□	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	■	■
Weight	With plug, sender/receiver each approx 0.01 lb. (7 g)		■		■		■		■
	With cable 2 m, sender/receiver each approx. 0.2 lb. (90 g)	■		■		■		■	
Housing material	Housing: ABS	■	■	■	■	■	■	■	■
	Optic: PMMA	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

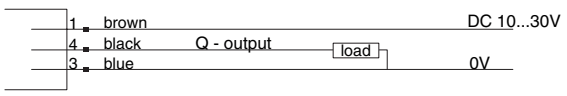
Connection types

MHSE15-N3236	MHSE15-N2236
MHSE15-N3336	MHSE15-N2336
MHSE15-P3236	MHSE15-P2236
MHSE15-P3336	MHSE15-P2336

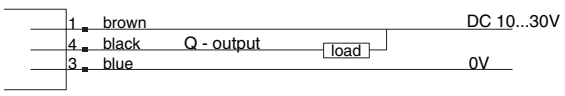
Sender



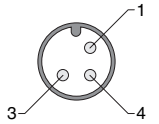
PNP Models



NPN Models



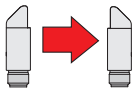
M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

MHSE15

Through Beam Sensors




0...13.1 ft (0...4 m)
sensing range

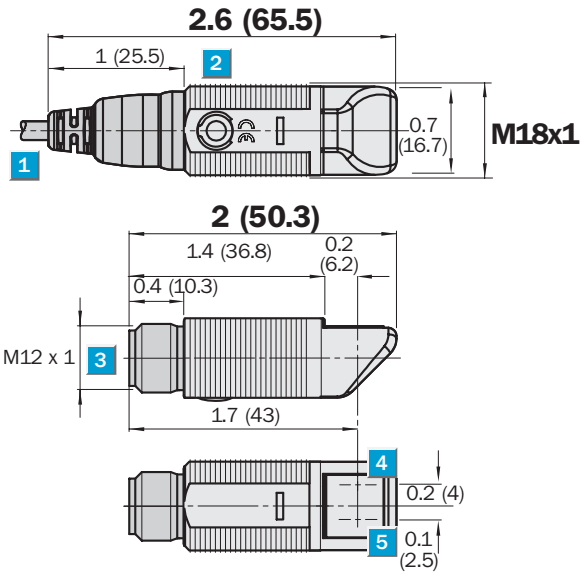
Class 2
LISTED 87LL

Highlights

- Long sensing range
- Indicator LED shows output and operating reserve
- Right-angle optic axis
- Mounting accessories included - M18 nuts and patented snap ring

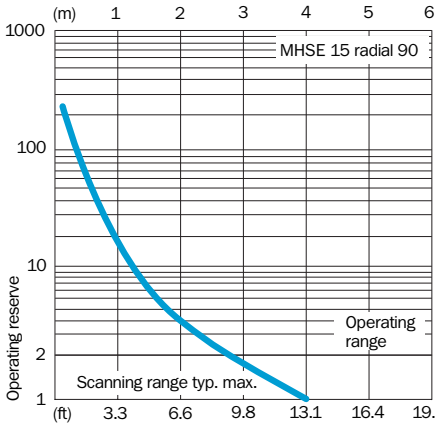
MHSE15

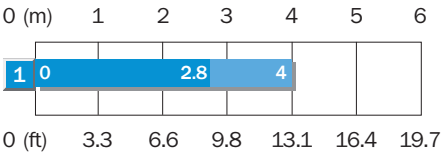
Dimensional Drawing



dimensions in inches (mm)

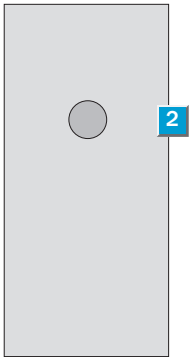
Sensing Distance





Adjustments

All types



1 Connector cable 2 m
2 Yellow LED indicator, (only receiver MHE 15)
-lights continuously:
Light reception > switching threshold 1
3 M12 plug, 3-pin
4 Axis of sender
5 Axis of receiver

See Chapter Accessories
Cables and connectors
Mounting systems

Order Information

Type	Part no.[1]
MHSE15-N2238	1026146
MHSE15-N3238	1026147
MHSE15-N2338	1026148
MHSE15-N3338	1026149
MHSE15-P2238	1026150
MHSE15-P3238	1026151
MHSE15-P2338	1026152
MHSE15-P3338	1026153

[1] Order number includes sender and receiver (pair)

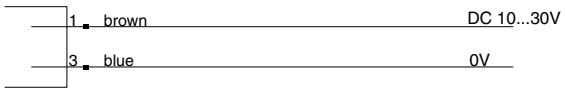
Technical Data	MHSE15	P2238	P3238	P2338	P3338	N2238	N3238	N2338	N3338
Sensing range SR, typ. max./reflect.	0…13.1 ft (0…4 m)	■	■	■	■	■	■	■	■
Operating range	0… 9.2 ft (0…2.8 m)	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 1.9 in at 9.8 ft (50 mm at 3 m)	■	■	■	■	■	■	■	■
Angle of dispersion sender	Approx. 1.5°	■	■	■	■	■	■	■	■
Optical axis	Radial (90°)	■	■	■	■	■	■	■	■
Light source[1], light type	LED red light, 650 nm	■	■	■	■	■	■	■	■
Light reception indicator	Yellow LED: lights continuously:	■	■	■	■	■	■	■	■
	Light reception > switching threshold 1	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Residual ripple[3]	≤ 5 V_{PP}	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	Q: PNP	■	■	■	■				
	Q: NPN					■	■	■	■
Signal voltage HIGH	V_S - 2.9 V	■	■	■	■				
	V_S					■	■	■	■
Signal voltage LOW	Approx. 0 V	■	■	■	■				
	≤ 2.9 V					■	■	■	■
Switching mode	Light-switching			■	■			■	■
	Dark-switching	■	■			■	■		
Output current I_A max.	≤100 mA	■	■	■	■	■	■	■	■
Response time[5]	≤ 1.4 ms	■	■	■	■	■	■	■	■
Max. switching frequency[6]	350/s	■	■	■	■	■	■	■	■
Connection type plug	M12, 3-pin		■		■		■		■
cable[7] sender	PUR, 2 m, 2x0.14 mm², Ø 3.6 mm	■		■		■		■	
cable[7] receiver	PUR, 2 m, 3x0.14 mm², Ø 3.6 mm	■		■		■		■	
VDE protection class cable[8]	□	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Circuit protection[9]	A, B, C	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation -13…131°F (-25…55°C)	■	■	■	■	■	■	■	■
	Storage -13…158°F (-25…70°C)	■	■	■	■	■	■	■	■
Weight With plug	Sender/receiver each approx 0.01 lb. (8 g)		■		■		■		■
With cable 2 m	Sender/receiver each approx. 0.2 lb. (91 g)	■		■		■		■	
Housing material	Housing: ABS	■	■	■	■	■	■	■	■
	Optic: PMMA	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A=77°F (25°C)
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) Do not bend below 32°F (0°C)
8) Reference voltage 50 V DC
9) A = V_S connection reverse-polarity protected
B = Interference pulse suppression
C = Outputs overcurrent and short circuit protected

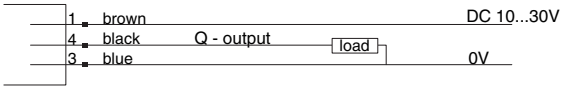
Connection types

MHSE15-N3238	MHSE15-N2238
MHSE15-N3338	MHSE15-N2338
MHSE15-P3238	MHSE15-P2238
MHSE15-P3338	MHSE15-P2338

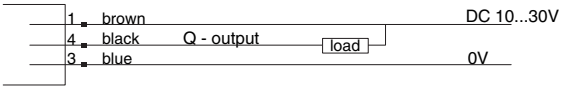
Sender



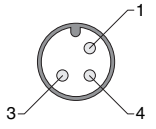
PNP Models



NPN Models



M12 Connector



Wire colors refer to standard cable, not included with quick disconnect models.

WF Next Manual

Fork Sensors

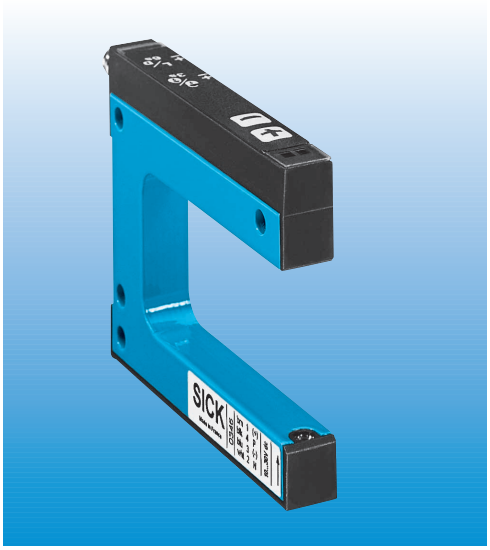
0.08...4.7 in (2...120 mm)
sensing range/fork width

CE

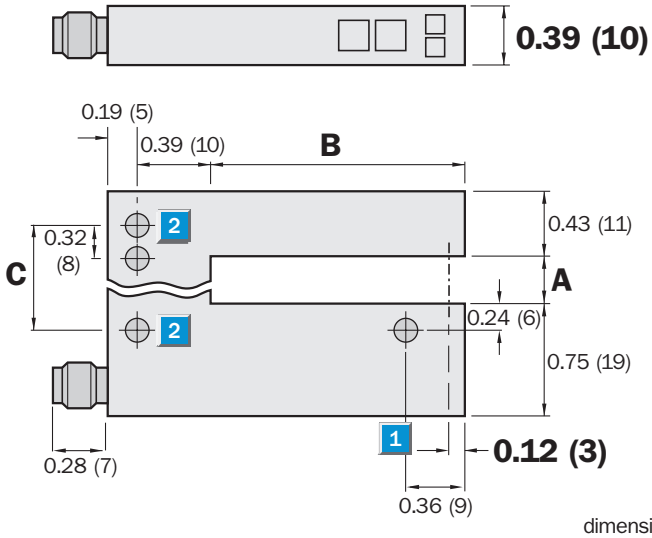
Highlights

- Simple and accurate adjustment via "+" and "-" buttons
- PNP and NPN switching output
- Selectable light/dark switching
- Rugged aluminum housing

WF Next



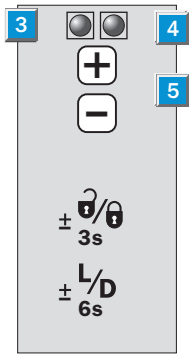
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Optical axis
2 Mounting holes, Ø 4.2 mm
3 Function indicator (red)
4 Function indicator (yellow), switching output
5 "+"/"-" buttons and function button

Dimensions

	A (mm)	B (mm)	C (mm)
	Fork width	**Fork depth**	
WF2	**2**	42/59/95	14
WF5	**5**	42/59/95	14
WF15	**15**	42/59/95	27
WF30	**30**	42/59/95	42
WF50	**50**	42/59/95	40
WF80	**80**	42/59/95	70
WF120	**120**	42/59/95	110

Accessories page
Cables and connectors

Order Information

Fork Depth 40 mm		Fork Depth 60 mm		Fork Depth 95 mm	
Type	**Part no.**	**Type**	**Part no.**	**Type**	**Part no.**
WF2-40B410	6028428	WF2-60B410	6028436	WF2-95B410	6028443
WF5-40B410	6028429	WF5-60B410	6028437	WF5-95B410	6028444
WF15-40B410	6028430	WF15-60B410	6028438	WF15-95B410	6028445
WF30-40B410	6028431	WF30-60B410	6028439	WF30-95B410	6028446
WF50-40B410	6028432	WF50-60B410	6028440	WF50-95B410	6028447
WF80-40B410	6028433	WF80-60B410	6028441	WF80-95B410	6028448
WF120-40B410	6028435	WF120-60B410	6028442	WF120-95B410	6028449

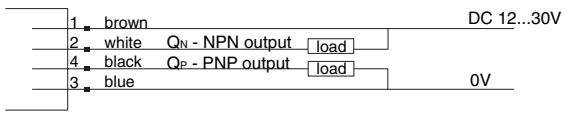
Technical Data	WF-	2-XX[1] B410	5-XX[1] B410	15-XX[1] B410	30-XX[1] B410	50-XX[1] B410	80-XX[1] B410	120-XX[1] B410
Sensing range/fork width	0.1 in (2 mm)	■						
	0.2 in (5 mm)		■					
	0.6 in (15 mm)			■				
	1.2 in (30 mm)				■			
	2.0 in (50 mm)					■		
	3.2 in (80 mm)						■	
	4.7 in (120 mm)							■
Fork depth	40, 60, or 95 mm	■	■	■	■	■	■	■
Light source	LED, infrared light, pulsed	■	■	■	■	■	■	■
Minimum detectable object size	0.008 in (0.2 mm)	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■
Current consumption[3]	40 mA	■	■	■	■	■	■	■
Residual ripple[4]	< 10%	■	■	■	■	■	■	■
Switching output	PNP/NPN	■	■	■	■	■	■	■
	Light/dark adjustable via button	■	■	■	■	■	■	■
Signal voltage		■	■	■	■	■	■	■
PNP	HIGH = V_S – (< 2 V)/LOW = 0 V	■	■	■	■	■	■	■
NPN	HIGH = V_S/LOW = < 2 V	■	■	■	■	■	■	■
Output current I_A	100 mA	■	■	■	■	■	■	■
Stability of response time[5]	± 20 µs	■	■	■	■	■	■	■
Response time[5], switching frequency[6]	Max. 100 µs; 10,000/s	■	■	■	■	■	■	■
Initialization time	100 ms	■	■	■	■	■	■	■
Ambient light safety								
Incandescent lamp	5,000 Lux	■	■	■	■	■	■	■
Sunlight	10,000 Lux	■	■	■	■	■	■	■
VDE protection class[7]	III	■	■	■	■	■	■	■
Enclosure rating	IP 65	■	■	■	■	■	■	■
Circuit protection[8]	A, B, C	■	■	■	■	■	■	■
Ambient temperature[9]	Operation -4…140°F (-20…60°C)	■	■	■	■	■	■	■
	Storage -22…176°F (-30…80°C)	■	■	■	■	■	■	■
Housing	Aluminum	■	■	■	■	■	■	■
Weight	Approx. 1.26…5.6 oz (36…160 g)[10]	■	■	■	■	■	■	■

1) XX = Fork depth (e.g. 40 = fork depth equivalent to 40 mm)
2) Limit values, reverse polarity protected
3) Without load
4) May not exceed or fall short of V_S tolerances
5) Signal transit time with resistive load
6) With light/dark ratio 1:1; no time delay
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
9) Do not bend when temperature is below -32°F (0°C)
10) Depending on fork width

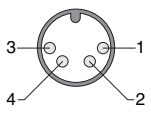
Output Function

Switching type:	Light switching (Q)		Dark switching ($\bar{Q}$)	
Light path free	Yes	No	Yes	No
PNP/NPN output	HIGH	LOW	LOW	HIGH
Function indicator (yellow)	On	Off	Off	On

Connection Diagram



M8 Connector



wire colors refer to standard cable, not included

WF Next Teach-In

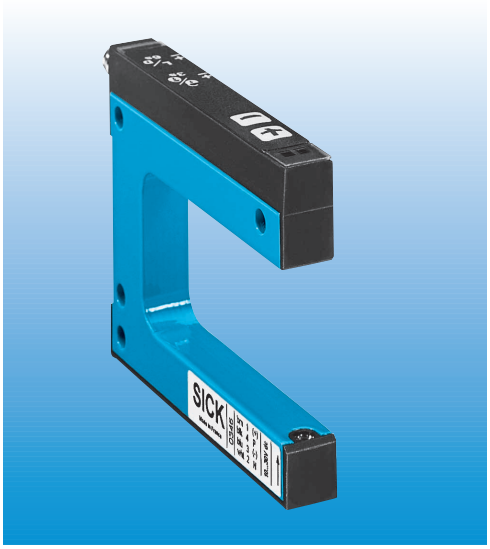
Fork Sensors

0.08...4.7 in (2...120 mm)
sensing range

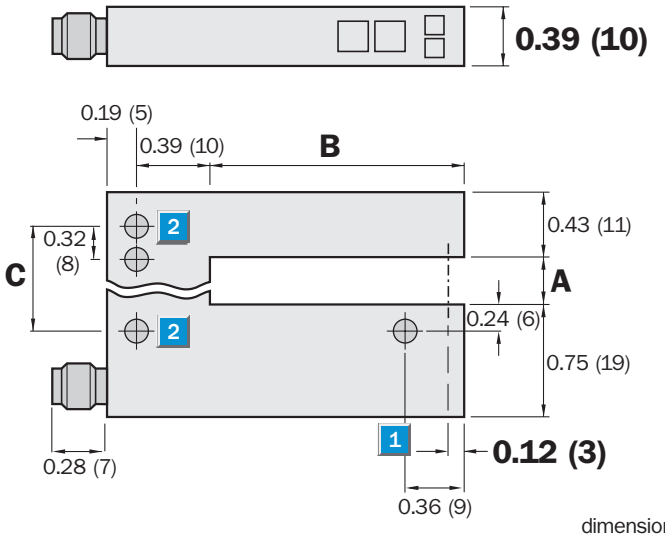
Highlights

- Simple setup using two-point Teach-in
- PNP and NPN switching output
- Selectable light/dark switching
- Rugged aluminum housing

WF Next



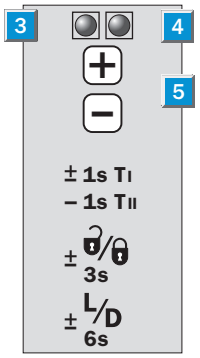
Dimensional Drawing



dimensions in inches (mm)

Adjustments

All types



1 Optical axis
2 Mounting holes, Ø 4.2 mm
3 Function indicator (red)
4 Function indicator (yellow), switching output
5 "+"/"-" buttons and function button

Dimensions

	A (mm) Fork width	B (mm) Fork depth	C (mm)
WF2	**2**	42/59/95	14
WF5	**5**	42/59/95	14
WF15	**15**	42/59/95	27
WF30	**30**	42/59/95	42
WF50	**50**	42/59/95	40
WF80	**80**	42/59/95	70
WF120	**120**	42/59/95	110

Accessories page
Cables and connectors

Order Information

Fork Depth 40 mm		Fork Depth 60 mm		Fork Depth 95 mm	
Type	**Part no.**	**Type**	**Part no.**	**Type**	**Part no.**
WF2-40B416	6028450	WF2-60B416	6028457	WF2-95B416	6028464
WF5-40B416	6028451	WF5-60B416	6028458	WF5-95B416	6028465
WF15-40B416	6028452	WF15-60B416	6028459	WF15-95B416	6028466
WF30-40B416	6028453	WF30-60B416	6028460	WF30-95B416	6028467
WF50-40B416	6028454	WF50-60B416	6028461	WF50-95B416	6028468
WF80-40B416	6028455	WF80-60B416	6028462	WF80-95B416	6028469
WF120-40B416	6028456	WF120-60B416	6028463	WF120-95B416	6028470

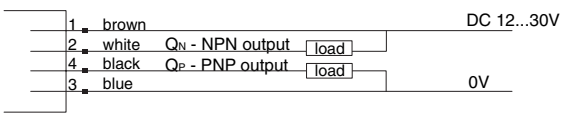
Technical Data		WF-	2-XX[1] B416	5-XX[1] B416	15-XX[1] B416	30-XX[1] B416	50-XX[1] B416	80-XX[1] B416	120-XX[1] B416		
Sensing range/fork width	0.1 in (2 mm)		■								
	0.2 in (5 mm)			■							
	0.6 in (15 mm)				■						
	1.2 in (30 mm)					■					
	2.0 in (50 mm)						■				
	3.2 in (80 mm)							■			
	4.7 in (120 mm)								■		
Fork depth	40, 60, or 95 mm		■	■	■	■	■	■	■		
Light source	LED, infrared modulated		■	■	■	■	■	■	■		
Minimum detectable object size	0.008 in (0.2 mm)		■	■	■	■	■	■	■		
Supply voltage V_S	10…30 V DC[2]		■	■	■	■	■	■	■		
Current consumption[3]	40 mA		■	■	■	■	■	■	■		
Residual ripple[4]	< 10%		■	■	■	■	■	■	■		
Switching output	PNP/NPN		■	■	■	■	■	■	■		
	Light/dark adjustable via button		■	■	■	■	■	■	■		
Signal voltage			■	■	■	■	■	■	■		
PNP	HIGH = V_S – (< 2 V)/LOW = 0 V		■	■	■	■	■	■	■		
NPN	HIGH = V_S/LOW = < 2 V		■	■	■	■	■	■	■		
Output current	100 mA		■	■	■	■	■	■	■		
Stability of response time[5]	± 20 µs		■	■	■	■	■	■	■		
Response time[5], switching frequency[6]	Max. 100 µs; 10,000/s		■	■	■	■	■	■	■		
Teach-in via button			■	■	■	■	■	■	■		
Initialization time	100 ms										
Ambient light safety			■	■	■	■	■	■	■		
Incandescent lamp	5,000 Lux		■	■	■	■	■	■	■		
Sunlight	10,000 Lux		■	■	■	■	■	■	■		
VDE protection class[7]	III		■	■	■	■	■	■	■		
Enclosure rating	IP 65		■	■	■	■	■	■	■		
Circuit protection[8]	A, B, C		■	■	■	■	■	■	■		
Ambient temperature[9]	Operation	-4…140°F (-20…60°C)	■	■	■	■	■	■	■		
	Storage	-22…176°F (-30…80°C)	■	■	■	■	■	■	■		
Housing	Aluminum		■	■	■	■	■	■	■		
Weight	Approx. 1.26…5.6 oz (36…160 g)[10]										

1) XX = Fork depth (e.g. 40 = fork depth equivalent to 40 mm)
2) Limit values, reverse polarity protected
3) Without load
4) May not exceed or fall short of V_S tolerances
5) Signal transit time with resistive load
6) With light/dark ratio 1:1; no time delay
7) Reference voltage 50 V DC
8) A = V_S connections reverse-polarity protected
B = Outputs short-circuit protected
C = Interference pulse suppression
9) Do not bend when temperature is below -32°F (0°C)
10) Depending on fork width

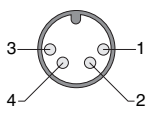
Output Function

Switching type:	Light switching (Q)		Dark switching ($\bar{Q}$)	
Light path free	Yes	No	Yes	No
PNP/NPN output	HIGH	LOW	LOW	HIGH
Function indicator (yellow)	On	Off	Off	On

Connection Diagram



M8 Connector



wire colors refer to standard cable, not included

OD MAX

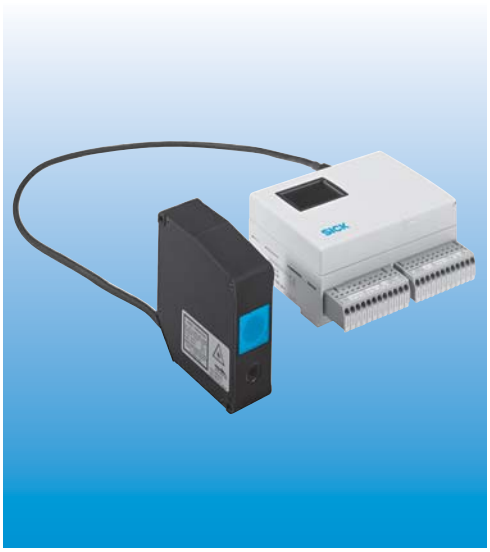
Displacement Sensor

30 ± 5/85 ± 20/350 ± 100 mm
sensing range

Highlights

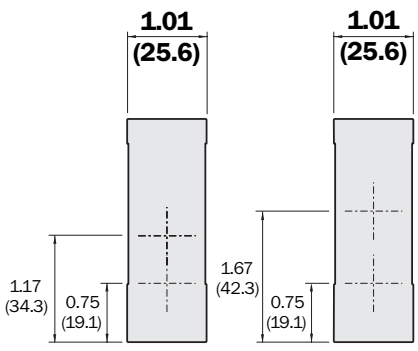
- Laser Technology
- CMOS Technology: object independent measuring from shiny to dark
- High measurement accuracy
- High-End-System: 1 or 2 sensor heads per controller
- 4 analog outputs and 5 switching outputs
- RS 232C interface

OD MAX

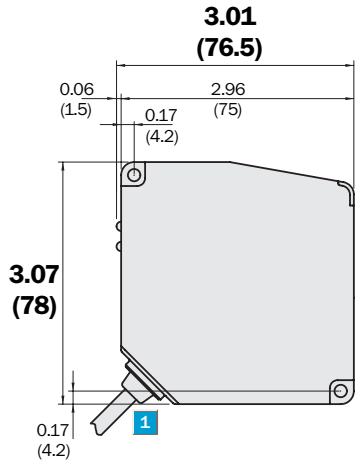


Dimensional Drawing

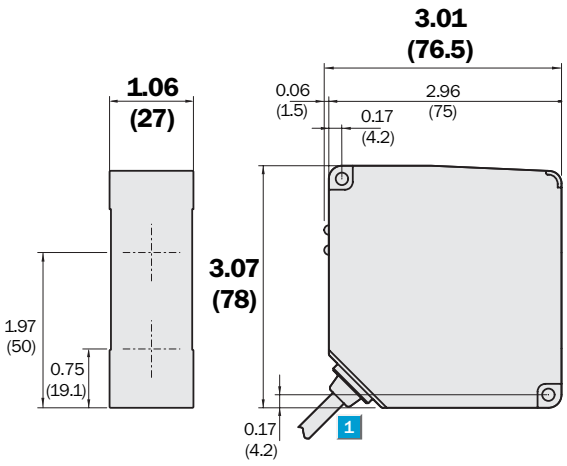
OD30-05T1



OD85-20T1



OD350-100T1

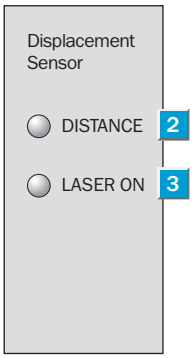


dimensions in inches (mm)

1 Cable Ø 5 mm/0.5 m with 10-pin connector
2 Distance indicator
3 Laser on LED

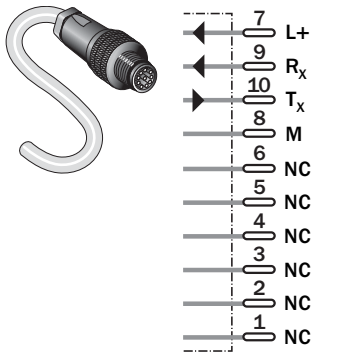
Adjustments

All types



Connection Types

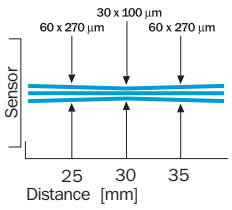
All types | 10-pin



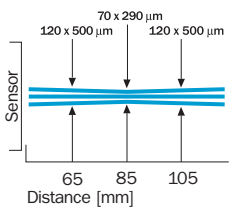
Technical Data	OD	30-05T1	85-20T1	350-100T1
Measuring range	30 ± 5 mm	■		
	85 ± 20 mm		■	
	350 ± 100 mm			■
Light source	Red laser diode 2 (II)[1]	■	■	■
Measuring frequency	10 kHz	■	■	■
Resolution[2]	1 µm	■		
	5 µm		■	
	50 µm			■
Reproducibility[3]	3 µm	■		
	15 µm		■	
	150 µm			■
Accuracy[4]	± 10 µm	■		
	± 40 µm		■	
	± 200 µm			■
Supply voltage V_S	Supplied from the controller	■	■	■
Temperature drift	± 0.01% FS[5]/°C	■	■	■
Enclosure rating	IP67	■	■	■
VDE protection class	III	■	■	■
Ambient temperature T_A	Operation: 14…113°F (-10°…45°C)[6]	■	■	■
	Storage: -4…140°F (-20°…60°C)	■	■	■
Ambient light limit	Max. 3,000 lx (fluorescent light)	■	■	■
	Max. 10,000 lx (sun light)	■	■	■
Vibration resistance	10/s…55/s[7]	■	■	■
Shock resistance	50 g (500 m/s²)	■	■	■
Weight	250 g (including 50 cm cable)	■	■	■
Housing material	Diecast aluminum (sensor head housing)	■	■	■
Cable extension	0.5 m pig tail with connector[8]	■	■	■

1) Wavelength 650 nm, max.output 1 mW
2) Averaging: 256 measurements
Object: white ceramic
Distance range: average distance
3) With constant conditions of the environment
4) Equivalent ± 0.1% of full scale for 6…90% remission
5) Full scale:
OD30-05T1= 10 mm
OD85-20T1= 40 mm
OD350-100T1= 200 mm
6) Non-condensing
7) Double amplitude 1.5 mm, 2 h for XYZ axes
8) Extendible by cable to max. 10 m

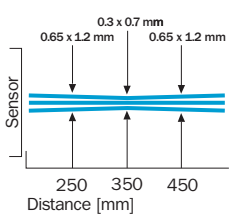
OD30-05T1: Lightspot diameter



OD85-20T1: Lightspot diameter



OD350-100T1: Lightspot diameter



Order Information

Type	Part no.
OD30-05T1	6028959
OD85-20T1	6028958
OD350-100T1	6028957

AOD MAX

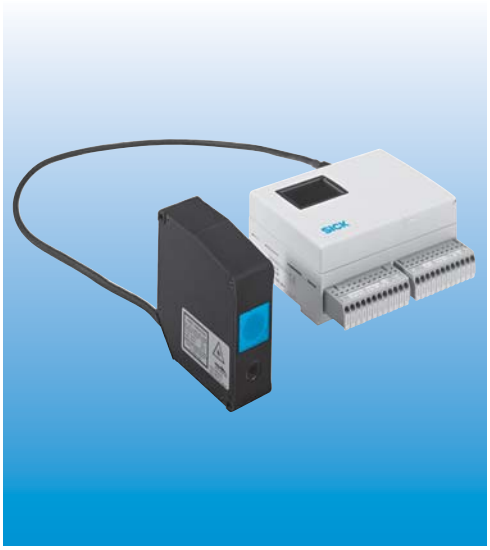
Displacement Sensor

30 ± 5/85 ± 20/350 ± 100 mm
sensing range

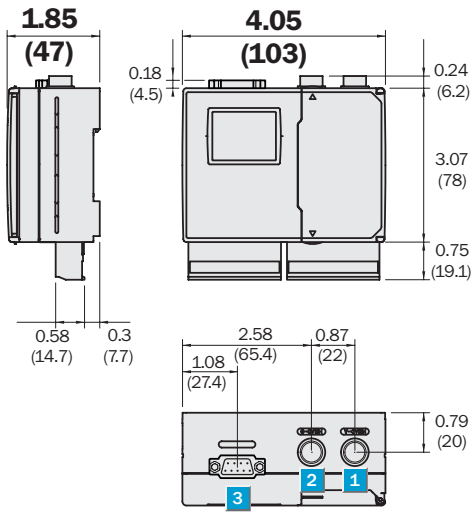
Highlights

- Laser Technology
- CMOS Technology: object independent measuring from shiny to dark
- High measurement accuracy
- High-End-System: 1 or 2 sensor heads per controller
- 4 analog outputs and 5 switching outputs
- RS 232C interface

AOD MAX



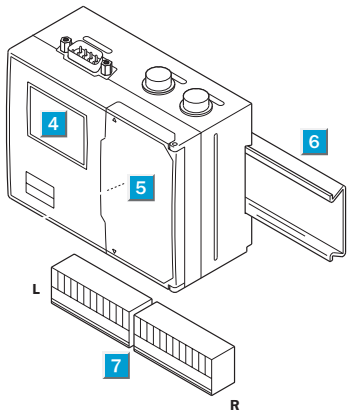
Dimensional Drawing



dimensions in inches (mm)

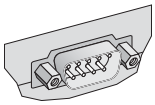
Adjustments

AOD-P1
AOD-N1



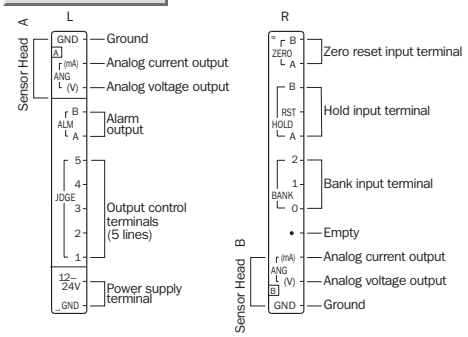
1. Sensor head A connection port
2. Sensor head B connection port
3. RS 232C interface
4. LCD display
5. Operation panel
6. DIN rail
7. Terminal board (detachable)

Connector pinning RS 232C



Connection terminal board

AOD-P1
AOD-N1



Connector pinning RS 232C

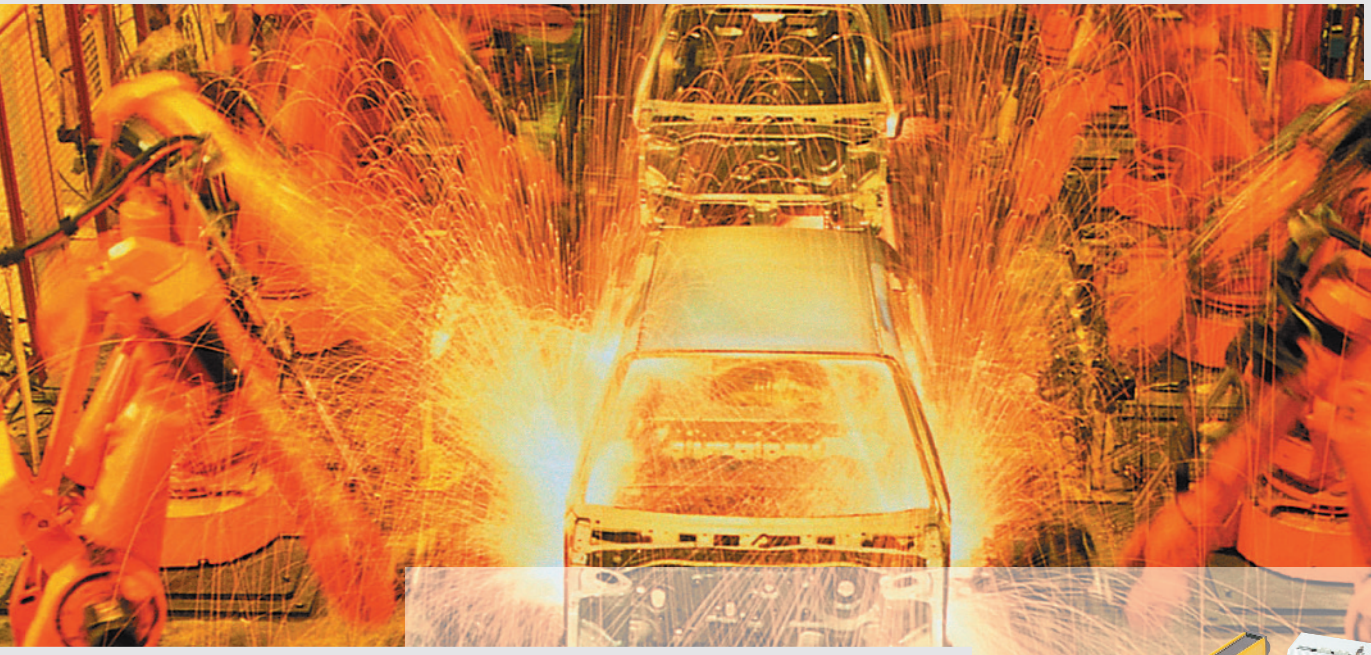
1. DCD – Data Carrier Detect
2. RXD – Receive Data
3. TXD – Transmit Data
4. DTR – Data Terminal Ready
5. SG – Signal Ground
6. DSR – Data Set Ready
7. RTS – Request to Send
8. CTS – Clear to Send
9. RI – (Ring Indicator)

Technical Data	AOD	P1	N1
In- and outputs	PNP	■	
	NPN		■
Response time[1]	0.5 ms	■	■
Output rate	10 kHz	■	■
Supply voltage V_S	12…24 V DC ± 10%	■	■
Power consumption	6 W	■	■
Outputs			
2 analogue voltage outputs	-5…+5 V[4]	■	■
2 analogue current outputs	4…20 mA[5]	■	■
5 switching outputs[6]	Max. 100 mA/24 V DC[7]	■	■
2 alarm outputs	To indicate failed measurements	■	■
Data interface	RS232C (male)	■	■
Inputs			
3 Bank inputs	External memory bank selection	■	■
2 Hold inputs	Holding the measurement/Laser off	■	■
2 Zero reset inputs	To reference the measurement	■	■
Additional features	Arithmetical calculations	■	■
	Frequency filters	■	■
	Autom/manual sensitivity setting	■	■
	Timer functions	■	■
	8 Memory banks	■	■
	Hold functions	■	■
Display type	LCD color display	■	■
Enclosure rating	IP20	■	■
VDE protection class	III	■	■
Ambient temperature T_A	Operation: 14…113°F (-10°…45°C)[8]	■	■
	Storage: -4…140°F (-20°…60°C)	■	■
Vibration resistance	10/s…55/s[9]	■	■
Shock resistance	20 g (196 m/s^2)	■	■
Weight	240 g (including terminal board)	■	■
Housing material	Polycarbonate	■	■
Terminal board material	Nylon 66	■	■
Connection type	Terminal board	■	■

1) Without averaging and manually selected sensitivity
2) When connected with 2 sensor heads. Including analogue current output
3) 1 for each sensor head, or 1 for the calculation result
4) Output impedance 100 Ω resolution 1 mV
5) Load impedance max. 300 Ω resolution 1.5 µA
6) For the calculation result
7) Residual voltage max. 1.8 V
8) Non-condensing
9) Double amplitude 1.5 mm, 2 h for XYZ axes

Order Information	
OD Max™ Amplifier Unit	
Type	**Part no.**
AOD-P1	6028960
AOD-N1	6028961

Accessories, extension cable		
Type	**Part no.**	**Length**
DSL-1210-G02M	6028943	2 m
DSL-1210-G05M	6028944	5 m



Product Catalog

Safety Systems 2004

NORTH AMERICA

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SAFETY SYSTEMS 2004

"Everyone, and that includes you and me,
is at some time careless, complacent,
overconfident and stubborn.
At times, each of us becomes distracted,
inattentive, bored and fatigued.

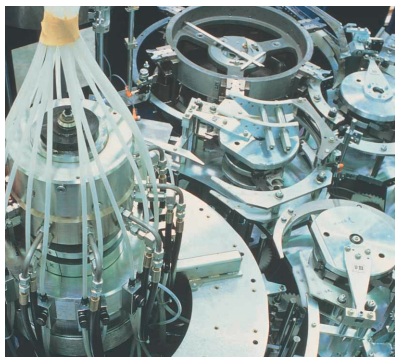
We occasionally take chances, we misunderstand,
we misinterpret and we misread.

These are completely human characteristics.

Because we are human and because all of these traits
are fundamental and built into each of us,
the equipment, machines and systems
that we construct for our use have to be made
to accommodate us the way we are, and not vice versa."

-Al Chapanis,
former Professor of Human Factors Engineering,
Johns Hopkins University.

SICK



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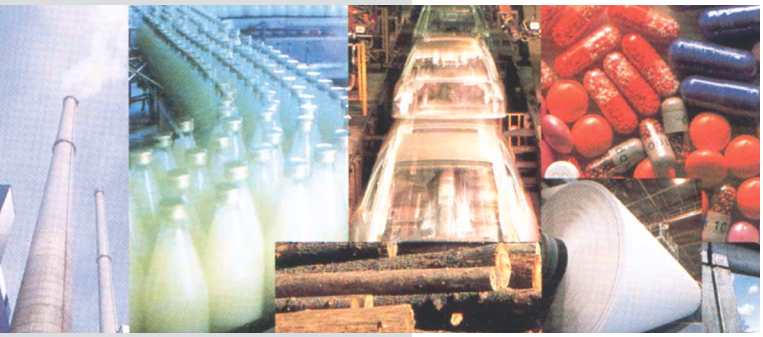
SICK – Company Profile



Leadership

SICK is a global leader in factory and process automation solutions. We offer customers a wide range of products that provide solutions at every phase of production and automation. Safety systems, industrial sensors, automatic identification solutions, encoders and environmental monitors from SICK are used within diverse industries such as automotive, machine tool, robotics, food and beverage, material handling and semiconductor.

From automotive assembly lines to retail distribution centers and semiconductor wafer production and transport, products and services from SICK help ensure worker safety, optimize production and logistics processes, and provide consistent high quality.

Innovation

SICK continues to lead the way, leveraging a long history of innovation and rich tradition of quality industry solutions. Inventor and entrepreneur Dr. Erwin Sick founded the company in 1946. Soon after, he unveiled the industry's first print registration control device. A few years later, the company developed the industry's first safety light curtain, setting the standard for industrial safety applications. SICK also created the first bar code reader and measuring light curtain. These designs were first in an extensive line of innovations. Today, SICK holds more than 350 patents for its safety systems, industrial sensors, and automatic identification solutions.

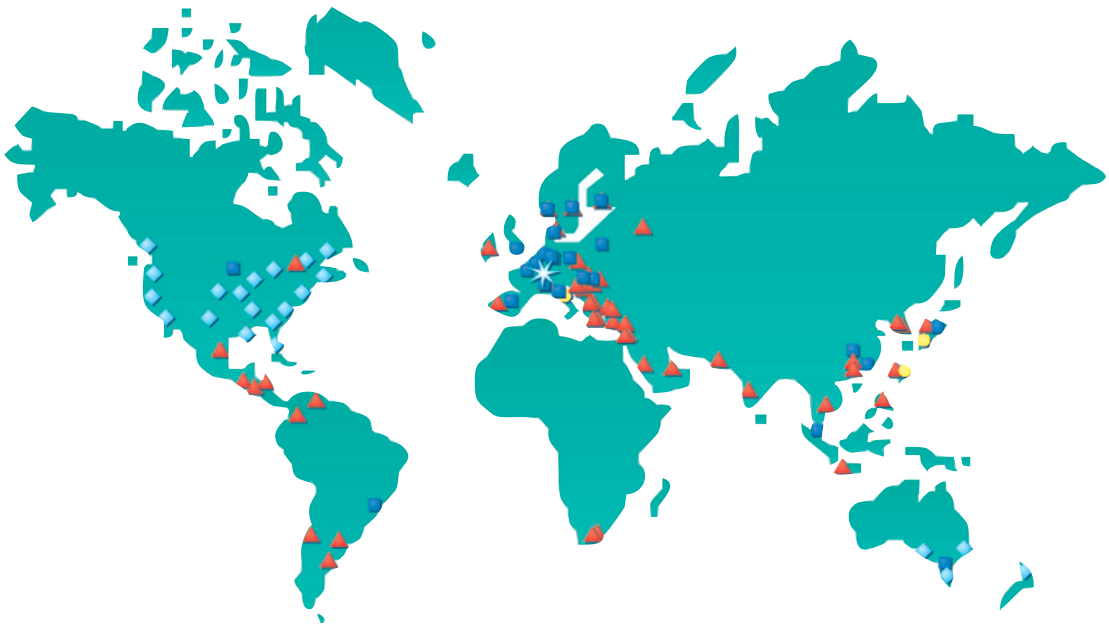
Dr. Erwin Sick

SICK in the US and in the World

SICK Worldwide

Founded by Erwin Sick in 1946 in Munich, Germany, the company now has a significant worldwide presence that includes 60 subsidiaries and agencies around the globe as well as production centers in Germany, the United States, Italy, Poland, Hungary, and Japan. Through its Safety Systems, Industrial Sensors, Automatic Identification, and Environmental and Process Analysis divisions, SICK currently employs more than 3,600 people worldwide.

Today, the company's headquarters, research and development centers– which are essential to our innovation-driven enterprise– as well as two main production plants, are located in Waldkirch and Reute, Germany. SICK Germany ranks amongst the best industrial employers in Europe.



SICK in the US and in the World

SICK North America

Established in 1976, the North American subsidiary of SICK is headquartered in Minneapolis, Minn. With sales throughout the U.S., Canada and Mexico, SICK North America helps its customers achieve their goals: safe environments, high production rates, short processing times, and consistent high quality.

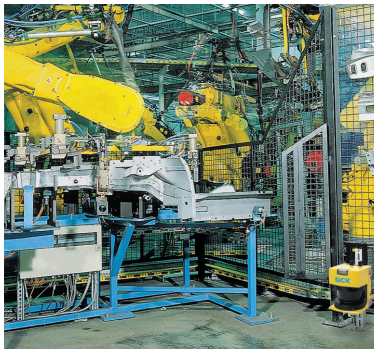
SICK designs and manufactures cost-effective products to achieve a high level of precision, reliability and versatility. In the U.S., SICK North America leverages its factory and process automation expertise into diverse industries such as automotive, machine tools, food and beverage, packaging, material handling, robotics and many others. With U.S. manufacturing and research and development facilities in Minnesota, Ohio and Massachusetts, and sales offices around the country, SICK North America is positioned to provide the broad and innovative product portfolio and comprehensive services that our customers demand.

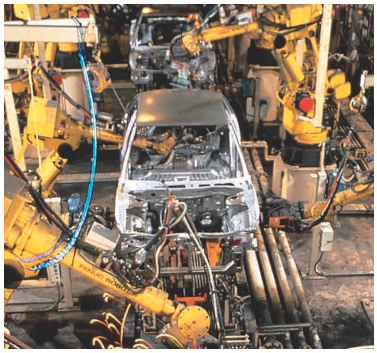
All this translates to an unchallenged leadership in market share for safety systems and industrial sensors, as well as automatic identification solutions.

SICK North America - Divisions

SICK Safety Systems

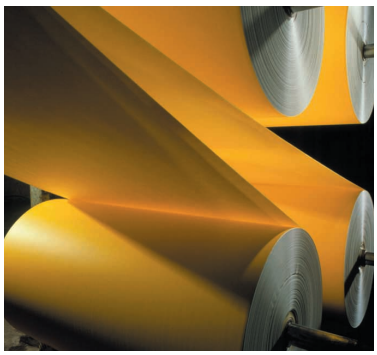
Innovative products from SICK provide comprehensive safeguarding of both personnel and machinery. As specialists in sensor technology, SICK develops and manufactures pioneering products that provide protection in hazardous zones, dangerous locations and for safeguarding access points. By providing products and services which encompass all aspects of machine safety and security, SICK is setting a new standard in safety technology.

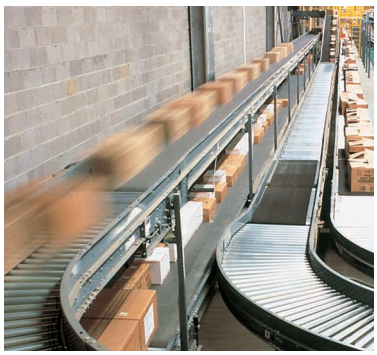




SICK Industrial Sensors

SICK's complete line of photoelectric, inductive, magnetic and capacitive sensors meet the growing efficiency of industrial processes. SICK has become a world leader in factory automation solutions by continually offering innovative product enhancements like reduced housing size and increased range, while maintaining the highest quality production process in the industry. The application possibilities of our comprehensive line of sensors are virtually endless.





SICK North America - Divisions

SICK Automatic Identification

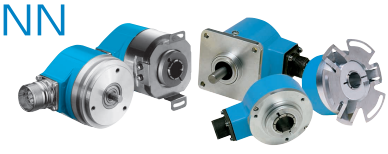
SICK Auto Ident, Inc. has developed innovative, high performance scanning and data capture solutions to meet the demanding requirements of the automatic identification industry. From off-the-shelf bar code readers to complex vision systems, SICK has solutions for your applications.

SICK offers an unmatched combination of technological know-how, a world-class customer support network and the broadest base of application experience in the industry.

SICK Stegmann

SICK Stegmann is a leading manufacturer of shaft encoders (also known as rotary sensors) and actuators for automation technology. The addition of these technologies to SICK's factory automation solutions has provided access to the growth market of drive technology. Continuous innovation combined with the highest levels of precision and quality enable SICK Stegmann to provide customers with encoder systems that are among the best in the world.

SICK | STEGMANN



SICK North America - Divisions

SICK Maihak

SICK Maihak offers in-situ and extractive analyzers for gas and liquid analysis and measurement instrumentation for dust, opacity, volume flow and level.

SICK Maihak has more than 50 years of combined technical experience serving the industries of power, cement, refining, petrochemical, chemical, pharmaceutical, waste incineration, water treatment, pulp and paper, steel, food and beverage, glass and other areas.

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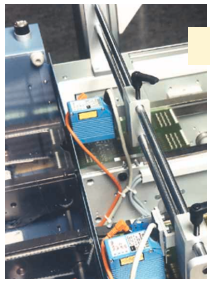
Our main markets

AGV

Packaging

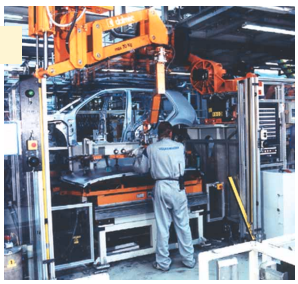


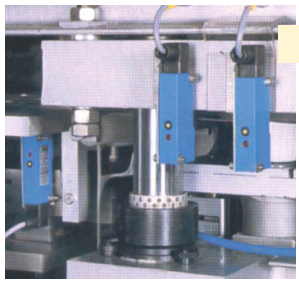
Electronics

Logistics

Automotive

Machine Tool



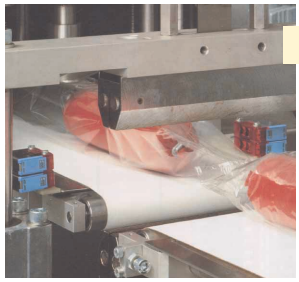


Plastics

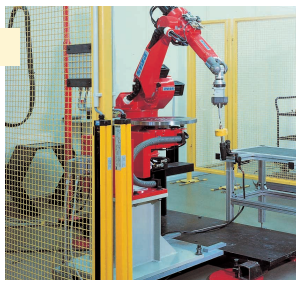
Our main markets

Textile

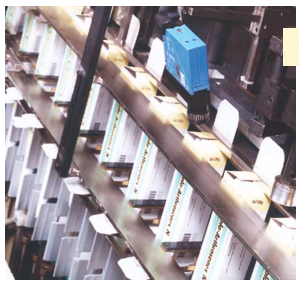
Food



Robotics



Pharmaceutical



Bottling

Ceramics

SICK Safety Systems

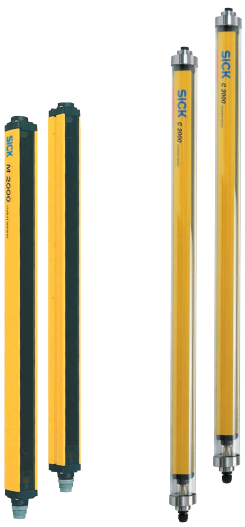
While many of today's automated production lines have been designed with safeguarding devices installed to offer safer working conditions than in the past, they still must allow machinery and personnel to work together to meet high production rates and stringent manufacturing criteria.

An increased production rate is often countered by relevant potential danger, especially where the machines in use involve inherent risk factors for the operator (for example, a stamping press). For this reason, workplace safety is of paramount importance and is backed by national and international laws, norms and safety standards. SICK is an instrumental member of important international standards and safety organizations that develop the guidelines used worldwide to ensure workplace safety.

Setting A New Standard in Safety Solutions

Innovative products from SICK provide comprehensive safeguarding of both workers and machinery. As specialists in sensor and interface safety technology, SICK develops and manufactures pioneering products that encompass all aspects of automation safety. The latest advances have come in the form of safety field-bus technology and optical safeguarding. The advent of safe field-bus architectures is revolutionizing the way systems are designed, installed, and utilized. SICK is leading the way in safe field-bus technology around the globe while continuing to set new standards in optical safeguarding.

SICK has established itself as the worldwide leading industrial safety solutions partner for both large- and small-scale projects in every branch of industry. Years of design, manufacturing, and experience in the field allow SICK to offer a complete range of safety solutions for markets such as automotive, machine tool, robotics, material handling, semiconductor, packaging and palletizing.



SUPPORT

As your partner in automation, SICK provides a variety of support options to ensure that our equipment is installed and operates according to your specifications. SICK provides before and after installation support through an established network of field personnel. With a worldwide presence and complete coverage of the North American market, you will find a personal contact in your area–at your side to provide consultation and support.

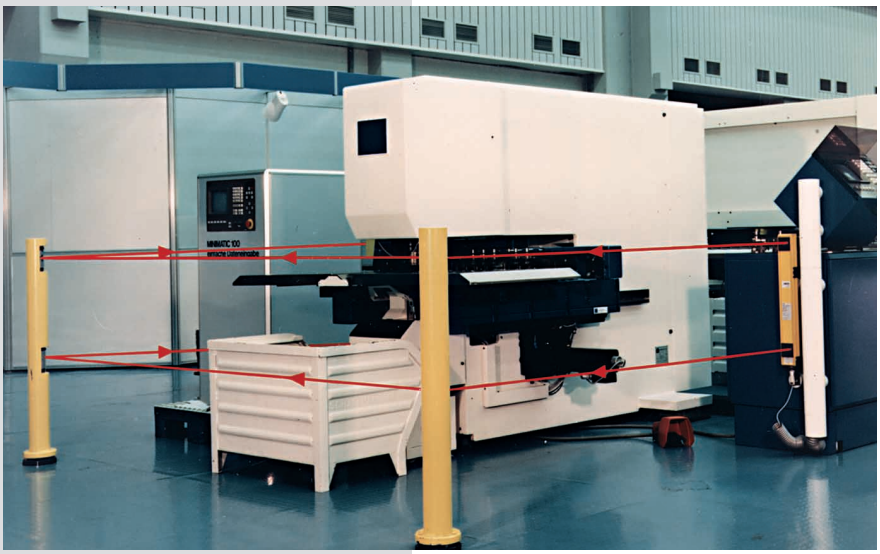
SOLUTIONS

SICK is the leading industrial automation supplier for safety sensor and automatic identification solutions. Our team of applications engineers has the specialized knowledge to assist you in choosing the best solution for your application. With leading products, expertise and services SICK is ready to help you reach your goal of lowering costs, increasing quality and improving safety.

SERVICE

SICK offers a comprehensive range of service options to support your operation. From safety consulting and machine design to repairs and training, SICK offers services to get your operation running and keep it running at maximum efficiencies. Our service offering includes safety and engineering consulting, installation, maintenance, repairs, and product and application training.

Safety standards and regulations



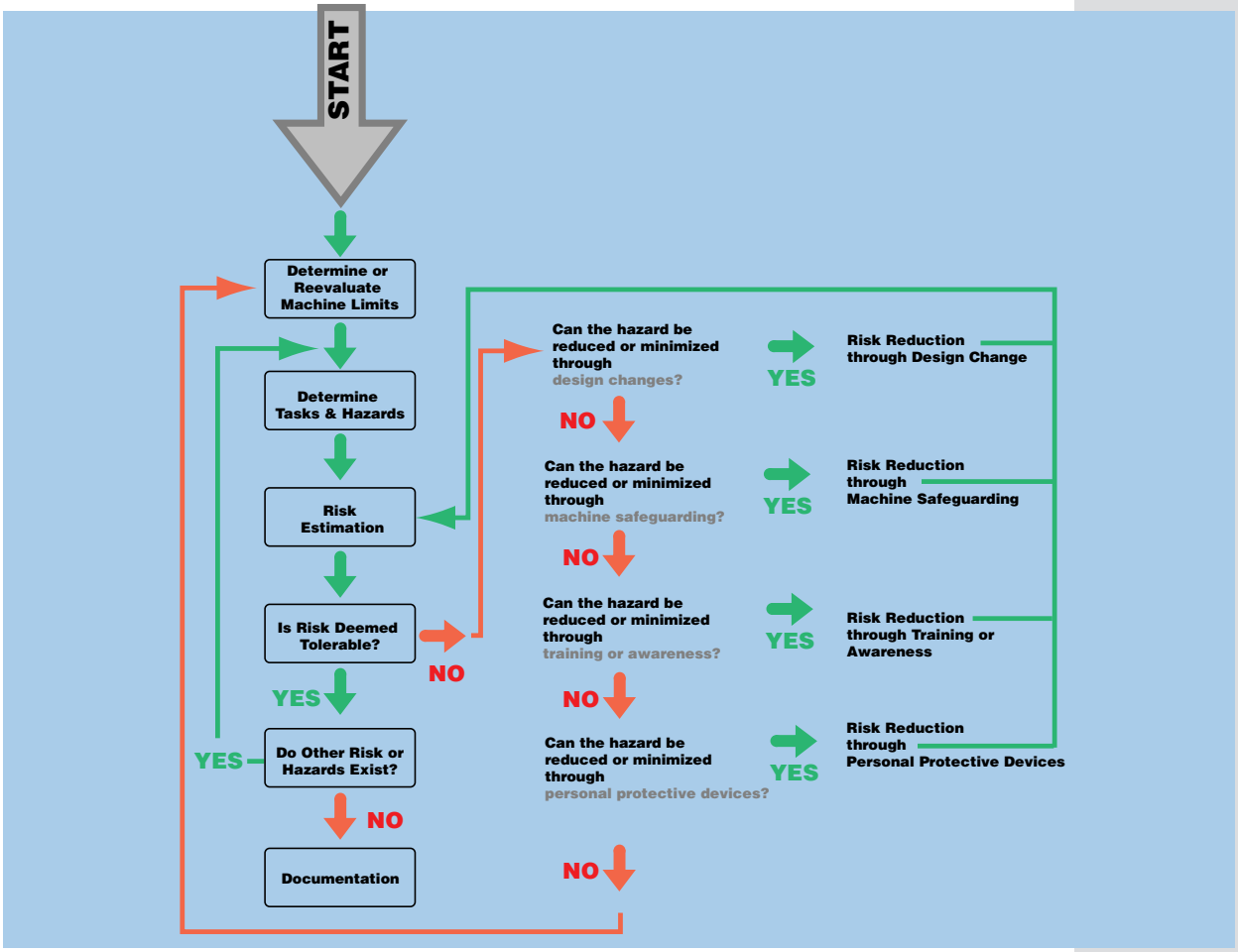
General

This section serves as a guide for designers and users of machinery who specify and use protective devices. This information takes into account applicable North American and European regulations, standards and directives. The examples provided are the result of SICK's many years of practical experience and should be viewed as typical applications. However, no legal claims can be derived from the examples that follow, as every machine requires a specific solution based on the local, regional and national regulations and standards.

When designing a machine, the potential risks must be analyzed and mediated. Where necessary, additional protection must be incorporated to protect operators and other individuals from residual hazards such as crushing, shearing, cutting, snatching, clamping, trapping, perforation, puncturing, risk of shock, etc. [cf. Title 29 U.S. Code of Federal Regulations, Part 1910 Subpart O, European Standards EN 292 (ISO 12100) and EN 1050 (ISO 14121)]. This is known as Risk Assessment and Risk Reduction.

The flowchart presented on the next page summarizes one method of risk assessment that provides insight into the hierarchy of risk reduction strategies.

Example of risk assessment



Why opto-electronic guarding?

Some risks cannot be eliminated through design so it is necessary to use safeguarding devices. Generally speaking, when an operator has to use a machine frequently, and in doing so, he or she is exposed to the risk of hazardous motion, it may be advisable to use a safeguarding device to prevent exposure to the hazard.

Safeguarding devices, when installed properly, prevent access to a hazard or detect the entry of personnel entering a hazardous location. When an entry is detected, the safeguarding device, in conjunction with the control system, either prevents the initiation of hazardous motion or initiates an immediate stop of the hazardous motion, thus eliminating the existence of the hazard.

Opto-electronic protective devices are often preferred over other mechanical safeguarding devices such as fixed safeguards, two-hand controls and barrier devices for several reasons:

- Reduction of Access Time – the operator no longer has to wait for a guard to open
- Increased Productivity – the operator saves time in loading the machine
- Improved Ergonomics – repetitive motion is minimized and perhaps eliminated
- Protects Other Individuals – some safeguarding devices protect the operator, but provide little or no protection for other individuals who may be in or near the hazardous area

Choosing an optical electronic safeguarding device

Once the decision is made to utilize an opto-electronic protective device, the next step in the process is the selection of a specific type of safeguard. The principle criteria for choosing an opto-electronic protective device are defined in the following four steps. Each step is interdependent and calls for an iterative approach.

WARNING!

Before we begin, opto-electronic protective devices cannot be utilized alone if the operator is exposed to any risk of being hit by splashes (e.g., molten materials) or flying materials. Also, it is imperative that the access time be greater than the time needed to stop the hazard.

STEP 1: Defining the zone to be guarded

The first step in choosing which opto-electronic protective device is best suited for an application, is to define and assess the risks associated with the machine. Depending on the configuration of the machine installation, the following points must be taken into account:

- The dimensions of the zone that require safeguarding
- The different points of access and the accessible hazards associated with the machine
- The risk of passing through the safeguarding device(s) and being present in the hazardous zone of the machine undetected

STEP 2: Define the safeguarding function to be performed

The second step is to define what function needs to be performed by the safeguarding device. The primary functions of safeguarding devices generally include, but are not limited to, causing the hazard to cease before access is attained or preventing the unintended start of the machine. Safeguarding device functionality is generally categorized as one of the following:

SAFEGUARDING FUNCTION #1:
POINT-OF-OPERATION

Point-of-operation safeguarding is safeguarding which occurs in close proximity to a machine tool where material is positioned and a process is performed. This safeguarding function is meant to detect fingers or hands entering a defined area during the hazardous motion of the machine.

SAFEGUARDING FUNCTION #2:
PERIMETER / ENTRY-EXIT

Perimeter or entry-exit safeguarding is designed to detect an arm or body entering an area. Once entry has been detected, the hazardous motion of the machine is stopped so that personnel no longer have the potential for exposure to the hazard.

SAFEGUARDING FUNCTION #2:
PERIMETER / ENTRY-EXIT (cont.)

An additional requirement of this safeguarding function is that the operator is required to have a full view of the hazardous area at the control station. This control station, including the ability to restart the machine, must be located well outside of the hazardous area. (The start of the machine cannot be possible from inside of the hazardous area.) In addition, the operator must verify that no person is inside the hazardous area before starting the machine.

SAFEGUARDING FUNCTION #3:
AREA SAFEGUARDING

The function of area safeguarding is similar to perimeter safeguarding with the additional requirement of sensing the presence of personnel within the defined perimeter. This type of safeguarding is suitable for machines where hazardous zones are not visible from the control point or when there is a need to safeguard the approaches to the hazardous area. Such guarding is also suitable for Automated Guided Vehicles (AGVs) to protect personnel during vehicle movement.

STEP 3: Compliance with category of the safety-related parts of the machine control system

Several standards address the methods of assessing and estimating risks associated with the tasks and hazards of a machine [cf. EN 954 (ISO 13849), EN 1050 (ISO 14121), ANSI / RIA R15.06, ANSI B11.TR3, IEC 61 508, and others)]. For the purpose of this discussion, a review of EN 954 and EN 1050 is presented.

Whereas the essential requirements of the European Machinery Directive aim for a high level of safety, the resources used must nevertheless be in proportion to the risk occurring. The safeguarding of an operator who manually loads and unloads piece parts inside a hydraulic press shall not be treated in the same way as the safeguarding of an operator working on a machine where the maximum risk is that of pinching a finger.

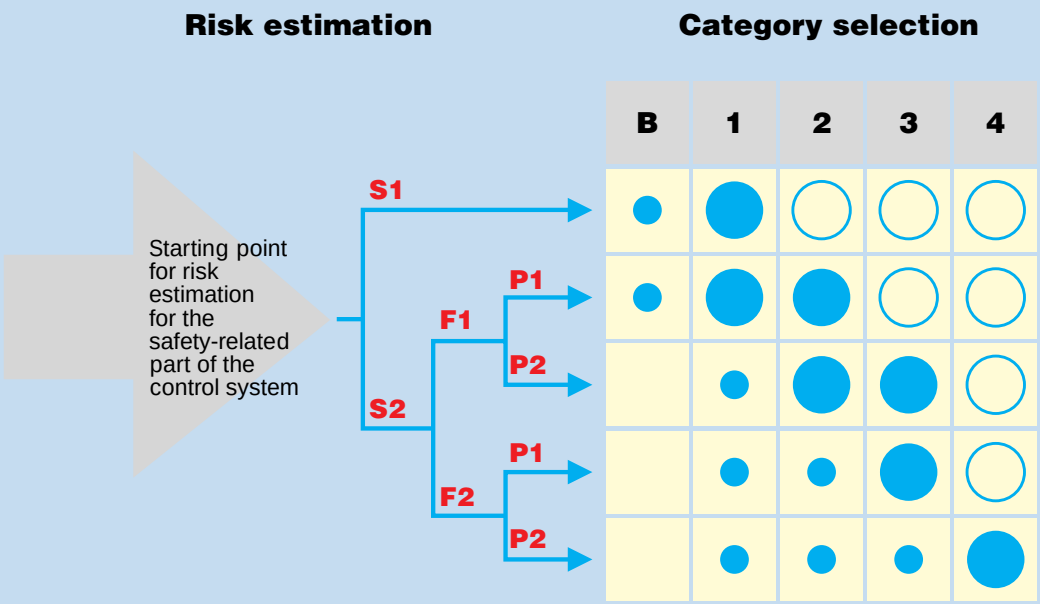
Furthermore, the same machine may have several points of access with varying degrees of risk. Different measures shall therefore be taken for different parts of a machine's safety-related control system.

Standard EN 954 helps the designer to define the categories of the different parts of the safety-related control system on the basis of three parameters:

- The potential severity of the injury
- The frequency and / or duration of exposure to the hazard
- The possibility of avoiding the hazard

The behavior of safety-related control systems in the event of a fault is defined for each of the categories (B, 1, 2, 3, 4). Assuming identical technology (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a progressive scale. For example, category 4 is higher than category 3. On the other hand, they are not intended to compare different technologies. Nevertheless, the safeguarding device and its interface shall meet the requirements of the category of the safety-related parts of the machine control system in question in order that the safeguarding function shall be performed (e.g., stopping the machine and

Category selection of the safety-related part of the control system



- Preferred categories
- Possible categories which can require additional measures
- Measures which can be overdimensioned for the relevant risk

S SEVERITY (of injury)

S1 Slight injury (normally reversible) or requires only first-aid as defined in OSHA § 1904.12*
S2 Serious injury (normally irreversible, or fatal) or requires more than first-aid as defined in OSHA § 1904.12*

F FREQUENCY (or duration of exposure to hazard)

F1 Infrequent Typical exposure to hazard more than once per hour*
F2 Frequent exposure Typical exposure to hazard more than once per hour*

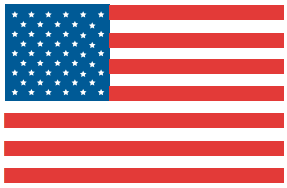
P POSSIBILITY (of avoiding the hazard)

P1 Likely Can move out of the way; or sufficient warning/reaction time; or robot speed less than 250 mm/sec*
P2 Not likely Cannot move out of way; or inadequate reaction time; or robot speed greater than 250 mm/sec*

*Note: Additional definition and criteria information are based on ANSI R15.06-1999 Table 1.

Table of system behavior as a function of category (EN 954)

Categories	Summary of requirements	System behavior	Principle on which safety is based
B	Safety-related parts of control systems and/or their protective equipment, as well as their components, shall be designed, constructed, selected, assembled and combined in accordance with relevant standards so that they can withstand the expected influence.	The occurrence of a failure can lead to the loss of the safety function.	Mainly characterized by selection of components
1	Requirements of B shall apply. Well-tried components and well-tried safety principles shall be used.	The occurrence of a failure can lead to the loss of the safety function but the probability of occurrence is lower than for category B.	
2	Requirements of B and the use of well-tried safety principles shall apply. Safety function shall be checked at suitable intervals by the machine control system.	The occurrence of a failure may lead to loss of the safety function between the checking intervals. The loss of the safety function is detected with internal or external testing of the device.	Mainly characterized by structure
3	Requirements of B and the use of well-tried principles shall apply. Safety-related parts shall be designed, so that: - a single failure in any of these parts does not lead to the loss of the safety function, and - whenever reasonably practicable the single fault is detected.	When a single failure occurs, the safety function is still assured. Some, but not all, failures are detected. An accumulation of undetected failures may lead to loss of the safety function.	
4	Requirements of B and the use of well-tried safety principles shall apply. Safety-related parts shall be designed, so that: - a single failure in any of these parts does not lead to a loss of the safety function, and - the single failure is detected at or before the next demand upon the safety function. If this is not possible, then an accumulation of failures shall not lead to a loss of the safety function.	When the failures occur, the safety function is always retained. The failures will be detected in time to prevent loss of the safety function.	



STEP 4: Calculating the minimum safety distance (United States and Canada)

The calculation of the minimum safety distance for a safeguarding device is described in the U.S. Code of Federal Regulations, Volume 29 (29CFR), Part 1910, Subpart O entitled “Machine Safeguarding.”

Users are also directed to refer to specific machine regulations and standards that may apply to their application.

Any safeguarding device shall be installed in such a way that access to the hazardous zone is not possible without detection by the safeguarding device.

If the minimum safety distance calculated is acceptable from an operational and ergonomic point of view, the installation and the configuration of the safeguarding device must prevent access to the hazardous zone by personnel (e.g. the ability to reach over, under, around or through the safeguard without being detected should be prevented).

If the minimum distance is too great and is not acceptable from an ergonomic point of view, it must be determined as to whether it may be possible to reduce the overall machine stop response time or reduce the depth of penetration factor (D_{pf}) by improving the object sensitivity (resolution) of the safeguarding device.

General Safety Distance Calculation as given in
ANSI B11.19-2003 Annex D Equation 7; CSA/CAN Z142-02 and Code of Federal Regulations Volume 29 Part 1910.217 (h) (9) (v):

$$D_s = H_s \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

Where...

Minimum Safety Distance Required

D_s The minimum distance in inches (or mm) from the hazardous zone to the detection point, plan or zone.

Hand Speed Constant

H_s A parameter in inches / seconds or mm / second, derived from data on approach. Speeds of the body or parts of the body. Often 63 in / s is used for H_S.

Components of the Overall Response Time of the Machine

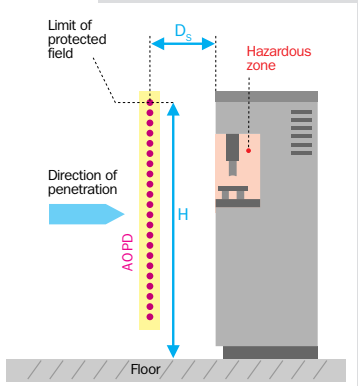
T_s Stop time of the machine tool measured at the final control element
T_c Response time of the control system
T_r Response time of the presence-sensing device and its interface
T_{bm} Additional response time allowed for brake monitor to compensate for wear
Note: Any additional time delays must also be accounted for in this calculation

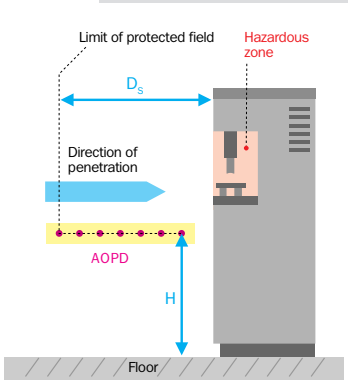
Depth Penetration Factor

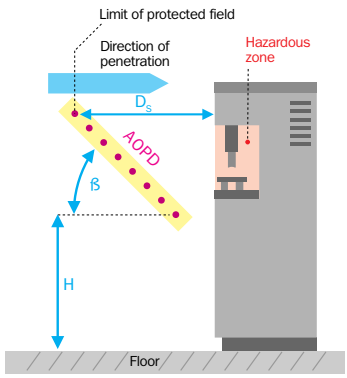
D_{pf} An additional distance added to the overall safety distance required. This value is based on intrusion toward the danger zone prior to actuation of the electro-sensitive protective equipment (ESPE). Values range from 0.25 inches to 48 inches or more depending on application. For example, in opto-electronic safeguarding, such as with a perpendicular safety light curtain applications with object sensitivity (resolution) less than 2.5 inches, the D_{pf} can be approximated based on the following formula:

D_{pf} (inches) = 3.4 x (Object Sensitivity – 0.276), but not less than 0.

Perpendicular Approach $\beta = 90° (\pm 5°)$	Object Sensitivity (Resolution) **Less than 64 mm (2.5 in)** Height of Lowest Beam < 300 mm (12 in) Height of Highest Beam ≥ 1200 mm (48 in)	$D_S = H_S \times \Sigma T_{total} + D_{pf}$ Where D_{pf} is determined by: $D_{pf} = 3.4 \times (\text{Resolution} - 6.875 \text{ mm})$ $D_{pf} = 3.4 \times (\text{Resolution} - 0.275 \text{ in})$
	Object Sensitivity (Resolution) **Equal to or Greater than 64 mm (2.5 in) and Less than 600 mm (24 in)** Height of Lowest Beam < 300 mm (12 in) Height of Highest Beam ≥ 1200 mm (48 in)	$D_S = H_S \times \Sigma T_{total} + D_{pf}$ Where D_{pf} is determined by: $D_{pf} = 900$ mm (36 in)
	Object Sensitivity (Resolution) **Less than 600 mm (24 in)** Height of Lowest Beam < 300 mm (12 in) Height of Highest Beam ≥ 900 mm (36 in)	$D_S = H_S \times \Sigma T_{total} + D_{pf}$ Where D_{pf} is determined by: $D_{pf} = 1200$ mm (48 in)
Horizontal or Parallel Approach $\beta = 0° (\pm 5°)$	Height of Protective Field < 300 mm (12 in)	$D_S = H_S \times \Sigma T_{total} + D_{pf}$ Where D_{pf} is determined by: $D_{pf} = 1200$ mm (48 in)
Angular Approach $5° < \beta < 85°$		Where β equal or greater than 30°, use the perpendicular approach defined above. Where β is less than 30°, use the horizontal or parallel approach defined above. The safety distance D_S is based on the beam closest to the hazard.







Per ANSI R15.06-1999

IMPORTANT NOTE:

Under any circumstances it shall not be possible to reach the closest hazard. For calculation of the height of detection zone ref. EN 294, (ISO 13852), Table 1.

D_S: minimum safety distance
H: height of the detection zone
d: object sensitivity resolution
ß: angle between plane of detection and direction of penetration
T: time

STEP 4: Calculating the minimum safety distance (European)

The calculation of the safety distance for an optical electronic safeguard device is described in standard EN 999 (ISO 13855). If a standard exists that addresses a specific machine type (e.g., cold metal presses) or particular technical specifications (renewal of cold metal presses), these standards and technical specifications must be adhered to.

Any safeguarding device shall be installed in such a way that access to the hazardous zone is not possible without detection by the safeguarding device.

If the minimum safety distance calculated is acceptable from an operational and ergonomic point of view, the installation and the configuration of the safeguarding device must prevent access to the hazardous zone by personnel (e.g. the ability to reach over, under, around or through the safeguard without being detected should be prevented).

If the minimum distance is too great and is not acceptable from an ergonomic point of view, it must be determined as to whether it may be possible to reduce the overall machine stop response time or reduce the depth of penetration factor (D_{pf}) by improving the object sensitivity (resolution) of the safeguarding device.

For example: With a perpendicular approach and an overall stopping performance of 100 ms, the calculated distance will be equal to 368 mm for an opto-electronic protective device with resolution of 35 mm, whereas with a resolution of 14 mm the calculated distance would only be 200 mm.

With regard to the detection capability of the opto-electronic protective device, at a minimum, the distance C outlined in the table below shall be used when calculating the minimum distance S (table taken from EN 692 and EN 693).

General calculation formula given in EN 999

$$S = (K \times T) + C$$

Where...

S is the minimum distance in mm from the hazardous zone to the detection point, plane or zone;

K is a parameter in mm per second, derived from data on approach speeds of the body or parts of the body;

T is the overall stopping performance in seconds;

C is the additional distance in mm, based on intrusion towards the danger zone prior to actuation of the protective equipment.

Detection Capability d mm	Additional Distance C mm	Cycle Initiation by the AOPD
≤ 14	0	Allowed
14 ≤ 20	80	
20 ≤ 30	130	
30 ≤ 40	240	Not Allowed
40	850	

cf.: EN 692, prEN 693, prEN 12622

Vertical Approach

β = 90° (± 5°)
d = ≤ 40 mm

n.b. To prevent bypassing the opto-electronic protective device, use EN 294.

In practice this standard cannot always be applied because it considers the hand to be deformable. In this case, it is necessary to seek advice from the responsible body.

S = 2000T + 8 (d - 14)
where S > 100 mm
K = 2000 mm / s
C = 8 (d - 14)

where S > 500 mm
take S = 1600T + 8 (d - 14)
in this case S cannot be < 500 mm.

40 < d ≤ 70 mm

Height of lowest beam ≤ 300 mm
Height of highest beam ≥ 900 mm

No. beams	Recommended heights
4	300, 600, 900, 1200 mm
3	300, 700, 1100 mm
2	400, 900 mm
1	750 mm

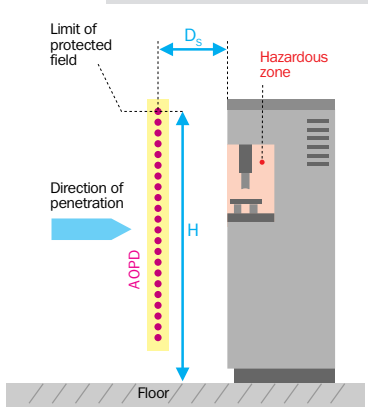
S = 1600T + 850 mm

d > 70 mm
multi-beam

S = 1600T + 850 mm

single beam

S = 1600T + 1200 mm

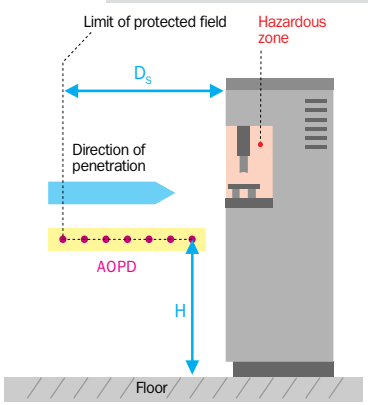


Parallel Approach

β = 0° (± 5°)

15 (d-50) ≤ H ≤ 1000 mm
H ≥ 300 mm there is a risk of undetected access under the beam to be taken into account for H
where d ≤ (H / 15) + 50

S = 1600T + (1200 - 0.4 H)
where 1200 - 0.4 H > 850 mm
K = 1600 mm / s
C = 1200 - 0.4 H

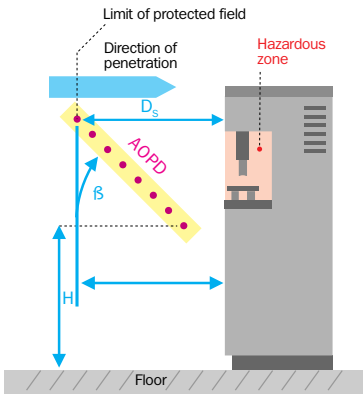


Angular Approach

5° < β < 85°

d ≤ (H / 15) + 50 applies to the lowest beam

Where ß > 30°C, cf. vertical approach
Where ß < 30°C, cf. parallel approach
S then applies to the furthest beam whose height ≤ 1000 mm



Per EN 999 (ISO 13855)

S: minimum distance
H: height of the detection zone above the reference plane
d: detecting capability (resolution)
β: angle between plane of detection and direction of penetration
T: overall stopping performance

Machine safeguarding examples

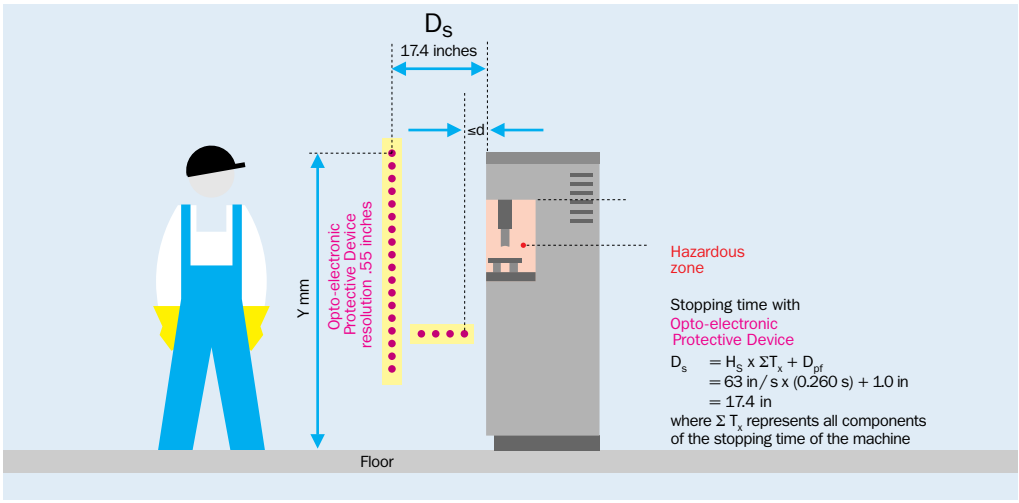
Area guarding on an assembly line

This example shows two possible ways of addressing safeguarding needs for a machine with a hazardous pinch point. Both vertical and horizontal machine safeguarding is taken into account. It is assumed that the machine is only accessible via this front access, that the risk is one of severe injury and that the operator frequently accesses the hazardous zone.

SOLUTION #1: PERPENDICULAR APPROACH. POINT-OF-OPERATION GUARDING IN COMBINATION WITH AREA GUARDING.

In the diagram below, a safety light curtain with 14 mm resolution is mounted vertically to provide point- of-operation safeguarding. A second light curtain segment is mounted horizontally to prevent personnel from being present behind the vertical approach.

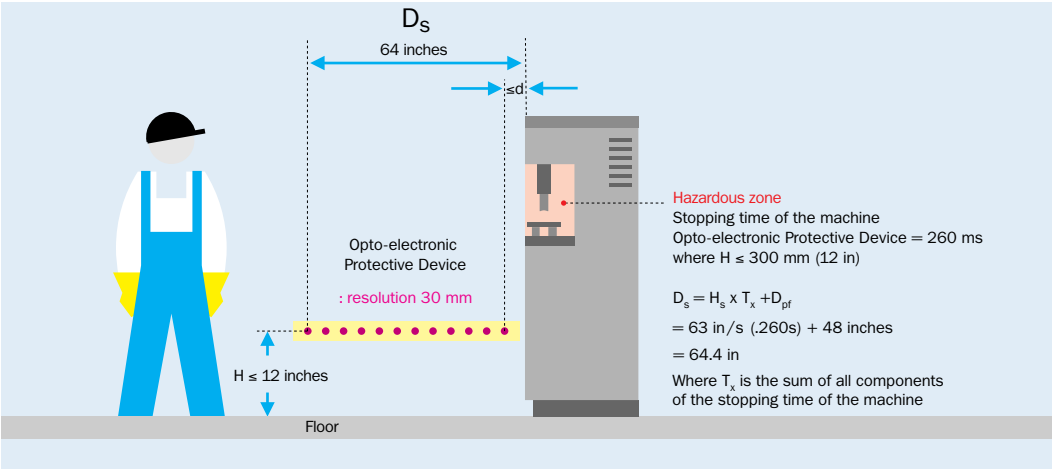
It is imperative that the vertical light curtain is mounted in such a way as to prevent personnel from reaching over, under or around the safety light curtain, thus reaching the hazard undetected.



SOLUTION #2: HORIZONTAL APPROACH. AREA SAFEGUARDING.

In this approach, a horizontal opto-electronic protective device is used. The above diagram shows the calculation of the safety distance D_S and the positioning of the optical electronic safeguarding device.

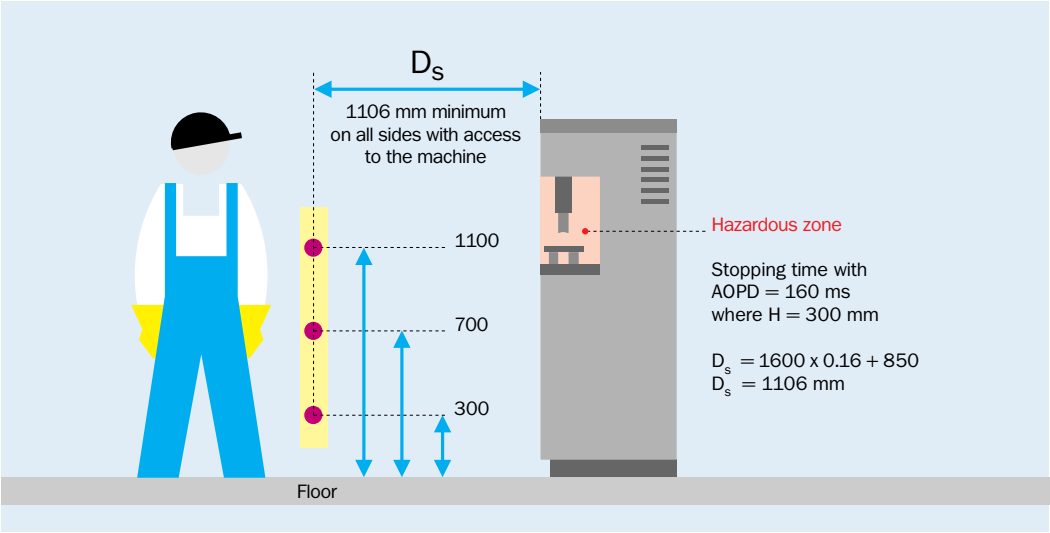
It is important to note that the maximum mounting height of the opto-electronic protective device is 0.3 m (12 in). If these mounting considerations cannot be met, mechanical means have to prevent a person from entering the hazardous zone undetected by passing under the opto-electronic protective device.



Perimeter safeguarding example

The diagram below shows a perimeter safeguarding application that uses an opto-electronic protective device with three beams (at heights of 300, 700 and 1100 mm) and is mounted in a perpendicular approach to the hazard.

This solution must account for the possibility of the operator becoming undetected between the hazardous zone and the opto-electronic protective device. Consequently, additional precautions must be taken to alleviate this risk. For example, the local control shall be positioned in such a way that the whole of the hazardous zone can be seen, and it shall be located outside of the hazardous zone and out of reach of any personnel who may be inside the defined perimeter.



Guarding the interior of a large press example

This type of guarding is recommended for large presses where access is possible at ground level. A SICK S 3000 area scanner may be used to prevent the press from starting when an operator is detected inside of the hazardous area of the press. In this case, the area scanner is utilized as a secondary-safeguarding device. It does not take the place of the primary safeguarding device, namely the SICK Safety Light Curtain shown in the foreground.

The safety distance must be calculated for the main safeguarding device, the function of which is to stop the press, whereas the secondary device detects the presence of a person in the press and does not allow the hazardous downward motion of the press to be initiated.

Power Press Application: Uses a combination of SICK safety light curtain for point of operation safeguarding and SICK proximity laser scanner for area safeguarding. Both the safety light curtain and the laser scanner are active during the starting process of the press. As the down stroke occurs, the laser scanner is muted.

Connection to machine control circuit interface

Every safety device must be incorporated into the machine control system so as to form an integral part of it. Therefore, the relevant part of the machine control circuit, the connection of the safety device to that part of the control system and the safety device itself, must take into account the category, as defined at the time of estimating the risk in accordance with ANSI / R15.06-1999, EN 954, EN 1050 or other industry-accepted risk assessment criteria.

The following diagrams and corresponding explanations define safety categories in accordance with EN 954 and EN 1050. It is important to note that the safety "system" is comprised of more than just the safeguarding device. The control and interface unit(s), as well as all controlling elements (e.g. stop valve), must also be taken into account.

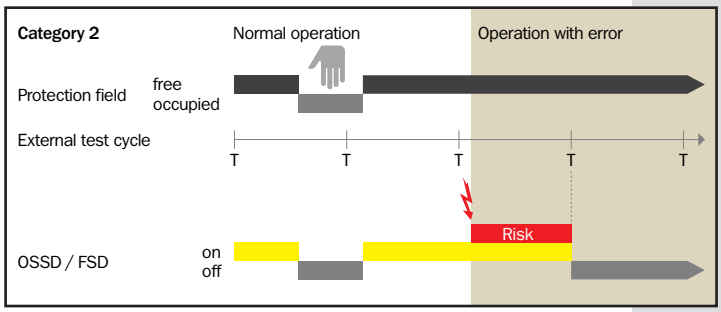
Under normal operating conditions, the safeguarding device is activated when the protective field is infringed upon. The safeguarding device then generates a safety stop signal which should, in turn, lead to the cessation of the hazardous motion of the machine.

However, if a fault does occur in the safeguarding device, it is dealt with differently, depending on the category of the safeguarding device as defined further in the diagrams below.

Loss of safety function between checking intervals possible.

Failure detection at time of checking through the external test.

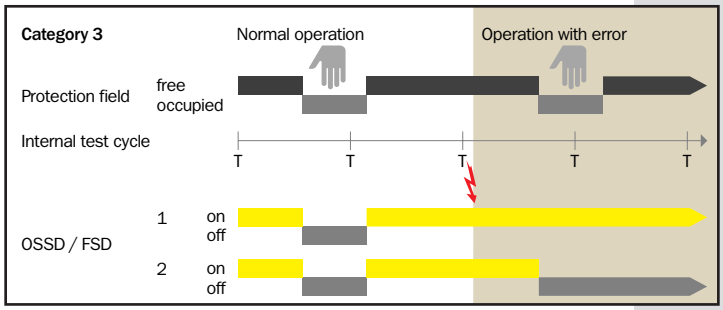
In the period between the failure occurrence and the next test there is a risk of a failure.



A single failure assures the safety function as an output signal for stopping can still be generated (e.g., if a hand enters the protection field). The failure is detected either when the hand enters the protection field or by internal checking.

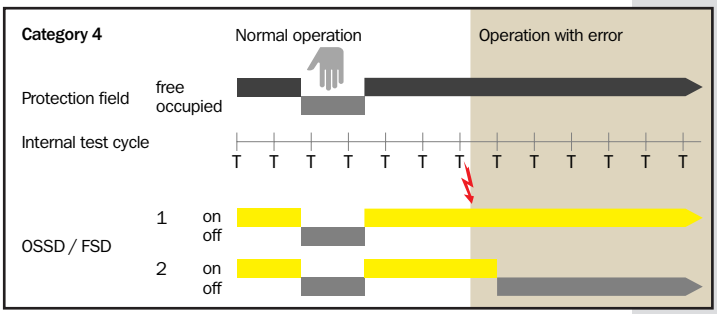
Accumulation of failure may lead to loss of the safety function.

The system shall be designed so that a single failure in any of its parts does not lead to the loss of safety functions.



A single failure still assures the safety function. In addition to category 3, the safety function must be assured in case of an accumulation of failure. Therefore, internal tests must be within the response time of the safety device.

The single fault is detected at or before the next demand on the safety function. If the detection is not possible then an accumulation of failure shall not lead to a loss of the safety function.



Control reliability

Control reliability has been defined and implemented based on a variety of definitions. In the definitions presented below, the word "shall" denotes a mandatory requirement for compliance with a regulation or standard. The words "should" and "may" are intended to reflect recommendations and good work practices. For example, OSHA 1910.211 defines control reliability as:

"A control system designed and constructed so that a failure within the system does not prevent normal stopping action from being applied when required, but does prevent initiation of a successive cycle until the failure is corrected. The failure shall be detectable by means of a simple test or indicated by the control system."

The American National Standards Institute (ANSI) defines control reliability in their standard B11.19-2003 as:

"The capability of the machine control system, the safeguarding, other control components and related interfacing to achieve a safe state in the event of a failure within their safety related functions."

ANSI B11.19-2003 Annex C further states:

"Control reliability of electrical, electronic, pneumatic, or hydraulic systems or devices frequently consists of monitored, multiple and independent parallel or series components, modules, devices or systems. Control reliability of machine control systems or devices can be achieved by the use of, but not limited to, one or both of the following:

- *The use of two or more dissimilar components, modules, devices or systems, with the proper operation of each being verified (monitored) by the other(s) to ensure the performance of the safety function(s).*
- *The use of two or more identical components, modules, devices or systems, with the proper operation of each being verified (monitored) by the other(s) to ensure the performance of the safety function(s).*

These methods require that the safeguarding device, its interface to the control system (or directly to the actuator control) and actuator control meet the above requirements.

Another control reliability strategy may be used when the machine motion is stopped and reinitiated at least once per cycle. This strategy requires that the control system and the actuator control utilize the design methods above. The safeguarding device and its interface may or may not be control reliable. To ensure that these elements cannot cause a loss of the safety-related function(s), the control system must be designed to require that the device and its interface is exercised automatically or by the operator (e.g., releasing hand controls or interrupting an electro-optical device) before a subsequent machine cycle may be initiated. The achievement of control reliability is dependent upon the selection and integration of components, modules, devices and systems that have been specifically designed and intended for use in safety-related functions."

Based on these definitions, it is important to take control reliability into account in the development of safety-related electrical, electronic and pneumatic systems. Control reliable circuits are frequently hardware based and include monitoring at the system level. Standards are now also allowing the use of programmable, firmware based control reliable circuits. ANSI / RIA R15.06-1999 provides requirements for implementation of firmware-based control reliability. Section 6.4 of this standard, entitled "Safety related software and firmware based controllers," states the following:

"Software and firmware-based controllers used in place of hardware based components with safety-related devices shall be designed such that any single safety related component or firmware failure shall:

- *lead to the shutdown of the system in a safe state, and*
- *prevent subsequent automatic operation until the component failure has been corrected;*
- *supply the same degree of safety achieved by using hardwired/hardware components per 4.5.4.*

For example, this degree of safety may be achieved by using microprocessor redundancy, microprocessor diversity, and self-checking; be certified by a Nationally Recognized Testing Laboratory (NRTL) to an approved standard applicable for safety devices."

Underwriters Laboratories (UL) has developed a new category (NRGF) for these types of programmable systems. This category covers control equipment incorporating software for use in safety-related functions and includes compliance with IEC/EN 61 508, "Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems." Based on the definitions and testing of firmware-based safety systems, safety-rated field bus architectures such as PROFIsafe, AS-i Safety at Work and DeviceNet Safety will continue to gain industry acceptance and implementation for the foreseeable future. Advantages of safety-rated field bus systems include:

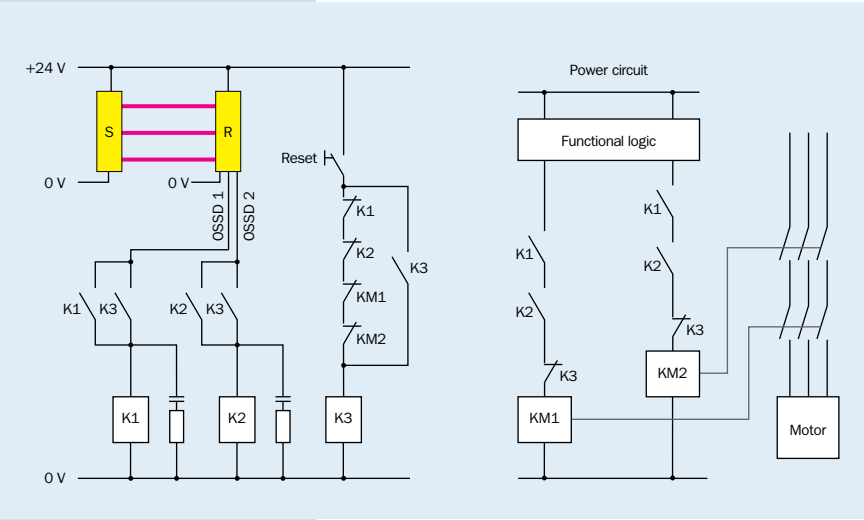
- Reduced Wiring Efforts
  - Reduction in the number of components required
  - Locating remote inputs and outputs closer to sensors and actuators
  - Making replacement of modules simpler without interrupting other inputs and outputs
  - Simpler assembly of subsystems
- Machine Availability
  - Faster debugging capability
  - Improved diagnostic functions
  - Lower Mean Time To Repair (MTTR)
  - Remote Maintenance and Diagnostics
  - Reduced time to restart
- Improved Technology
  - Changeover from relay based solutions to control system solutions
  - Increased automation capability
  - User mode functionality
  - Provides easier expansion capability and component reusability
- Media Independent Protocol/ Multi-Vendor Solutions
  - Increased flexibility through user-selectable component choices
  - Protects hardware investment now and in the future
  - Reduction of acquisition costs due to competition
  - Reduction of engineering costs through commonality of parts
- Computer Aided Engineering
  - Reduced efforts in system planning

It is also important to note that standard programmable devices (i.e. standard PLCs) that have not been third-party certified as safety-rated devices should not be utilized for the purpose of safeguarding as these devices do not comply with the control reliability requirements mandated by OSHA regulations.

SICK Intelliface interfaces feature a variety of control reliable devices that satisfy customer expectations for hardware-based control, safety-rated controllers or safe-rated field bus technology. Refer to the UE 10, UE 100 and UE 1000 series of devices for additional information.

Control reliable circuit example with external reset

Safety Stop Control Circuit **Safety Stop Circuit**



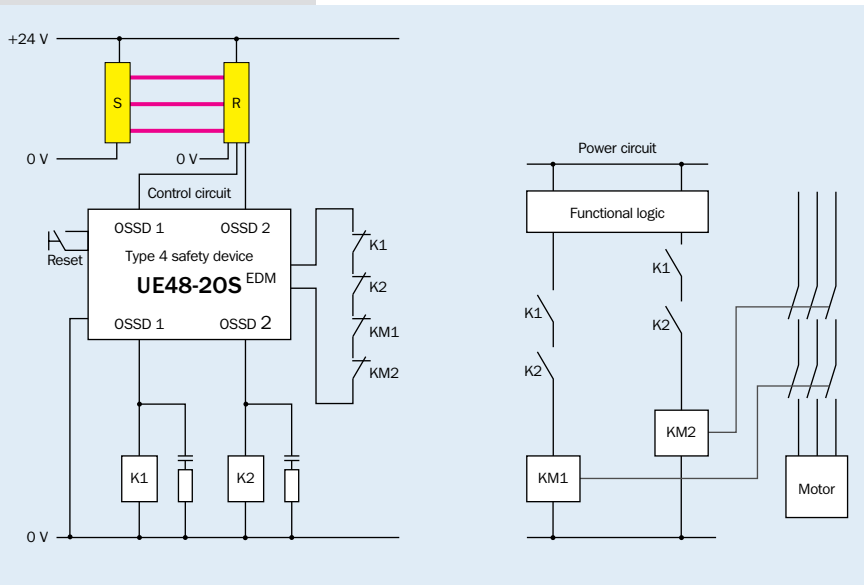
Control Reliable Circuit with External Reset

The diagram represents a simple machine where the opto-electronic protective device resetting function also causes the machine to start. K1, K2 and K3 are machine control the auxiliary safety contactors. KM1 and KM2 are contactors. All contactors must utilize captive contacts.

Here, control reliability is assured at all stages: At the level of the safety device, at the level of the auxiliary contactors K1 and K2 (relay technology) and to protect the coherence of the system at the level of contactors KM1 and KM2. Self-monitoring of contacts is assured by preventing restarting via K3. If one of the NO contacts is welded, its "counterpart" NC contact remains open. Consequently, the coil of K3 is not energized and will not allow coils K1 and K2 to latch. The control circuit therefore remains open.

Control reliable circuit example with internal reset

Safety Stop Control Circuit **Safety Stop Circuit**



Control Reliable Circuit with External Reset

Example of connection of a type 4 safety device with reset. Reset is dynamically monitored by safety devices from SICK (protection against short-circuits). The wiring is somewhat simpler compared that outlined in the diagram. Above External Device Monitoring (EDM) is also monitored dynamically.

Opto-electronic protective devices and muting

In certain applications, "muting" the safeguarding function of the control system may be necessary in order to move products from one location to another. Based on this definition of muting, the process of implementing muting in a control system raises the issue of personnel safety in machine guarding installations.

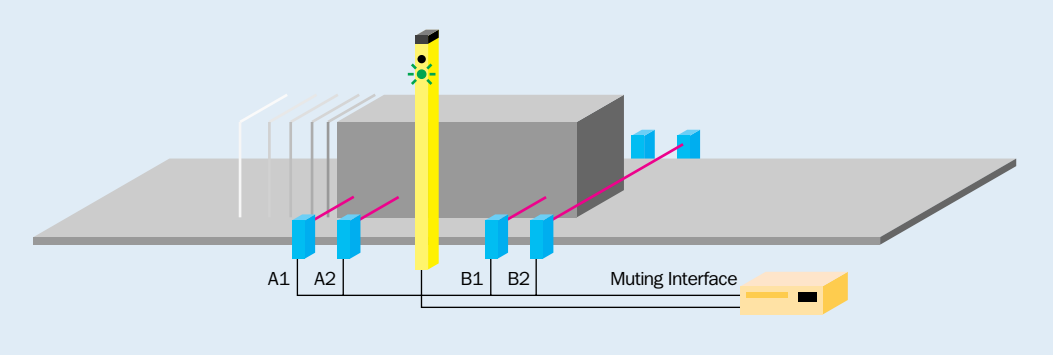
ANSI B11.19-2003 defines muting as: "The automatic temporary bypassing of any safety related function(s) of the control system or safeguarding device." Section 8.3.2.5 of this standard provides further clarification regarding muting when using safeguarding presence sensing devices.

"Muting of the device shall be permitted during the non-hazardous portion of the machine cycle. Muting of the device shall be accomplished such that a single failure of a component, a subassembly or a module of the system/device that affects the performance of the safety-related functions shall not prevent a normal stop command from being initiated, or shall cause an immediate stop command. In the event of a failure, re-initiation of the machine shall be prevented until the failure is corrected or the system or device is manually reset. In the presence of a failure, repetitive manual reset of the system or device shall not be used for production.

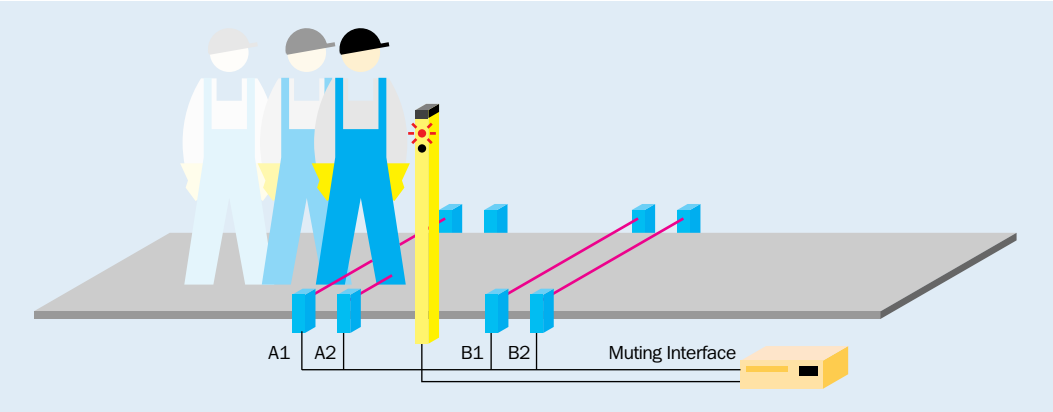
If the machine has reversing capability where a muting hazard is possible, the control system shall include an automatic means so muting is only permitted in the forward direction.
If an individual can pass through a sensing field when the device is muted, means shall be provided to ensure that the individual is outside of the hazard area, or that the machine ceases hazardous motion when the muting is removed."

A number of European standards also address the issue of muting. For example, European Standard EN 415-4 requires the following conditions be met for muting in a conveyor or palletizer application:

- Muting may only occur during the period of the operating cycle when the loaded pallet obstructs access to the hazardous zone.
- Muting shall be automatic.
- Muting shall not depend on a single electrical signal.
- Muting shall not depend entirely on software signals.
- The muting signals, if they occur in the course of an invalid combination, shall not allow a state of muting, and ensure that the protective function is retained.
- The muting state must be removed immediately after the pallet has passed through and the protective device is thus effective again.



The conveyed material is identified, which mutes the safety light curtain. No safety stop signal is generated.



As the operator moves through the muting sensor array, he does not satisfy the profile of the conveyed material. Muting does not take place. When the protective field of the safety light curtain is infringed upon, a safety stop signal will be generated.

Regulations, directives, objectives and procedures

Health and safety in the workplace has been a serious topic in the United States for more than 30 years. In 1970, the United States Congress recognized that "personal injuries and illnesses arising out of work situations imposed a substantial burden upon, and were a hindrance to, interstate commerce in terms of lost production, wage loss, medical expenses and disability compensation payments." (Occupational Safety and Health Act (OSHA) of 1970, Section 2 (a)).

Based on these issues and others, Congress passed the Occupational Safety and Health Act of 1970. This act encourages "employers and employees efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthful working conditions." (OSHA Act of 1970, Section 2 (b) (1)).

As part of the OSHA Act of 1970, Congress established the Occupational Safety and Health Administration (OSHA) to enforce worker safety regulations associated with the Act.

From a European perspective, the reality of free circulation of goods, services and people has forced new regulations and standards to be developed such that common laws apply to all goods, services and people within the European community.

Member states of the European Union have therefore attempted to develop harmonized technical standards, fiscal regulations and common rules, which apply uniformly to all member states.

Safety of machinery and operators is an area where harmonization has progressed at a rapid pace. Directives have been passed and technical standards have been developed which specifically address the issue of machinery safety.

The remainder of this Safety Engineering section deals specifically with those regulations and standards that apply to the United States and Europe.

Worker safety regulatory agencies in the United States

Worker safety regulations in the United States are enforced through the Occupational Safety and Heath Administration (OSHA). The United States Congress, through the Occupational Safety and Health Act, established OSHA on December 29, 1970. The goal of this act was to assure safe and healthful working conditions for working men and women by:

- Authorizing enforcement of the standards developed under the Act,
- By assisting and encouraging the States in their efforts to assure safe and healthful working conditions; and
- By providing for research, information, education and training in the field of occupational safety and health.

Occupational and Health Standards in the United States are defined in Title 29 of the Code of Federal Regulations Part 1910, which is broken down into a number of subparts. Subpart O deals specifically with Machinery and Machine Guarding and defines general requirements for all machines as well as requirements for certain specific types of machinery. A breakdown is presented in the table on the following page.

In addition, Section 18 of the OSHA Act of 1970 encourages States to develop and operate their own job safety and health programs. The following states have approved State Plans:

• Alaska	• Michigan	• Tennessee
• Arizona	• Minnesota	• Utah
• California	• Nevada	• Vermont
• Connecticut*	• New Mexico	• Virgin Islands
• Hawaii	• New York*	• Virginia
• Indiana	• N. Carolina	• Washington
• Iowa	• Oregon	• Wyoming
• Kentucky	• Puerto Rico	
• Maryland	• S. Carolina	

** The Connecticut and New York State Plans cover public sector (State and Local Government) employment only.*

OSHA provides contact information and an OSHA profile for each of these State Plans which may include additional regulations. This information may be obtained at OSHA's web site at:

www.osha-slc.gov/fso/osp/

or

www.osha.gov/index.html

Worker safety regulatory agencies in the United States and Canada

In addition to the referenced OSHA Standards, OSHA also may enforce National Consensus Standards as though they are OSHA standards. The term "national consensus standard" means any occupational safety and health standard or modification thereof, which:

- Has been adopted and promulgated by a nationally recognized, standards-producing organization under procedures whereby it can be determined by the Secretary of Labor that persons interested and affected by the scope or provisions of the standard have reached substantial agreement on its adoption;
- Was formulated in a manner which afforded an opportunity for diverse views to be considered;
- Has been designated as such a standard by the Secretary of Labor, after consultation with other appropriate Federal agencies; and
- Any international standard that covers a subject which is not covered by a standard in the United States.

It is important to note that OSHA utilizes these national consensus standards to further define machine safeguarding requirements in addition to Subpart O. For instance, in 1910.212(a)(3)(ii), the following statement is made:

"The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle."

"Any appropriate standards" refers to national consensus standards that are generally accepted in industry. Where possible, OSHA promulgates these national consensus standards and established federal standards as safety standards. The American National Standards Institute (ANSI), National Fire Protection Agency (NFPA) and in some instances Underwriters Laboratories (UL) are national consensus standards bodies that may be referenced by OSHA.

A summary of important ANSI and other safety standards is presented in the tables that follow. Consult local, state and federal regulations for any additional requirements that may apply to your specific application.

In Canada, government agencies in all jurisdictions play a role in occupational safety and health. Various regulations outline the rights and responsibilities of employers, supervisors and workers.

Canada's federal government and each of the provinces/territories has its own occupational safety and health legislation. The federal government has responsibility for the health and safety of its own employees and federal corporations, plus workers in certain industries such as inter-provincial and international transportation (e.g., railways and air transport), shipping, telephone and cable systems, etc.

Approximately 10% of the Canadian workforce fall under federal jurisdiction. The remaining 90% of Canadian workers fall under the legislation of the province or territory where they work.

For example, in the province of Ontario, the provincial Ministry of Labour specifies the regulations associated with occupational safety and health. In the Ontario Occupational Health and Safety Act, Revised Statutes of Ontario, 1990, the following regulations for industrial establishments have been defined:

R.R.O. 1990, Reg. 851 ***Occupational Health and Safety Act for Industrial Establishments****, as amended by Ontario Regulations 516/92, 630/94, 230/95, 450/97, 144/99, 284/99, 528/00 and 488/01*

Consult the provincial, territory or federal regulations for additional information regarding the regulations that apply to the particular province, territory or federal jurisdiction. Additional information can be obtained from Canada's National Health and Safety website at URL address: http://www.canoshweb.org.

Several standards related to machinery and machine safety are presented in the tables below and on the following page:

Title 29 of the U.S. Code of Federal Regulations, Part 1910, Subpart O

- 1910.211 - Definitions
- 1910.212 - General requirements for all machines
- 1910.213 - Woodworking machinery requirements
- 1910.214 - Cooperage machinery
- 1910.215 - Abrasive wheel machinery
- 1910.216 - Mills and calenders in the rubber and plastics industries
- 1910.217 - Mechanical power presses
- 1910.218 - Forging machines
- 1910.219 - Mechanical power-transmission apparatus

Selected passages of these subpart sections appear in the appendix at the end of this Safety Engineering section.

Summary of Important National Consensus Standards for Worker Safety in the United States

ANSI B11.1	Mechanical Power Presses – Safety Requirements for Construction, Care and Use
ANSI B11.2	Hydraulic Power Presses – Safety Requirements for Construction, Care and Use
ANSI B11.3	Power Press Brakes – Safety Requirements for Construction, Care and Use
ANSI B11.4	Machine Tools – Shears – Safety Requirements for Construction, Care and Use
ANSI B11.5	Machine Tools – Iron Workers – Safety Requirements for Construction, Care and Use
ANSI B11.6	Lathes – Safety Requirements for Construction, Care and Use
ANSI B11.7	Cold Headers and Cold Formers – Safety Requirements for Construction, Care and Use
ANSI B11.8	Drilling, Milling and Boring Machines – Safety Requirements for Construction, Care and Use
ANSI B11.9	Grinding Machines – Safety Requirements for Construction, Care and Use
ANSI B11.10	Metal Sawing Machines – Safety Requirements for Construction, Care and Use
ANSI B11.11	Gear-Cutting Machines – Safety Requirements for Construction, Care and Use
ANSI B11.12	Machine Tools – Roll-Forming and Roll-Bending Machines – Safety Requirements for Construction, Care and Use
ANSI B11.13	Machine Tools – Single- and Multiple-Spindle Automatic Bar and Chucking Machines – Safety Requirements for Construction, Care and Use
ANSI B11.14	Machine Tools – Coil-Slitting Machines – Safety Requirements for Construction, Care and Use
ANSI B11.15	Pipe, Tube and Shape-Bending Machines – Safety Requirements for Construction, Care and Use
ANSI B11.16	Metal Powder Compacting Presses – Safety Requirements for Construction, Care and Use
ANSI B11.17	Machine Tools – Horizontal Hydraulic Extrusion Presses – Safety Requirements for the Construction, Care and Use
ANSI B11.18	Machine Tools – Machines and Machinery Systems for Processing Strip, Sheet or Plate from Coiled Configuration – Requirements for Construction, Care and Use
ANSI B11.19	Performance Criteria for the Design, Construction, Care and Operation of Safeguarding When Referenced by Other B11 Machine Tool Safety Standards.
ANSI B11.20	Machine Tools – Manufacturing Systems / Cells – Safety Requirements for Construction, Care and Use
ANSI B11.21	Machine Tools using Lasers for Processing Materials – Safety Requirements for Construction, Care and Use
ANSI B11 TR.1	Ergonomic Guidelines for the Design, Installation and Use of Machine Tools
ANSI B11 TR.2	Mist Control on Machines Using Metal Working Fluids
ANSI B151.27	Safety Requirements for Robots Used with Horizontal Injection Molding Machines
ANSI B56.5	Safety Standard for Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles
ANSI R15.06	Safety Requirements for Robots and Robot Systems
ANSI B65.1	Safety Standards for Printing Press Systems

The National Fire Protection Agency (NFPA)

NFPA 70E	Electrical Safety Requirements for Employee Workplaces

Other National Consensus Standards

ASME B15.1	Safety Standards for Mechanical Power Transmission Apparatus

Underwriters Labs (UL)

UL508	Industrial Control Equipment
UL61496-1, -2	Active Optical Protective Device Requirements
IEC 61508-1 to 7	Functional Safety Requirements

Canadian Standards Association (CSA)

CSA Z432-04	Safeguarding of Machinery
CSA Z142-02	Code for Power Press Operation: Health, Safety, and Guarding Requirements
CSA Z434-03	Industrial Robots and Robot Systems - General Safety Requirements

NOTE: This list of standards is not comprehensive, but rather a sampling of the more common machine safeguarding standards. Consult ANSI and other national consensus standards bodies for a complete listing.

Worker safety regulatory agencies in Europe

The Machinery Directive 98/37/EC is intended for the designers of new machines. This Directive defines the objectives in terms of the essential safety and health requirements to be satisfied by new machines, in order that they may be sold and freely circulated within the member states of the European Union, guaranteeing operators a high degree of protection.

The harmonized standards define ways and means of putting these objectives into practice. However, the standards are not obligatory. Rather, the Directive defines objectives with an obligation to achieve certain results. On the other hand, a machine built in accordance with the harmonized standards is assumed to satisfy the essential requirements of the Directive.

As required by European law, the Directive has to be implemented in each member country. The Directive came into full force for machinery on the January 1, 1995, and for safety components on the January 1, 1997.

Annex VI of The Machinery Directive outlines the requirements that manufacturers of new machinery must adhere to. Briefly, however, a distinction is made between dangerous equipment and other working equipment. Equipment that is considered dangerous is subject to special procedures. The Machinery Directive provides an exhaustive list of dangerous equipment, of which safety devices form an integral part. Other working equipment is subject to simpler procedures.

There are several "bodies" that assist both users, manufacturers and governmental agencies in determining equipment compliance. These include safety advisory bodies, accredited bodies and notified bodies. A brief description follows for each.

Safety advisory bodies

Companies wishing to verify that their equipment complies with European directives can obtain help from safety advisory bodies.

Accredited bodies

Certain safety advisory bodies are accredited and intervene after a notice has been served by the Inspectorate that requests conformity verification of the working equipment. Each EU member state is responsible for overseeing accreditation in its own country. Accredited bodies have the powers and resources needed to perform a variety of tasks: inspection, control, analysis, technical assistance, audits, tests, measurements, etc.

Notified bodies

Every EU Member State is obliged to nominate notified bodies according to the minimum criteria defined in the Machinery Directive, and to communicate this list to Brussels, Belgium (EC Headquarters). Only these bodies have the power to issue type approval certificates for the hazardous machines and safety devices mentioned in Annex IV of the Directive. It should be noted that, in practice, these bodies have their own specialist fields.

To certify the conformity of the equipment to the Machinery Directive (and any other directives), the manufacturer is obliged to affix "CE" marking on each machine and ensure that the machinery is accompanied by a "CE" declaration of conformity.

If the equipment is not included in the list of Annex IV, the "CE" declaration of conformity is provided on the basis of self-certification, for which the manufacturer is liable. However, a technical file must be compiled, and presented to the national authorities on request.

Worker safety regulatory agencies in Europe

If the equipment is included in the list outlined in Annex IV of the Machinery Directive, one of two situations may arise. Harmonized standards may exist for the working equipment, covering the whole range of applicable requirements. In this case, there are three possible methods of CE conformity:

- The manufacturer sends the technical file to a notified body, which acknowledges receipt and places the file in its archives. This is a self-certification procedure that constitutes an undertaking by the manufacturer to design the equipment or safety device in compliance with the standards.

- The manufacturer asks the notified body to examine the technical file to check that the harmonized standards are complied with. If this is the case, the body issues the manufacturer with a certificate of compliance.

- The manufacturer requests EC-type approval testing by a notified body for this purpose. In this instance, there are generally no harmonized standards for the working equipment or the machine or parts of the machine are not in line with the standards. The manufacturer must submit his/her machine and the technical dossier for EC-type approval testing by a notified body. This body verifies conformity with the Directives and issues an EC- type certificate, which sets out the results of the tests.

The aim of a second directive called "Use of Work Equipment by Workers at Work Directive" (89/655/EEC and its Amendment 95/63/EC) is to improve the level of safety of working equipment used in the European Union and of used equipment originating from the European Union. This ensures that the equipment conforms to the minimum requirements defined.

Each item of equipment is examined to determine its state of conformity and the date it was originally put into service. Equipment that is in use or sold second-hand which does not conform to the requirements outlined in this directive must comply with the technical requirements by January 1, 1997. These requirements are concerned with, among other things, control and stopping devices, warning and signaling devices and organizational procedures.

This directive and the enacted legislation does not require a level of safety identical to that of new machines; it simply imposes minimum safety requirements in order to limit, or even eliminate, the principal risks.

Each member country is allowed to add its own national requirements: service/maintenance intervals, use of gloves, etc.

European Industrial Equipment-related Directives

Directive Name	Reference
Machinery Directive	98/37/EEC as amended
Low Voltage Directive	73/23/EEC as amended
Electromagnetic Compatibility (EMC) Directive	89/336/EEC as amended
EX Directive	94/9/EEC as amended
Use of Work Equipment by Workers at Work Directive	89/655/EEC as amended

The above table is not an exhaustive list of all European Directives. The Europa website provides a resource for gaining additional information regarding this subject http://europa.eu.int/index_en.htm.

Harmonized European standards

A harmonized standard is a standard that has been produced upon the mandate of the Commission of the European Communities. A harmonized standard is a series of technical specifications drawn up to satisfy the essential safety requirements of Directives. Once it has been adopted by the CEN (the European Committee for Standardization) or CENELEC (the European Committee for Electrotechnical Standardization), the standard is translated and published in the Official Journal of the European Communities. This type of standard serves as a reference and replaces all national standards dealing with the same subject. The conformity of a safety device or machine with a harmonized standard gives rise to presumption of conformity with the essential safety and health requirements defined in the Machinery Directive (Article 5 of Directive 98/37/EC).

Different types of standards

European standards are broken down into three categories: Type A, B and C.

Type A standards

Type A standards (fundamental safety standards) provide basic concepts, principles for design and general aspects that can be applied to all machinery and may serve as guidance to the designer of equipment based on the absence of Type B or C standards.

Type B standards

Type B standards (group safety standards) deal with one safety aspect or one type of safety related device that can be used across a wide range of machinery. This standards group is broken into two parts. Type B1 standards deal with particular safety aspects such as the electrical safety of machines (EN 60 204) or the calculation of minimum safety distances (EN 999). Type B2 standards define the use of devices such as two hand controls, interlocking devices, pressure-sensitive devices, guards and Electro-sensitive protective equipment (IEC 61 496).

Type C standards

Type C standards (machine safety standards) define specific safety requirements for a particular machine or group of machines. Where this type of standard exists, it takes priority over Type A or Type B standards, but may also reference Type A or Type B standards. When a specific Type C standard does not cover a machine, conformity is obtained on the basis of Type A or B standards.

Types of standards	Number	Title
Type A	EN 292 – 1 and 2 (ISO 12100-1 and 2)	Safety of machinery – Basic concepts and general principles for design
	EN 1050 (ISO 14121)	Safety of machinery – Principles for risk assessment
Type B	EN 61496 (IEC 61496) part 1	Safety of machinery – Electro-sensitive protective equipment; General requirements and tests.
	part 2	Particular requirements for equipment using active opto-electronic protective devices
	part 3	Particular requirements for equipment using active opto-electronic devices responsive to diffuse reflection (AOPDDRs)
	EN 999 (ISO 13855)	Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body
	EN 294 (ISO 13852)	Safety of machinery – Safety distances to prevent danger zones from being reached by the upper limbs
	EN 349 (ISO 13854)	Safety of machinery – Safety distances to prevent parts of the human body from being crushed
	EN 811 (ISO 13853)	Safety of machinery – Safety distances to prevent hazardous zones from being reached by the lower limbs
	EN 954 – 1 and 2 (ISO 13849-1 and 2)	Safety-related parts of control systems – Part 1: General principles for design Part 2: Validation
	EN 60204-1 (IEC 60204-1)	Electrical equipment of machines – Part 1: General requirements
	EN 1088 (ISO 14119)	Interlocking devices associated with guards – Principles for design and selection
	EN 574 (ISO 13851)	Two-hand control devices – Functional aspects; principles for design
	EN 418 (ISO 13850)	Emergency stop equipment, functional aspects; principles for design
	EN 1037 (ISO 14118)	Prevention of unexpected start-up
Type C	EN 692	Mechanical presses; safety
	EN 693	Hydraulic presses; safety
	EN 12622	Hydraulic press brakes; safety
	EN 775 (ISO 10218)	Manipulation industrial robots; safety
	EN 1010 (ISO 1010)	Technical safety requirements for the design and construction of printing and paper converting machines
	EN 11111 (ISO 11111)	Safety requirements for textile machinery
	EN 81-1	Safety rules for the construction and installation of lifts – Part 1: Electric lifts
	pr EN 280	Mobile elevating work platforms; design calculation; stability criteria; construction; safety; examination and tests
	EN 1570	Safety requirements for lifting tables
	EN 1493	Vehicle lifts

Types of standards	Number	Title
Type C (cont.)	EN 1808	Safety requirements on suspended access equipment – Design calculations, stability criteria, construction tests
	EN 691	Woodworking machines – Health and safety – Common requirements
	pr EN 1870-1 and -4	Safety of woodworking machines – Circular sawing machines – Part 1: Circular saw benches (with and without sliding table) and dimension saws; Part 4: Single and multi-blade rip sawing machines with manual loading and/or unloading
	EN 940	Safety of woodworking machines – Combined woodworking machines
	EN 1218-1	Safety of woodworking machines – Tenoning machines – Part 1: Single spindle vertical moulding machines
	EN 12622	Hydraulic press brakes – Safety
	EN 289	Rubber and plastics machinery; compression and transfer moulding presses; safety requirements for the design
	EN 422	Rubber and plastics machines; safety – Blow moulding machines intended for the production of hollow articles – Requirements for the design and construction
	EN 1114-1	Rubber and plastics machines – Extruders and extrusion lines – Part 1: Safety requirements for extruders
	EN 1612-1	Rubber and plastics machines – Reaction moulding machines – Part 1: Safety requirements for metering and mixing units
	EN 528	Rail dependent storage and retrieval equipment – Safety
	EN 281	Self-propelled industrial trucks; sit-down rider-controlled; rules for the construction and layout of pedals
	pr EN 1459	Safety of machinery – Industrial trucks – Variable reach truck
	EN 1525	Safety of industrial trucks – Driverless trucks and their systems
	EN 1526	Safety of industrial trucks – Additional requirements for automated functions on trucks
	pr EN 1672-1	Food processing machinery – Safety and hygiene requirements – Basic concepts
	pr EN 1034	Technical safety requirements for the design and construction of paper making and finishing machines
	EN 972	Tannery machines – Reciprocating roller machines – Safety requirements
	EN 869	Safety requirements for high pressure metal die-casting units
	EN 710	Safety requirements for foundry moulding and core-making machinery and plant and associated equipment
	EN 60204-31	Safety of machinery – Electrical equipment of machines – Part 31: Particular safety and EMC requirements for sewing machines, units and systems
		This list is not exhaustive

For more information, we recommend the CEN web site: www.cenorm.be

Glossary

ANSI (American National Standards Institute): The American National Standards Institute is an association of industry representatives which develops technical standards which include safety standards. These standards comprise a consensus from a variety of industries on good practice and design. ANSI standards relevant to application of safety products include the ANSI B11 Series and ANSI / RIA R15.06 (industrial robots and robot systems).

AOPD (Active Opto-Electronic Protective Device): A device whose sensing function is performed by opto-electronic emitting and receiving elements detecting the interruption of optical radiations, generated within the device, by an opaque object present in the specified detection zone.

Blanking: A programmable feature of a safety light curtain system which allows the light curtain to ignore certain objects located within the defined area. See exact blanking and floating blanking.

CE "Conformite Europeenne" (French translation is "European Conformity"): The CE mark on a product or machine establishes its compliance with all relevant European Union (EU) Directives.

Control Reliability: A method of ensuring the integrity of performance of a control system. Control circuits are designed and constructed so that a single failure or fault within the system does not prevent the normal stopping action from being applied to the machine when required, or does not create unintended machine action, but does prevent initiation of successive machine action until the failure is corrected.

CSA (Canadian Standards Association): A testing agency analogous to Underwriters Laboratories, Inc. (UL) in the United States. A product that is "CSA Certified" has been type-tested and approved by the Canadian Standards Association as meeting electrical and safety codes.

Detecting Capability: In an AOPD, the dimension representing the diameter of an opaque cylinder which:
- for a light curtain, will actuate the sensing device when placed in the detection zone.
- for a light beam device, will actuate the sensing device when placed in the beam on the axis of the beam.

Diverse Redundancy: In diverse redundancy, the redundant components are of different design, and any microprocessor programs used must run from different instruction sets written by different programmers.

EDM (External Device Monitoring): A means by which the electro-sensitive protective equipment monitors the state of control devices which are external to the electro-sensitive protective equipment.

Emergency Stop (E-Stop): Arrest of dangerous machine motion resulting from actuation of an emergency stop switch. The switch may be in the form of a safety switch, button, trip cable or foot bar used in conjunction with an emergency stop safety relay.

Emitter: A component of a safety light curtain that consists of a row of synchronized / modulated light-emitting diodes. The emitter, together with the receiver that is placed opposite, creates a curtain of light called the protective field. The emitter is often referred to as the sender unit.

ESPE (Electro-Sensitive Protective Equipment): An assembly of devices and / or components working together for protective tripping or presence-sensing purposes and comprising as a minimum:
- a sensing function;
- a control / monitoring;
- output signal switching devices.

FSD (Final Switching Device): The two output relays (FSD1 and FSD2) of a safety light screen system which respond to an interruption of the defined area by interrupting the circuit connecting them to the Machine Primary Control Elements (MPCEs) of the guarded machine.

Fixed Blanking: A feature that allows a safety light curtain system to be programmed to ignore objects (such as brackets or fixtures) which will always be present at a specific location within the defined area so that the presence of these objects will not cause the Final Switching Devices (FSDs) of the system to trip or latch. If any of the objects are moved within or removed from the defined area, the FSDs are tripped or latched.

Glossary

Floating Blanking: A feature that allows a safety light curtain system to be programmed to produce an intentionally disabled light beam, within the light screen, which appears to move up and down ("float") in order to allow the feeding of an object through the curtain (the defined area) at any point along the length of the curtain without causing a trip or latch condition.

FMEA (Failure Mode and Effects Analysis): A testing procedure by which potential failure modes in a system are analyzed to determine their results or effects on the system. Component failure modes that produce either no effect or a lockout condition are permitted; failures which cause an unsafe condition (a failure to danger) are not.

Force-Guided Contacts: Relay contacts that are mechanically linked together, so that when the relay coil is energized or de-energized, all of the linked contacts move together. If one set of contacts in the relay becomes immobilized, no other contacts of the same relay will be able to move. The function of forced-guided contacts is to enable the safety circuit to check the status of the relay. Force-guided contacts are also known as "positive-guided contacts," "captive contacts" or "safety relays." All SICK Safety Relays use force-guided contacts.

FSD: See Final Switching Device.

Hard Guard: Screens, bars or other mechanical barriers affixed to the frame of the machine intended to prevent entry by personnel into the hazardous area(s) of a machine while allowing the point-of-operation to be viewed. The maximum size of opening is determined by Table 0-10 of OSHA standard 1910.217. Also called a "fixed-barrier guard."

Hazardous Area (ANSI): An area that poses an immediate or impending physical hazard.

Hazardous Motion (ANSI): Motion of equipment or release of energy that poses a hazard.

Light Curtain: An AOPD with a resolution between 14 mm and 40 mm, (i.e., protecting finger / hand / arm).

MPCE (Machinery Primary Control Element): An electronically powered element that directly controls the machine's normal operating motion in such a way that it (the element) is the last (in time) to operate when the motion is either initiated or arrested.

Minimum Object Sensitivity: See "Detecting Capabilities."

Muting: A temporary automatic suspension of a safeguarding function(s) by safety-related parts of the control system during otherwise safe conditions in the operation of a machine.

Object Sensitivity: See "Detecting Capabilities."

OSHA (Occupational Safety and Health Administration): A division of the U.S. Department of Labor that is responsible for the regulation of workplace safety. OSHA regulations often follow ANSI standards, including mechanical power press requirements (OSHA CFR 1910.217). In the absence of an applicable OSHA regulation, a national consensus standard may be used to show acceptable industry practice. When referenced, the provisions of such a standard are incorporated as part of the regulation and are enforced.

OSSD (Output Signal Switching Device): The component of the electro-sensitive protective equipment connected to the machine control system which, when the sensing function is actuated during normal operation, responds by going to the OFF state.

Overall Response Time (ANSI): Time occurring from actuating the safeguarding device to cessation of hazardous motion, or to the machine assuming a safe condition.

Overall Stopping Performance (IEC): The time interval resulting from the sum of the Electro Sensitivity Protection Equipment (ESPE) response time and the time to the cessation of hazardous machine operation.

Glossary

Presence Sensing Device (IEC): A device that continually senses the presence of a human body part in its detection zone which causes a machine or machine elements to remain in the stop condition or ensures an otherwise non-hazardous state.

Pressure Sensitive Device: Safety device of the 'mechanically activated trip' type intended to detect the touch of a person or a part of a person and comprising:

a) sensor(s) which generates a signal when pressure is applied to part of its outer surface, and
b) a control unit, which responses to the signal from the sensor and generates an output signal(s) to the control system of a machine.

Protection Zone: The zone within which a specified test piece will be detected by the electro-sensitive protective equipment. Also referred to as detection zone.

R(eceiver)

Resolution: See "Detecting Capability."

Safeguarding (ANSI): Methods of protection of individuals from hazard using guards, safeguarding devices or methods, or safe work procedures.

Safety Distance (ANSI): For an actuating control used as a safeguarding device, between the actuating controls and the nearest point-of-operation hazard, that ensures that the operator cannot release the actuating controls and reach the hazard before the slide can be stopped by brake actuation.

Safety Relay: An electrochemical relay with "force-guided" contacts which allow the monitoring circuit of a safety device to check relay status. See "forced-guided contacts."

S(ender)

Supplemental Safeguarding: Additional electro-sensitive safety device(s) and hard guarding measures, used for the purpose of preventing a person from reaching over, under or around the defined area of an installed safety light curtain system and into the point-of-operation of the safeguarded machine.

TÜV (Technischer Überwachungsverein): Independent testing and certification organization providing EMC and product safety testing and certification.

UL (Underwriters Laboratory): A third-party organization which tests manufacturers' products for compliance with appropriate standards, electrical codes and safety codes. Compliance is indicated by their listing mark on the product.

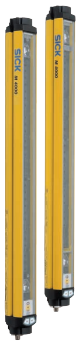
UL Mark of Canada: Identification of products listed by UL to Canadian requirements.

Coming soon

C 4000 Entry/Exit Palletizer

The revolutionary C 4000 Entry/Exit Safety Light Curtain will be offered in a Palletizer version for packaging applications. The C 4000 Entry/Exit Palletizer has advanced floating blanking technology to help keep products moving and workers safe. This all-inclusive safety light curtain does not require additional muting sensors, lamps or switches, making it a cost-effective solution for packaging.

M 4000 Multi-beam Perimeter Guard



The M 4000 Standard features a new housing and swivel mount endcaps that enables maximum mounting. The integrated LED and seven-segment display provide for easy monitoring and system diagnosis. Configuration settings can be made directly at the M4000 via 2 integrated push-buttons and a menu driven display. Optional features include: an endcap with integrated status lamp, AS-Interface Safety at Work, a separate connection for push button Reset, and an integrated laser alignment aid per beam.

UE 440/UE 470 Safety Controllers

This new line of configurable controllers is easy to program for multiple applications using drag-and-drop techniques and is certified to Safety Category 4 and SIL 3. The UE 440 safety controller monitors the safe functioning of a variety of applications while the UE 470 adds additional functions to address the special needs of advanced press applications. The UE 440/UE 470 have 2 EFI-Connectors and 15 inputs for added flexibility.

V 4000 Press Brake Safety System

The soon-to-be-released V 4000 Press Brake Safety System utilizes vision-based technology for safe guarding press brake applications. Benefits include increased productivity, increased safety, minimized downtime, and ease of implementation. The V4000 is ideal for point-of-operation safeguarding on press brake machines in metalworking and automotive applications.

Optoelectronics technology overview

Since it was founded, SICK has pioneered a long line of optoelectronic technical innovations, including the industry's first safety light curtain. Today, SICK is a world leader in opto-electronic safety solutions for hazardous machines.

Optoelectronic protective devices offer several advantages over mechanical safeguarding methods. Access time is reduced since an operator no longer has to wait for a guard to open. The operator saves time loading the machine, so productivity is increased. Repetitive motion is minimized. In addition, opto-electronic safety solutions not only protect the operator but can also protect other personnel who may be in the hazardous area.

Proper selection of optoelectronic safety devices is categorized based on the possible severity of the injury, frequency or duration of the exposure to the hazard, and the possibility for reduction or avoidance of the hazard.

Safety Categories

The same machine could have multiple access points with different risks. As a result, different safety measures may need to be taken for different parts of the machine.

Type 4

A Type 4 application is one in which a potential injury could be severe (normally irreversible and usually permanent), workers are exposed frequently, or for prolonged periods to a hazard and there is low possibility of avoiding the hazard.

Type 3

With Type 3 applications, there is a potential for severe injury, exposure to the hazard is short or infrequent and the possibility for avoidance is low (difficult to avoid). An example of a Type 3 application would be the presence sensing area inside a robot cell. The injury could be severe; however, access to the cell is infrequent, and the injury may or may not be avoidable.

Type 2

Type 2 applications are those in which the potential injury could range from light to more serious (normally reversible), exposure to the hazard is short or infrequent, and the hazard is possible to avoid under specific conditions. An example of a Type 2 application would be on a pick and place machine where the injury sustained might only be a bruise or a pinched finger.

Optoelectronics technology products

Safety light curtain C 4000 Standard/Advanced	Safety light curtain C 4000 Entry/Exit
Including a sender and a receiver	Including a sender and a receiver
■ Advanced functions integrated ■ Cascadable design, up to 3 linked protective fields are possible with one output signal ■ Simple diagnosis and configuration via PC ■ Universal interface. The same light curtain can be used with all interface and control architectures: from relay and safe PLC control to safety fieldbus	■ Dynamic blanking with auto teach-in ■ Simple diagnosis and configuration via PC
Protects fingers, hands, and persons. Ex. safeguard power presses, hazardous machinery, robot cells, etc.	Protects entrances. Ex. entry/exit of car bodies, conveyor systems
Technical specifications	**Technical specifications**
Protective field height (mm): 300/1800	Protective field height (mm): 900/1500
Protective field width (m): 0-6/0-19	Protective field width (m): 0-19
Resolution (mm): 14/20/30/40	Resolution (mm): 20
Response time: (see technical specs)	Response time: (see technical specs)
Safety category: 4 (SIL 3)	Safety category: 4 (SIL 3)
Further options: Reset, beam coding, fixed/floating blanking, reduction of the resolution, learning, EDM (external device monitoring)	Further options: Dynamic blanking with auto learning, restart, beam coding, EDM (external device monitoring)
pg. 82 (Standard), pg. 86 (Advanced)	pg. 94

Safety light curtain C 4000 Micro/Basic

Including a sender and a receiver

- Small, compact and allows for simplified machine integration

Protects fingers, hands and persons.
Ex. testing of PC cards, loading stations, power presses, etc.

Technical specifications

Protective field height (mm)	150/1800
Protective field width (m)	0-5/0-6
Resolution (mm)	14/30
Response time	(see technical specs)
Safety category	4 (SIL 3)
Further options	Reset, EDM (external device monitoring)

pg. 76

Optical perimeter guard MSL/MSM

Including a sender and a receiver

- Elaboration integrated
- Supplementary MSM model to connect directly to barrier
- Sender and receiver in one (MSLZ)

Protects persons. Ex. robot cells

Technical specifications

Protective field width (m)	0.5/70
Number of beams	2/35
Resolution	(see technical data)
Response time (ms)	≤ 15
Safety category	4

pg. 64 (MSL), pg. 68 (MSM)

Single beam sensors
L 4000/L 400 with UE 401

Including a sender and a receiver

- Plastic or metal housing, M18 or M30
- Cascading connection up to 8 pairs
- EDM and restart selections

Control entrance of isolated robots, palletization areas, automatic load systems

Technical specifications

Protective field width (m)	0-60
Number of beams	1-8
Response time (ms)	≤ 30
Safety category	4
Further options	Restart, EDM

pg. 54

Safety light curtain
C 2000

Including a sender and a receiver

- Integrated auto-test

Protects hands on semiconductor equipment

Technical specifications

Protective field height (mm)	150/1800
Protective field width (m)	0-6/19
Resolution (mm)	20/30/40
Response time	(see technical specs)
Safety category	2
Further options	Auto-test, cascading

pg. 144

Safety light curtain
C 2000 IP 67
M 2000 IP 67

Including a sender and a receiver

- Ideal for the protection in wash down areas
- Protection class IP 67

Safeguarding for category 2 applications

Technical specifications	
Protective field height (mm)	150/1200
Protective field width (m)	up to 14.5
Resolution (mm)	30 (C 2000)
Response time	(see technical specs)
Safety category	2
Further options	EDM

pg. 148

Multi-beam safety barrier
M 2000

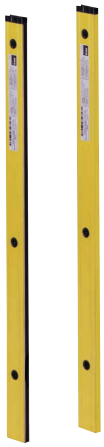
Including a sender and a receiver

- Integrated auto-test
- Codified beams
- Muting function with switchboard LE 20
- Version with sender and receiver in one

Safeguarding for category 2 applications

Technical specifications	
Protective field width (m)	0-6 (with mirror) 0-70
Number of beams	2-9
Response time (ms)	≤ 8
Safety category	2
Further options	Auto-test, reset

pg. 134



Safety light grid
LGT

Including a sender and a receiver

- Relay outputs
- Up-to-date microprocessor technology and specially design ICs (ASIC)
- Easy to mount and adjust
- Only 3 components (control unit, sender, and receiver strips)

Protect persons. Ex. Packaging machines, processing centers, production lines, etc.

Technical specifications

Protective field width (m)	0.1-6
Number of beams	Max 4
Response time (ms)	≤ 50
Safety category	2
Further options	manual or automatic reset; with and without external contactor monitoring

pg. 140

Safety Sensors
VS/VE and WS/WE with LE 20

Including a sender and a receiver

- Possibility of muting with LE 20

Protect persons. Ex. Robot station, palletizing process machine, etc.

Technical specifications

Protective field width (m)	Max 35
Number of beams	Max 6
Response time (ms)	≤ 25
Safety category	2
Further options	Auto-test, version with muting IP 65 optional

pg. 120

Safety laser scanner PLS/LSI

Scanning of surroundings

- 180° scan angle
- Safety Zone up to 4 m
- Semiconductor outputs

Protect persons. Ex. Robot station, process machines and AGVs

Technical specifications	
Protective field width (m)	4 (Safety Zone) 50 (Warning Zone)
Resolution (mm)	70 (distance 4 m)
Response time (ms)	According to config.
Safety category	3
Further options	monitoring cases are selectable

pg. 102 (PLS), pg. 106 (LSI)

Safety laser scanner S 3000

Scanning of surroundings

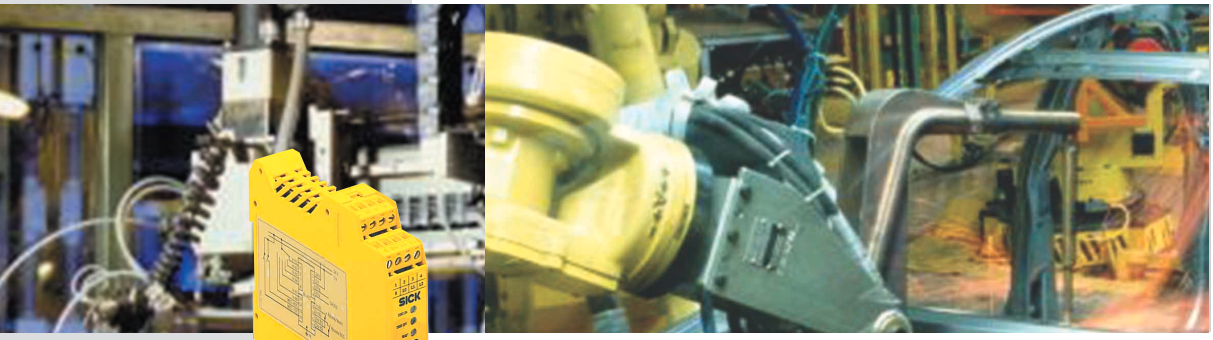
- 190° scan angle
- Safety Zone up to 5.5 m or 7 m
- Semiconductor outputs
- Certified for vertical applications

Protect persons.
Ex. Isolates robot, AGVs, etc.

Technical specifications	
Protective field width (m)	5.5 or 7 (Safety Zone) 49 (Warning Zone)
Resolution (mm)	30/40/50/70/150
Response time (ms)	According to config.
Safety category	3
Further options	monitoring cases are selectable, EDM, restart, protective field width selectable

pg. 112

Safety Photoelectric Switches
L 4000/L 400 and UE 401



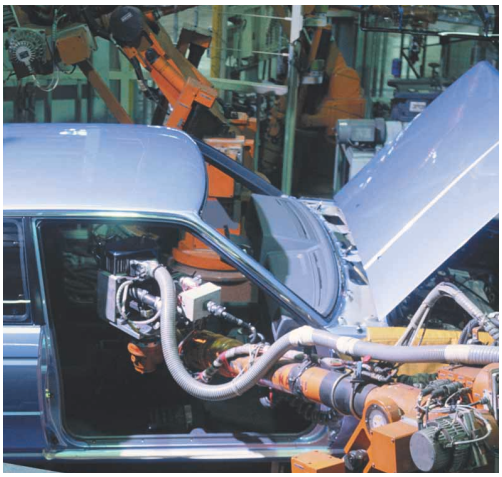
Features

- Type 4 Safety Category in accordance with EN 61 496
- Nickel-plated brass or economical plastic housing
- Compact cylindrical design, M18 and M30
- 0…60 m operating range
- Connection of up to 8 pairs (on cascaded circuit)
- Restart interlock selectable
- External Device Monitoring (EDM) selectable
- Intelligent testing prevents crosstalk (up to 4 sensor pairs)

Description of function

EDM

The external device monitor control verifies if the final switching devices are actually disabled at the time of the safety device intervention.



Restart

The L 4000/L 400 safety photoelectric switch with the UE 401 safety evaluation unit allows manual restart. The reset button should be placed in a location that allows the operator to have a complete view of the hazardous area.

Technical specifications

	L 4000/L 400
Supply voltage	24 V DC ± 20%
Power consumption	90 mA (sender and receiver)
Wavelength	660 nm
Beam diameter	12 mm (L 400)
	26 mm (L 4000)
Operating distance	0…5/10 m (L 400)
	0…60 m (L 4000)
Switching outputs	PNP
Housing	nickel-plated brass (L 4000)
	plastic (L 400)
Protection class	IP 67
Safety category	4 (when used with UE 401)
Operating temperature	-20…55° C
Storage temperature	-25…75° C
Tested to	IEC 61 496
Certifications	CE, cULus, DQS

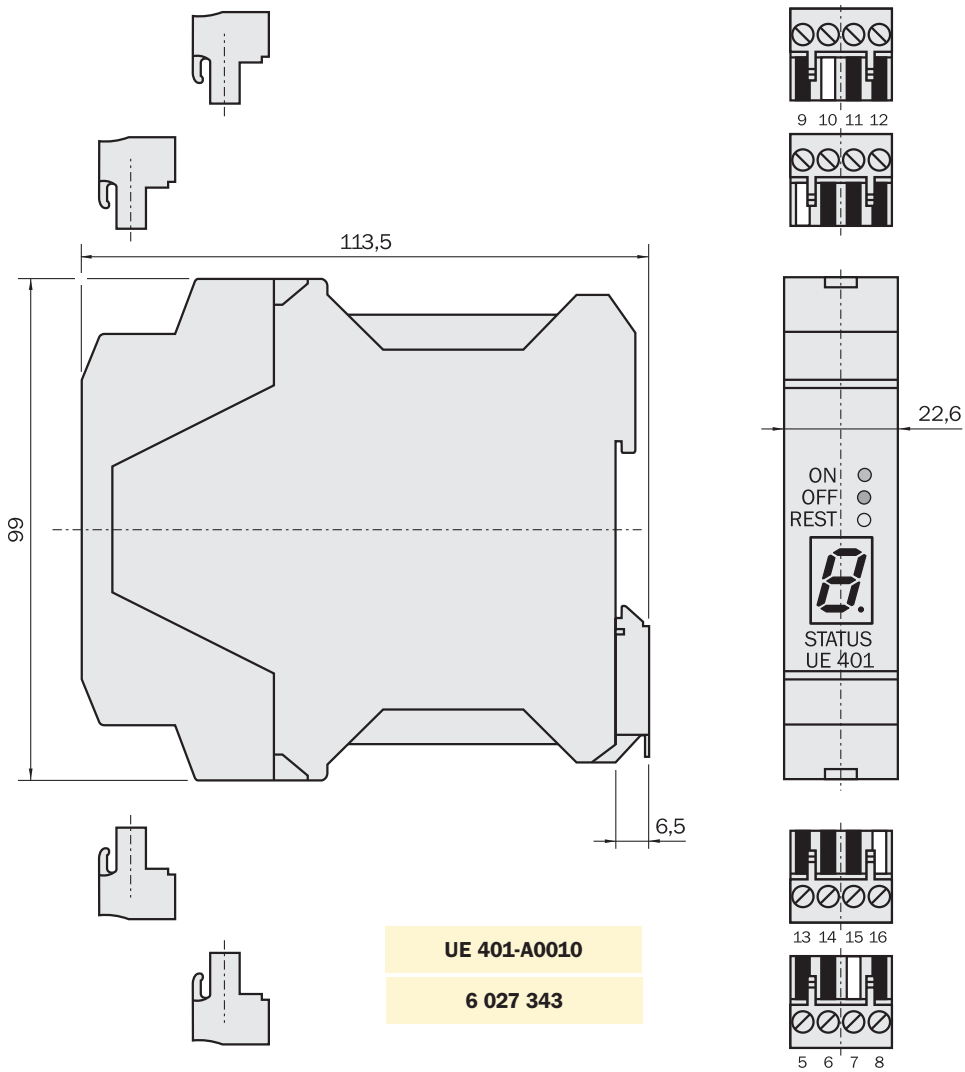
	UE 401
Supply voltage	24 V DC ± 20%
Power consumption	3.6 W
Response time	30 ms max
Inputs	EDM, Restart, 4 receiving inputs, deactivate EDM
Switching outputs	2 PNP
Protection class	IP 20
Safety category	4
Operating temperature	-20…55° C
Storage temperature	-25…75° C
Tested to	IEC 61 496
Certifications	CE, cULus, DQS

Product Selection Table

UE 401 A 0010 data processing controller			
Sensor Ø 18, range 0 ... 10 m	L 40 S 21 KA 1 A	Sender, straight optic, plastic	6 027 337
	L 40 E 21 KA 1A	Receiver, straight optic, plastic	6 027 338
	L 40 S 21 MA 1A	Sender, straight optic, metal	6 027 339
	L 40 E 21 MA 1A	Receiver, straight optic, metal	6 027 340
Sensor Ø 18, range 5 m	L 40 S 11 MA 1 A	Sender, 90° optic, metal	6 027 341
	L 40 E 11 MA 1A	Receiver, 90° optic, metal	6 027 342
Sensor Ø 30, range 0 ... 60 m	L 40 S 33 MA 2 A	Sender, straight optic, metal	6 027 335
	L 40 E 33 MA 2A	Receiver, straight optic, metal	6 027 336

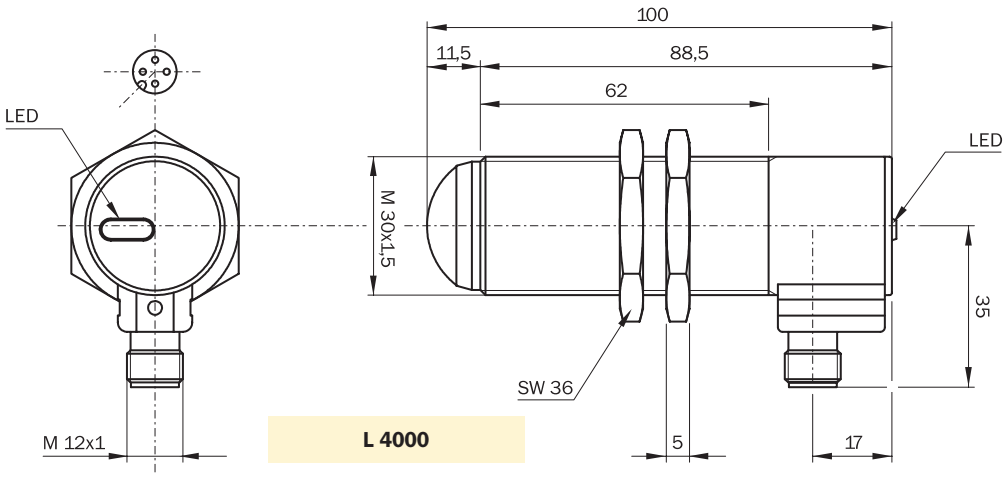
We recommend contacting Customer Service for product selection

Drawings

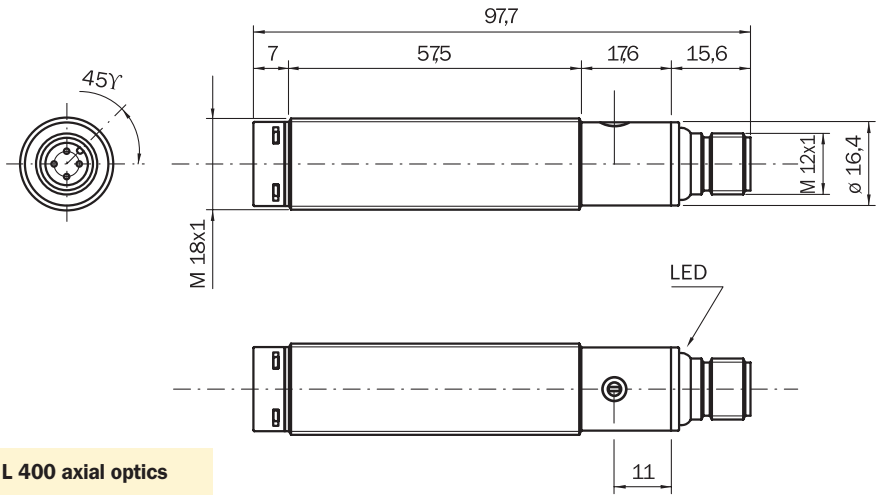


UE 401-A0010

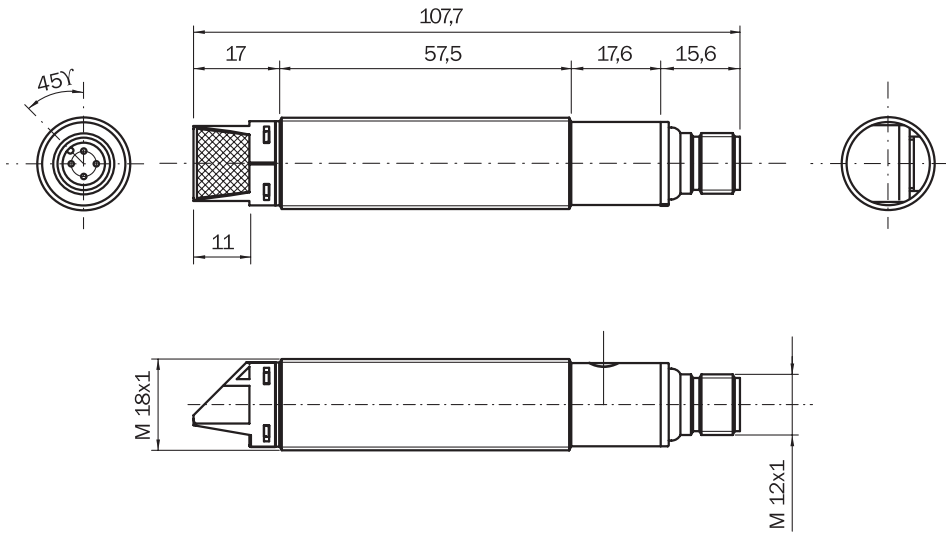
6 027 343



L 4000



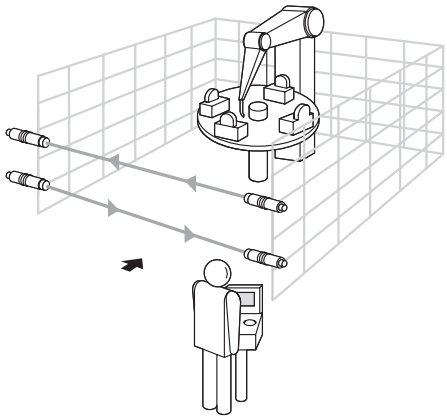
L 400 axial optics



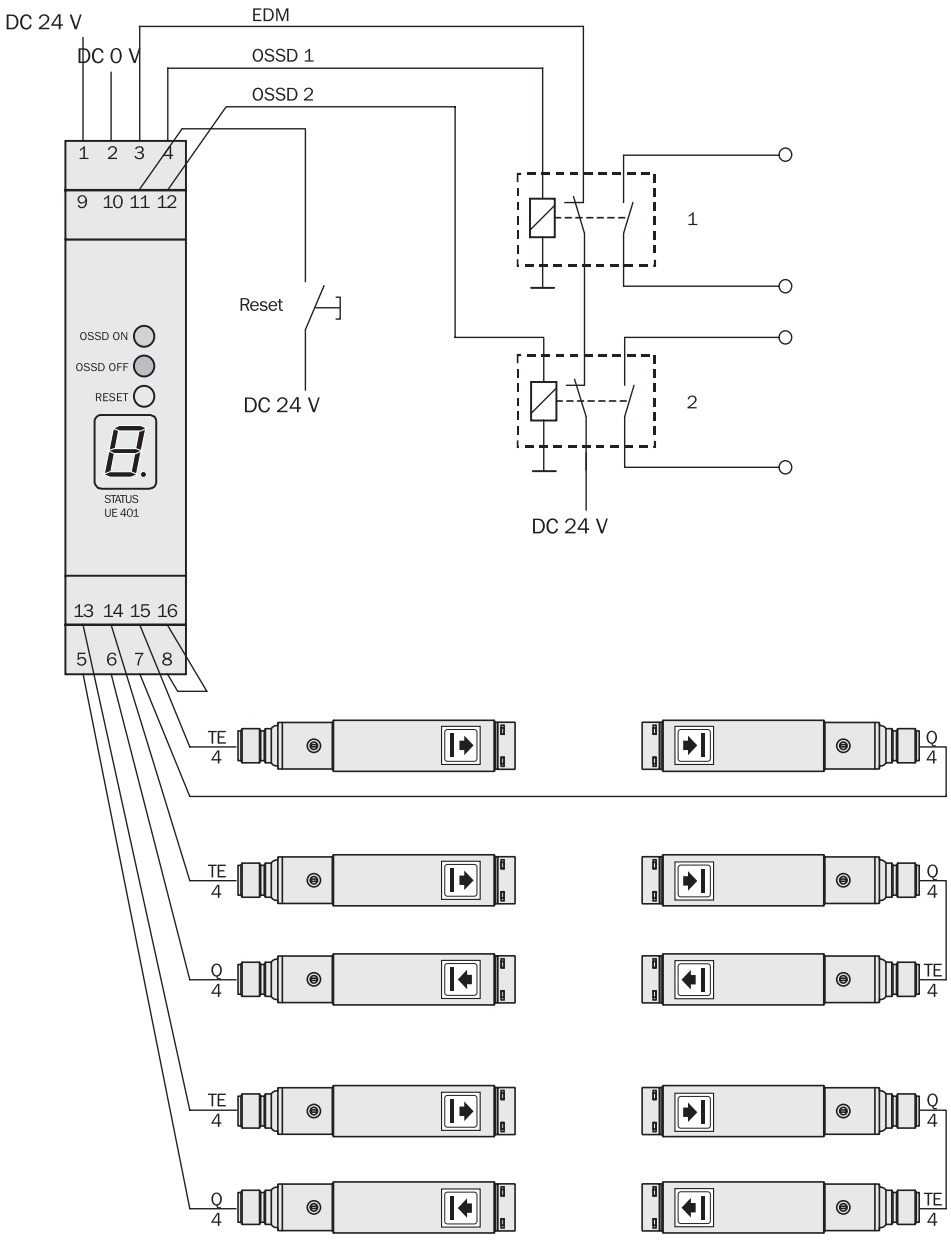
L 400 radial optics

Application example

- Access controls to automated cells
- Palletization areas
- Automatic load systems

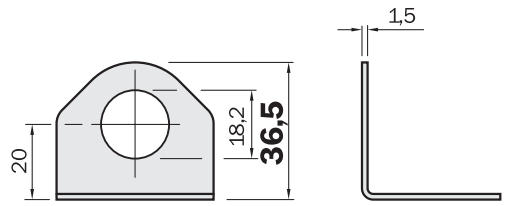


Connection example

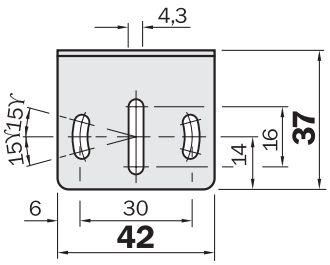


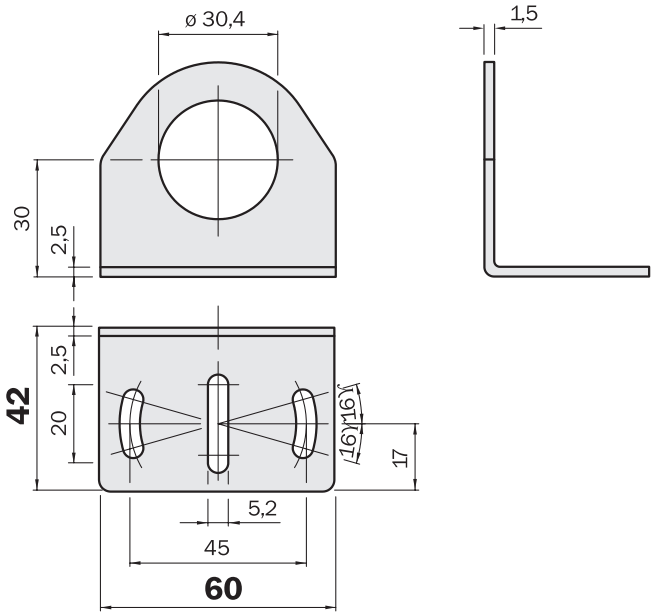
Accessories:
L 4000/L 400 and UE 401

Brackets

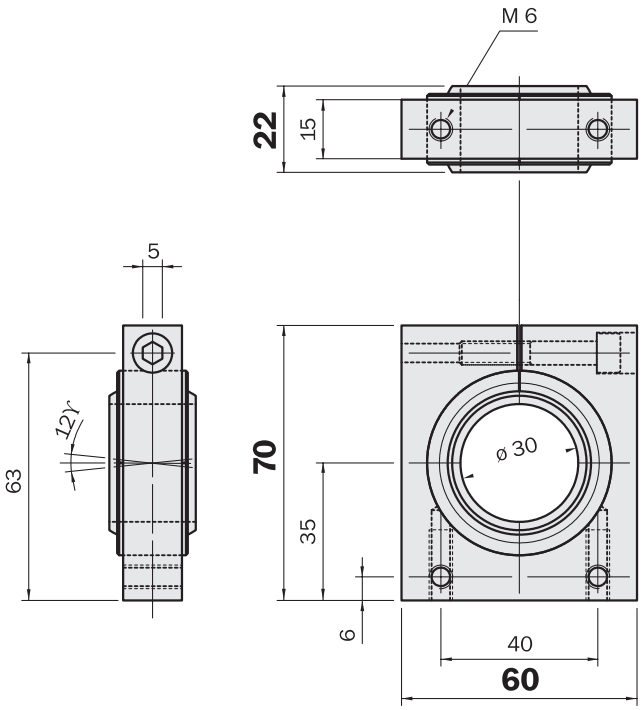


BEF-WN-M 18
Mounting brackets for
M18 sensor
Part number 5 308 446

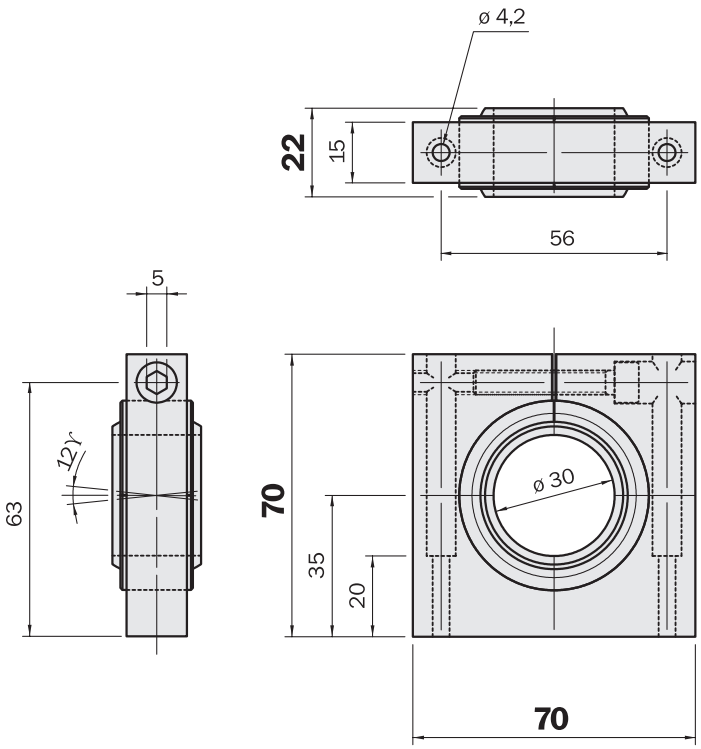




BEF-WN-M 30
Mounting brackets for
M30 sensor
Part number 5 308 445

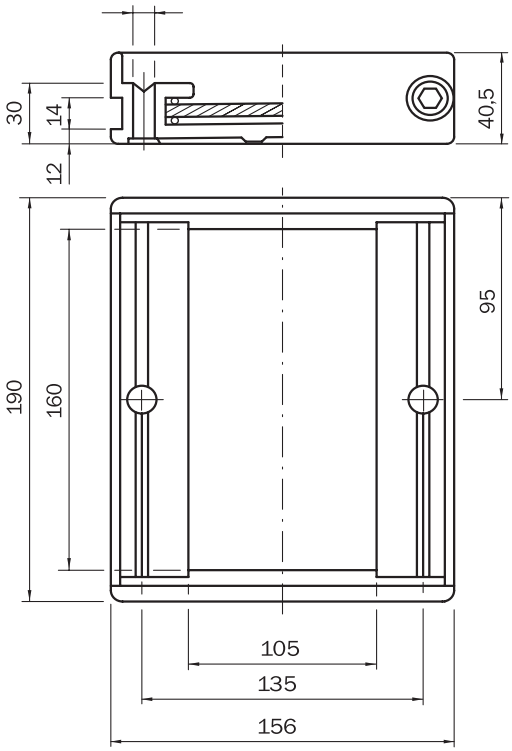


BEF-HA-M 30 A
Mounting brackets for
M30 sensor
revolving, with M6 axial
fastening thread
Part number 5 311 527

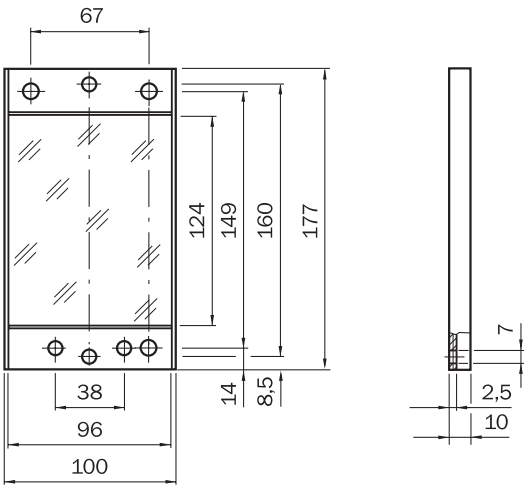


BEF-HA-M 30 R
Mounting brackets for M 30 sensor revolving, with M6 axial fastening thread
Part number 5 311 528

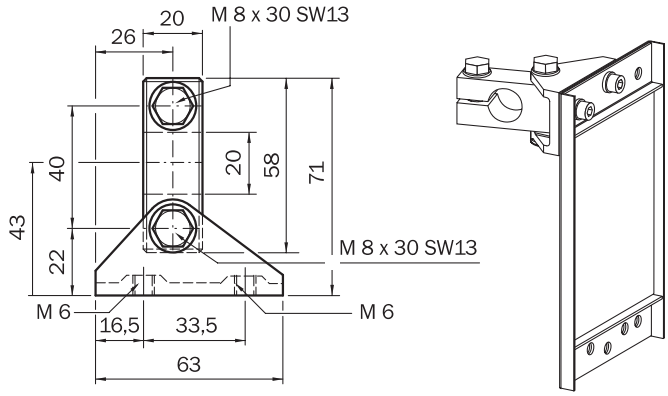
Corner mirror



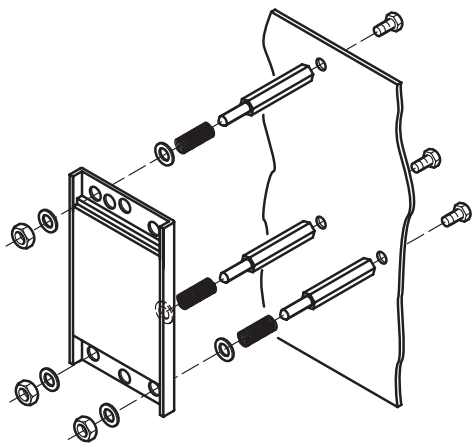
Mirror deviation control
PNS 105-1
Part number
1 004 076



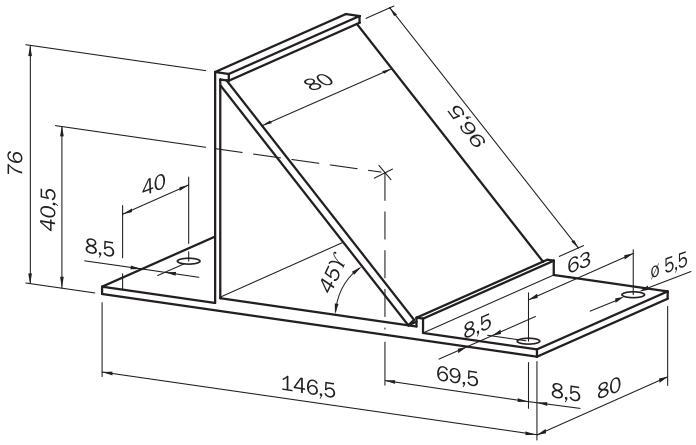
Mirror deviation control PSK 1
Part number 1 005 229



Support for mirror deviation control PSK 1
Part number 2 009 292

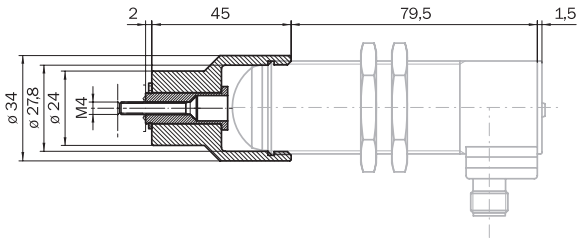


Spring fastening PSK 1
Part number 2 012 473

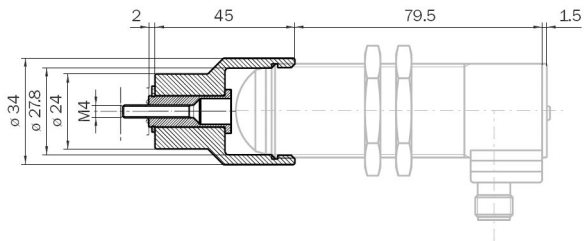


Mirror deviation control
PSK 45
Part number 5 306 053

Alignment laser adapter



AR-60 adapter bracket for
L 4000, M 30
Part number 5 311 529



Laser Alignment Device
AR-60
Part number 1 015 741

Optical perimeter guard MSL

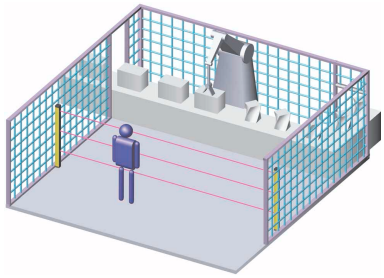
Features

- Integrated diagnostics
- Beam coding
- 2 to 35 beams
- Single beam model MSLZ
- Protected field height from 350 to 1,800 mm
- Maximum range of up to 70 m
- Modular safety muting

Description of Function

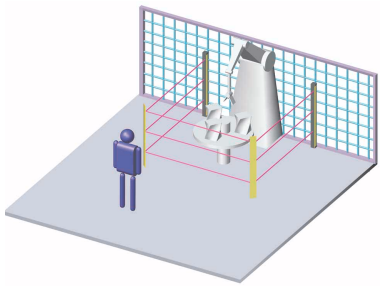
EDM

The external device monitor control verifies if the final switching device are actually disabled at the time of the safety device intervention.



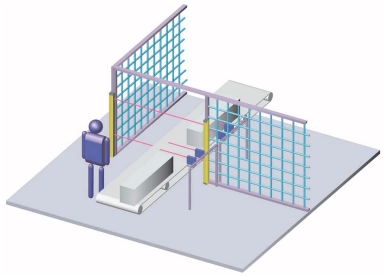
Restart

The MSL provides ideal access guarding of hazardous areas such as robot work cells, automated conveying, storage and transport systems. The MSL has an internal restart block. If the light beam is interrupted, the equipment stops and can no longer be used until the operator activates the reset button.



Beam coding

The beam coding function is used to eliminate reciprocal interference among several adjacent barriers. Thanks to this function, it is no longer necessary to place physical protection between barriers in order to avoid interference.

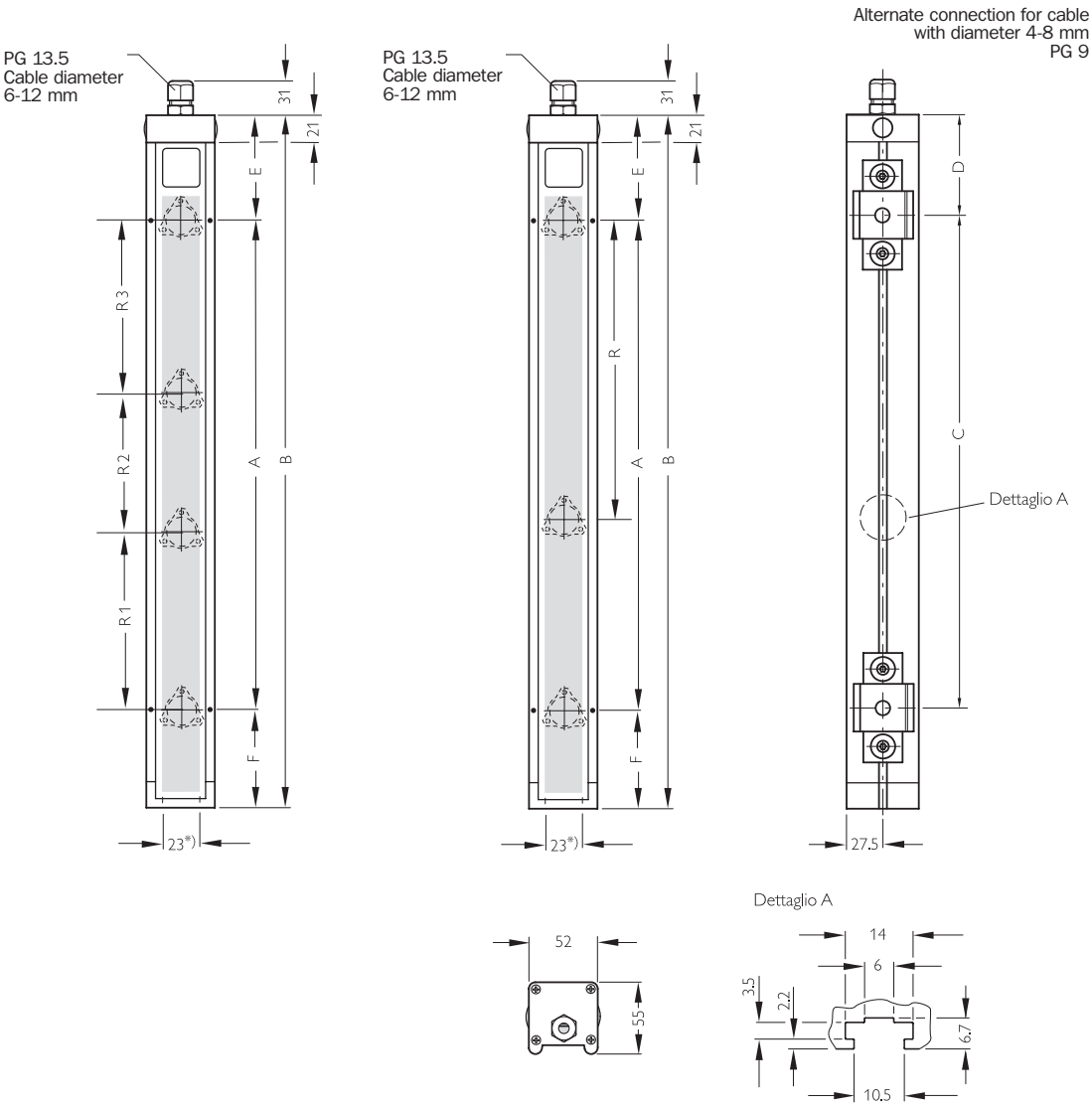


Technical specifications

	MSL
Supply voltage	24 V DC ± 20%
Power consumption	Sender 7 W, Receiver 5 W
Wavelength	880 nm
Number of beams	from 2 to 35
Response time	20 ms
Resolution	73, 93, 120, 130, 220, 400, 500
Protective field height	from 350 to 1800 mm
Operating distance	up to 70 m
Sender inputs	test
Receiver inputs	EDM, Restart
Switching outputs	2 OSSD PNP 500 mA
Function selectable	EDM, Restart
Protection class	IP 65
Safety category	4
Synchronization	optical
Dimensions	55 x 52 mm
Operating temperature	0…55° C
Storage temperature	-25…70° C
Tested to	pr EN 50 100
Certifications	CE, DQS

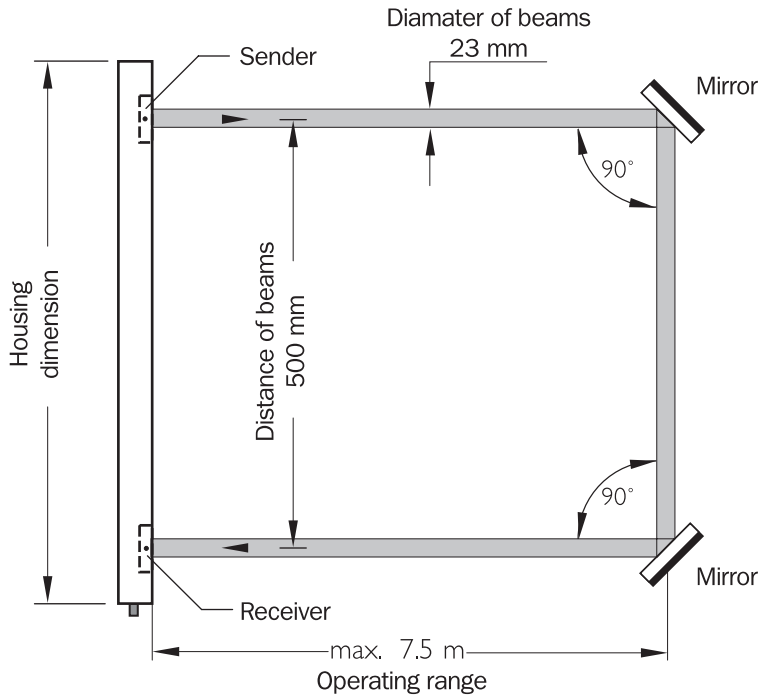
We recommend contacting Customer Service for product selection.

Drawings



	A	B	C	D	E	F	R
MSL 20-107	1330	1585	1425	80	107	148	70
MSL 23-107	1540	1736	1576	80	107	89	70
	A	**B**	**C**	**D**	**E**	**F**	**R**
MSL 14-105	650	835	675	80	107	78	50
MSL 17-105	800	985	825	80	107	78	50
MSL 20-105	950	1135	975	80	107	78	50
MSL 23-105	1100	1285	1125	80	107	78	50
MSL 26-105	1250	1435	1275	80	107	78	50
MSL 29-105	1400	1586	1426	80	107	79	50
MSL 32-105	1550	1736	1576	80	107	79	50
MSL 35-105	1700	1886	1726	80	107	79	50

	A	B	C	D	E	F	R
MSL 02-150	500	684	524	80	107	77	500
MSL 03-122	440	597	437	80	107	50	220
MSL 03-140	800	985	825	80	107	78	400
MSLZ 01-150	500	684	524	80	97	87	500

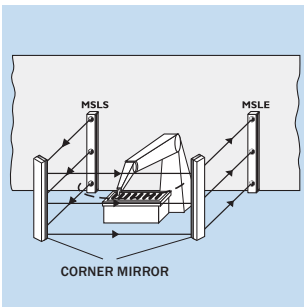


The single beam MSLZ allows the sender and the receiver to operate in the same housing. This configuration requires placing the mirror deviation control in front of the device.

MSLZ

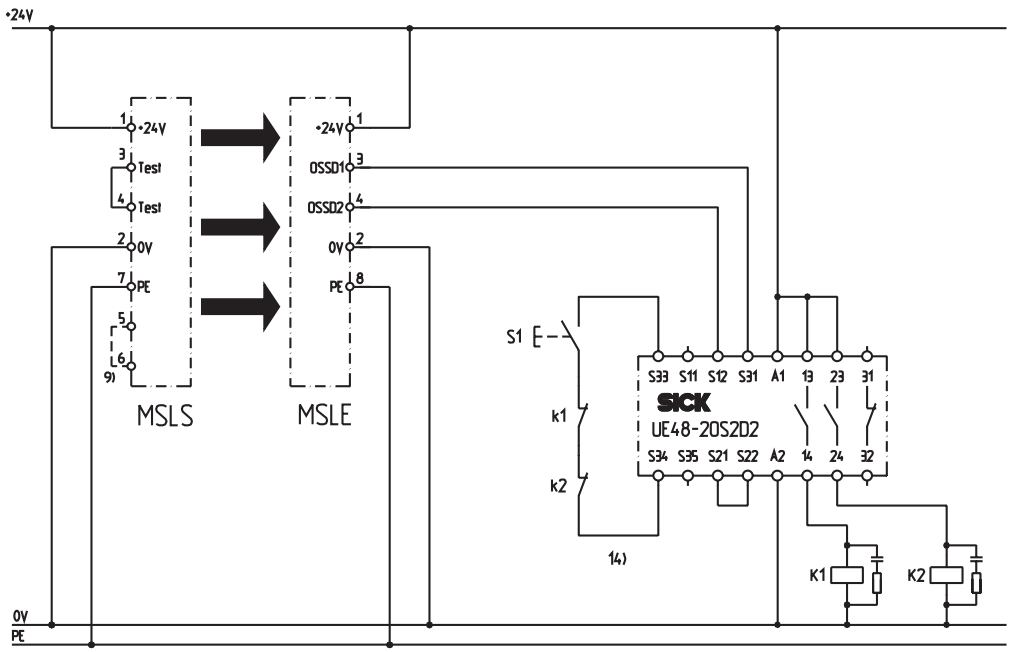
Application example

- Access controls to automated areas
- Protection of palletization areas
- Work centers
- Large frames
- Automatic loading systems



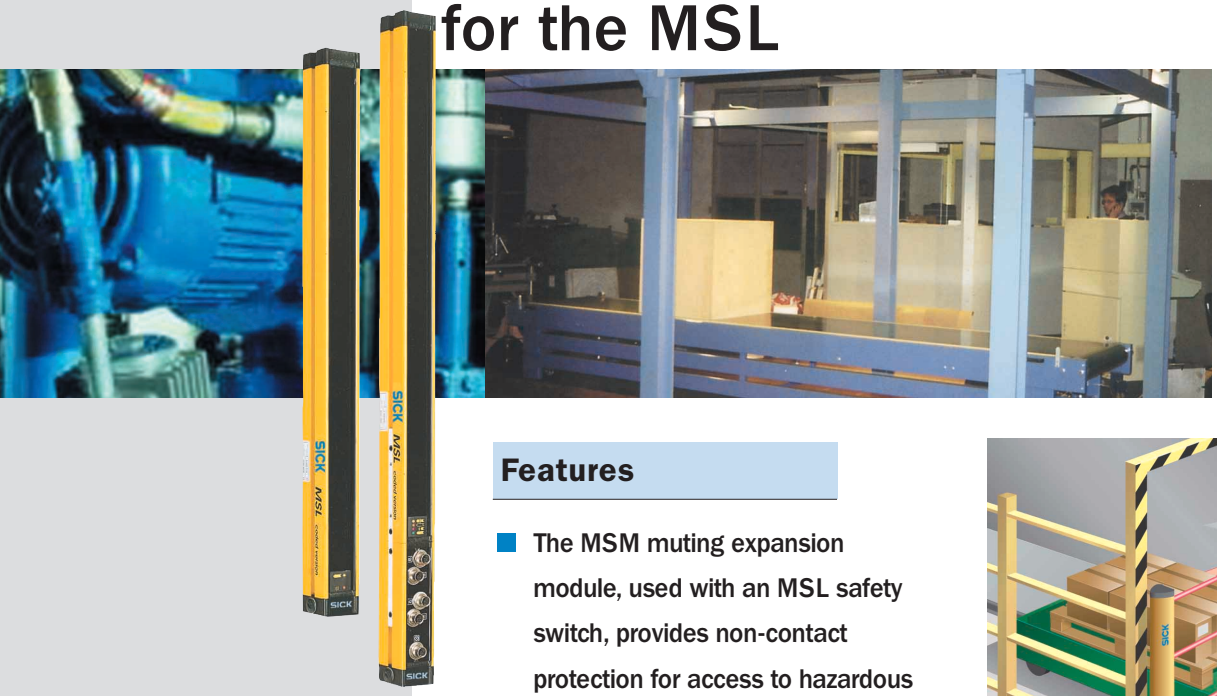
Access control to an automated cell

Connection example



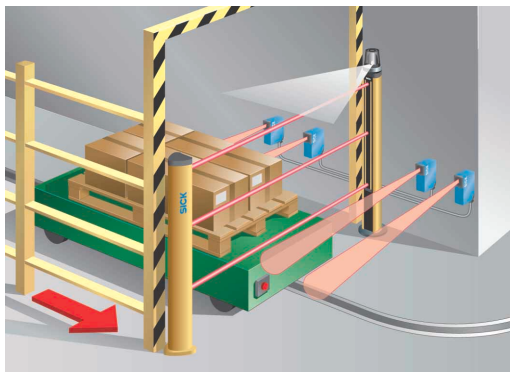
Example of a connection between the MSL multi-beam barrier and the UE 10 safety module

MSM
Muting expansion module for the MSL



Features

- The MSM muting expansion module, used with an MSL safety switch, provides non-contact protection for access to hazardous areas, including a muting function for the automated transport of material into a hazardous area
- Optional connections for up to 4 muting sensors
- Muting lamp connection

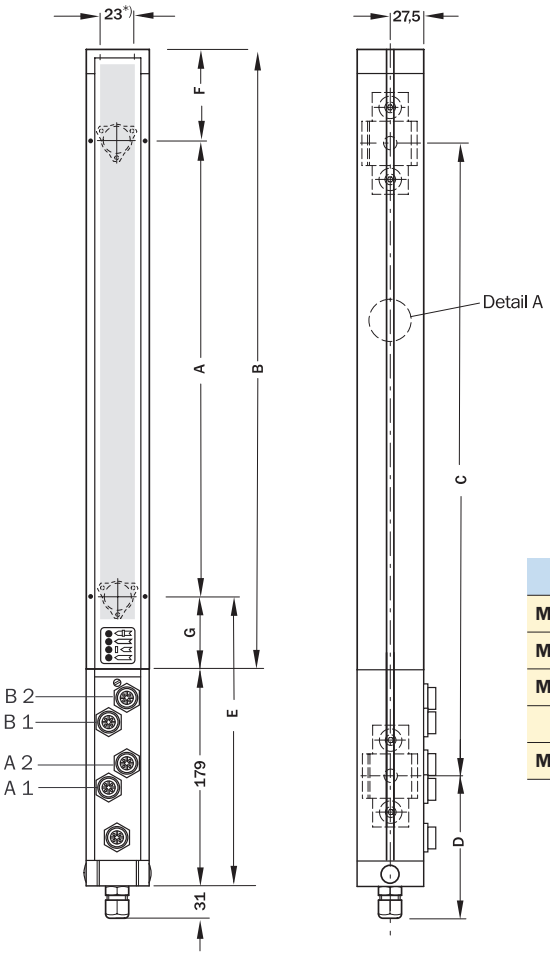


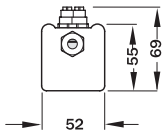
Technical specifications

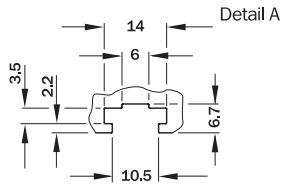
	MSM
Supply voltage	24 V DC ± 20%
Power consumption	5 W without lamp and sensors
Inputs	for photocell of muting and lamps
Protection class	IP 65
Safety category	4
Dimensions	55 x 5cm
Operating temperature	0…55° C
Storage temperature	-25…70° C
Tested to	pr EN 50 100
Certifications	CE, DQS

We recommend contacting Customer Service for product selection.

Drawings





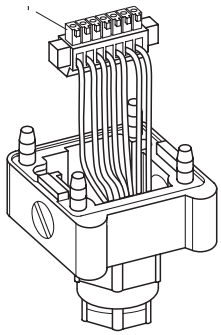


	A	B	C	D	E	F	G
MSL 02-X50	500	663	524	80	265	77	86
MSL 03-X22	440	576	437	80	265	50	86
MSL 03-X40	800	964	825	80	265	78	86
MSLZ 01-X50	500	663	524	80	255	87	76

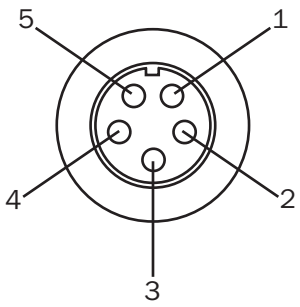
Accessories: MSL/MSM

Connectors

Part number	MSL/MSM
7 022 958	End cap assy. receiver, 7-pin mini
7 022 980	End cap assy. sender, 5-pin mini
7 021 354	MSLE conn. Hirschmann 6P+PE
2 018 539	MSLE conn. Hirschmann 6P+PE
2 018 584	MSLE conn. Hirschmann 11P+PE

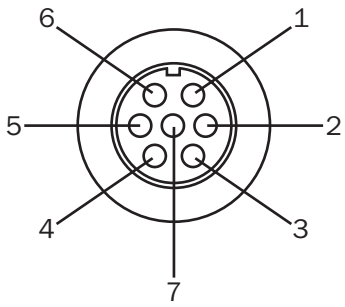


Sender



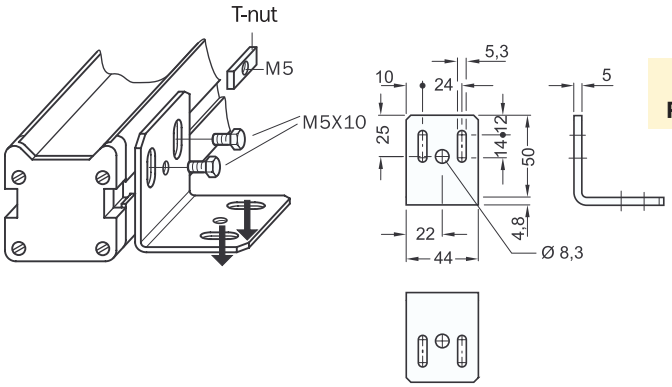
Pin	Color	Function
1	Black	+ 24 V DC
2	Blue	Test
3	Grn/Ylw	PE
4	Brown	Test
5	White	0 V DC

Receiver

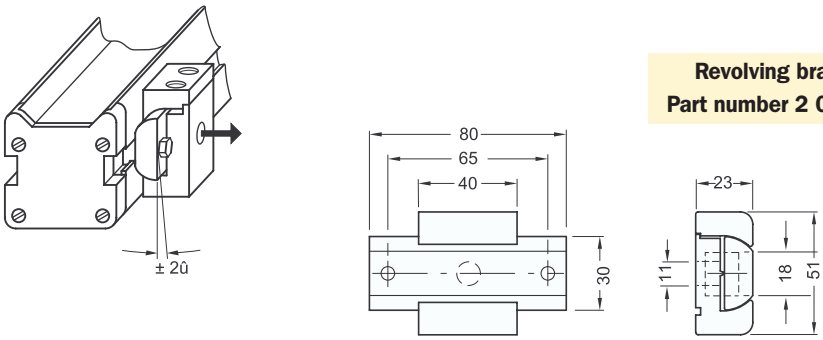


Pin	Color	Function
1	Black	+ 24 V DC
2	White	0 V DC
3	Blue	Out 1
4	Brown	Out 2
5	Gray	RES
6	Yellow	EDM
7	Green	PE

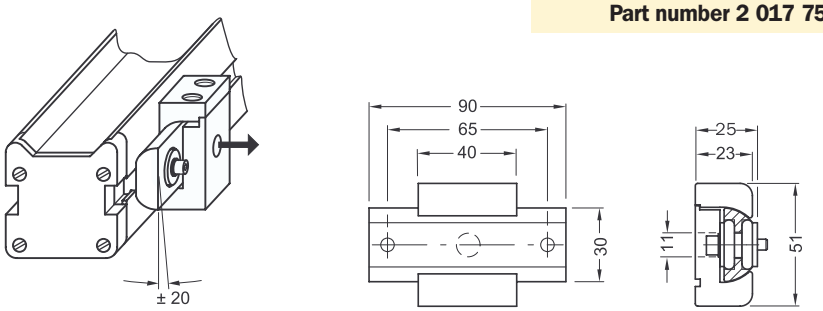
Brackets



Mounting bracket
Part number 7 021 352

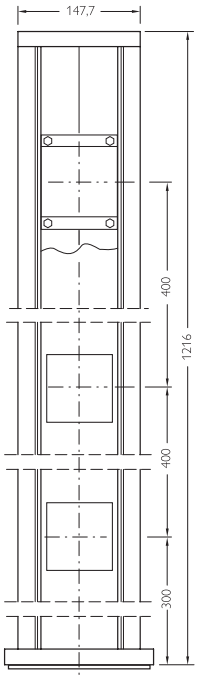


Revolving bracket
Part number 2 017 751

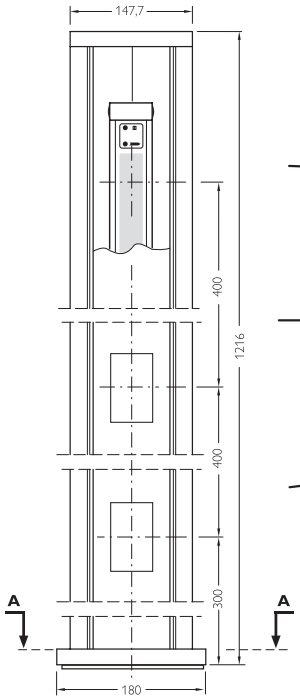


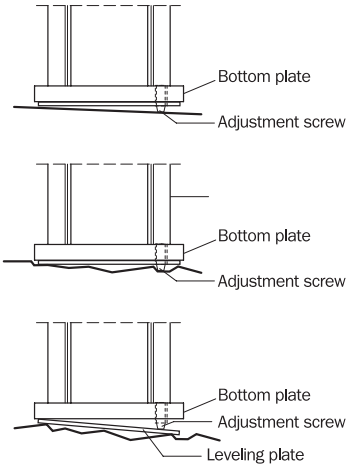
Revolving & vibration-damping bracket
Part number 2 017 752

Deviation mirrors/columns

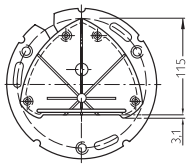


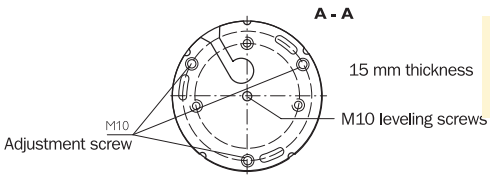
Leveling plate
Part number 4 031 053



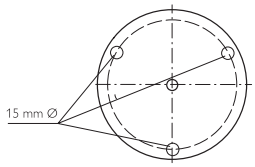


Leveling plate
Part number 4 031 053



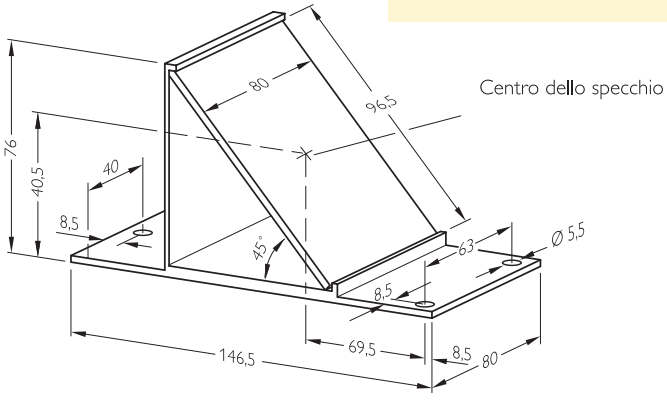


Bottom plate
Part number 4 031 238

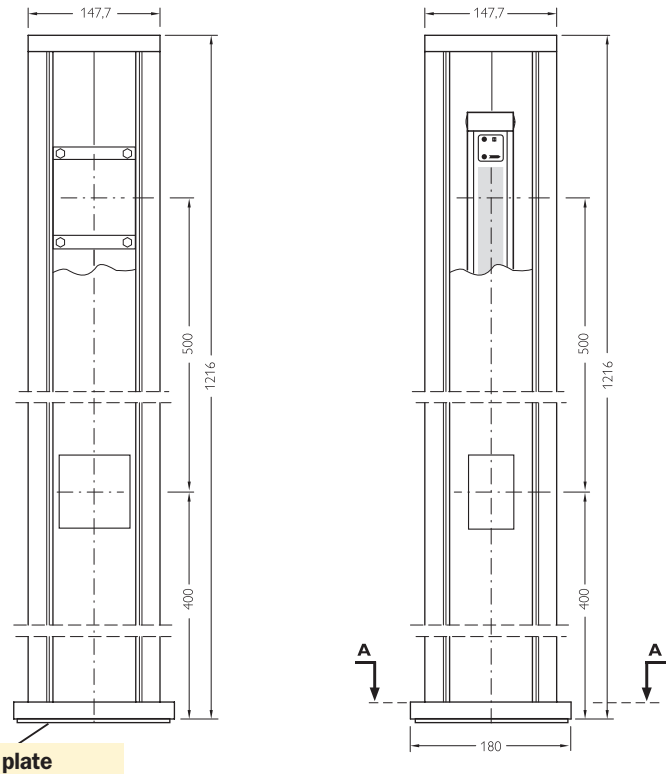


3 mm secondary thickness
Part number 4 031 053

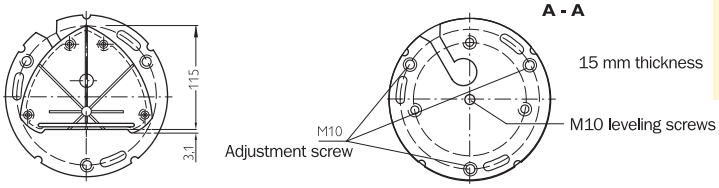
Deviation mirrors PSK 45
Part number 5 306 053



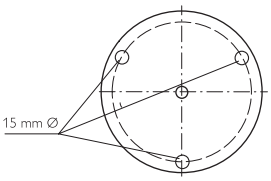
Deviation mirrors/columns



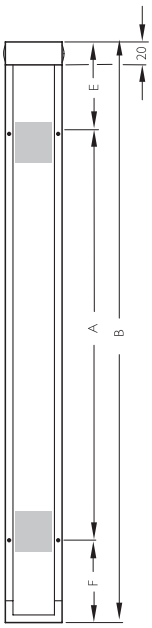
Leveling plate
Part number 4 031 053



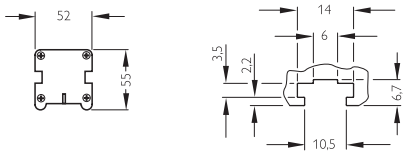
Bottom plate
Part number 4 031 238



Adjustment plate, 3 mm thick
Part number 4 031 053



Dimension of t-slot



Optoelectronics Type 4

C 4000 Product Selection



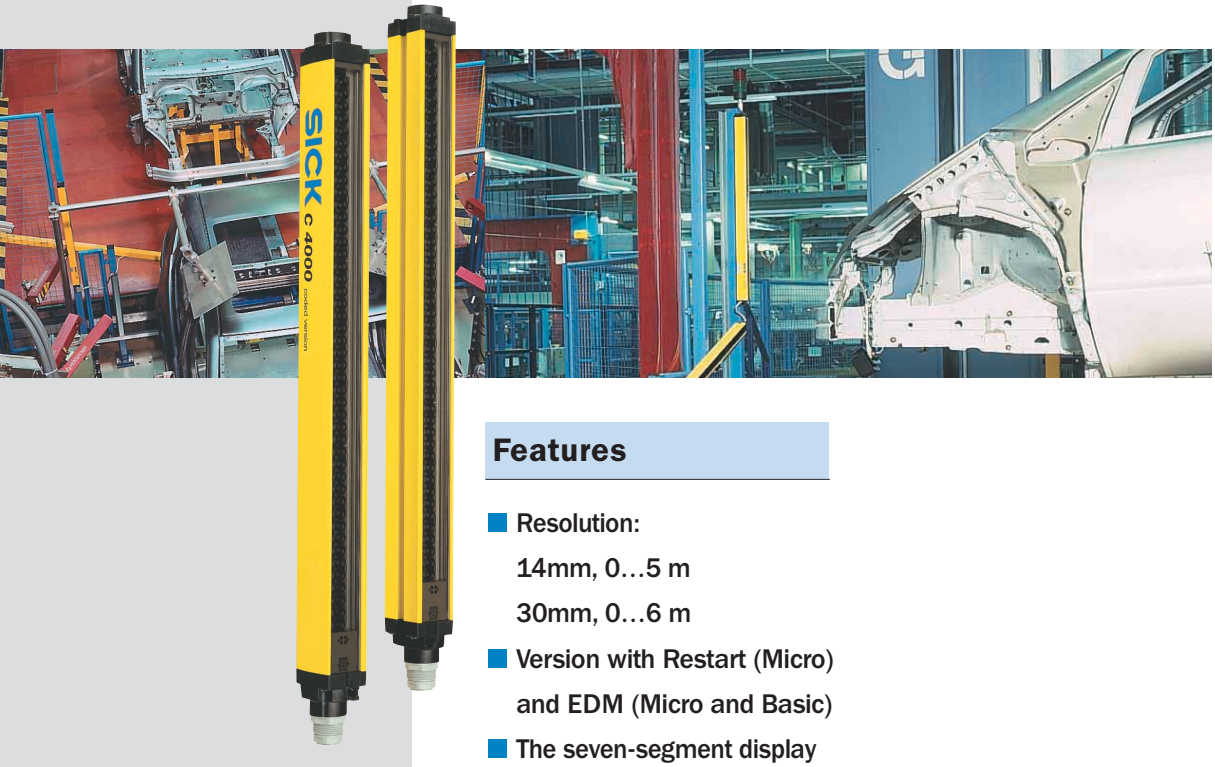

	Micro	Basic	Standard	Standard with Receiver Extension Plug
Available Resolutions (mm)	14, 30	14, 30	14, 20, 30, 40	14, 20, 30, 40
Available Protective Heights (mm)	300…1200	300…1800	300…1800	300…1800
Maximum Distance Between Sender and Receiver Units (Range)				
14 mm Resolution (m)	5 m	5	6	6
20 mm Resolution (m)	NA	NA	19	19
30 mm Resolution (m)	6 m	6	19	19
40 mm Resolution (m)	NA	NA	19	19
Housing Cross-Sectional Dimensions (mm)	25.8 x 33.5 mm	40 x 48	40 x 48	40 x 48
Type Designation per 61496 (ANSI/UL/IEC)	Type 4	Type 4	Type 4	Type 4
Safety Integrity Level (SIL) per EN 61508	SIL 3	SIL 3	SIL 3	SIL 3
Approvals	c UL us CE	c UL us CE	c UL us CE	c UL us CE
SICK Configuration and Diagnostic Software (Provided at No Charge when Available)	NA	NA	Yes, but may not be required in Guard Only applications	Yes, but may not be required in Guard Only applications
Seven-segment Diagnostic Display	Yes	Yes	Yes	Yes
External Device Monitoring	Yes	Yes	Yes	Yes
Restart Interlock				
Automatic Restart	Yes	Yes	Yes	Yes
Manual Restart	Yes	NA	Yes	Yes
Restart Required Output	NA	NA	Yes	Yes
Cascadability				
Stand Alone	Yes	Yes	Yes	Yes
Host-Guest Configurations	NA	NA	Guest Only	Guest Only
Host-Middle Guest-End Guest Configurations	NA	NA	End Guest Only	NA
Direct Connection Emergency Stop/Interlock	NA	NA	NA	Yes
Application Diagnostic Output (Only One)				
Emergency Stop or Interlock Status	NA	NA	NA	Yes
Front Lens Contamination	NA	NA	Yes	Yes
OSSD* Status	NA	NA	Yes	Yes
Beam Coding	NA	NA	Yes	Yes
Blanking Functionality (Up to Four Areas)				
Fixed Blanking	NA	NA	NA	NA
Floating Blanking	NA	NA	NA	NA
Reduced Resolution	NA	NA	NA	NA
Teach-in Functionality	NA	NA	NA	NA
Dynamic Floating Blanking	NA	NA	NA	NA
Connectivity Options (Sold Separately)				
UE 10 Series Safety Relay Modules	Yes	Yes	Yes	Yes
UE 100 Series Intelligent Interfaces	NA	NA	Yes	Yes
UE 1000 Safety Bus Interfaces	NA	NA	Yes	Yes

* OSSD: Output Signal Switching Device

NOTE: Not all features can be combined. Refer to Installation and Operation Instructions for additional detail.
When an Emergency Stop or Interlock is connected to any C 4000 version, External Muting of the C 4000 is NOT ALLOWED.

				
Standard Cascadable	**Advanced**	**Advanced with Receiver Extension Plug**	**Advanced Cascadable**	**Entry/Exit**
14, 20, 30, 40	14, 20, 30, 40	14, 20, 30, 40	14, 20, 30, 40	20
300…1800	300…1800	300…1800	300…1800	900…1800
6	6	6	6	NA
19	19	19	19	19
19	19	19	19	NA
19	19	19	19	NA
40 x 48	40 x 48	40 x 48	40 x 48	40 x 48
Type 4	Type 4	Type 4	Type 4	Type 4
SIL 3	SIL 3	SIL 3	SIL 3	SIL 3
cULus CE	cULus CE	cULus CE	cULus CE	cULus CE
Yes, but may not be required in Guard Only applications	Yes, for advanced functionality programming	Yes, for advanced functionality programming	Yes, for advanced functionality programming	Yes, for advanced functionality programming
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Host or Guest	Guest Only	Guest Only	Host or Guest	NA
Host or Middle Guest	End Guest Only	NA	Host or Guest	NA
Yes	NA	Yes	Yes	NA
Yes	NA	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
NA	Yes	Yes	Yes	NA
NA	Yes	Yes	Yes	NA
NA	Yes	Yes	Yes	NA
NA	Yes	Yes	Yes	NA
NA	NA	NA	NA	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes

Safety light curtain C 4000 Micro/Basic



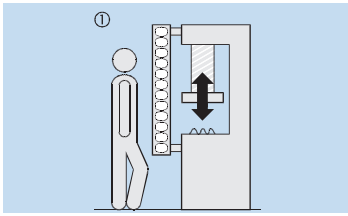
Features

- Resolution:
  14mm, 0…5 m
  30mm, 0…6 m
- Version with Restart (Micro) and EDM (Micro and Basic)
- The seven-segment display enables easy alignment and simplified diagnosis
- Protected field height:
  150…1200 mm (Micro)
  300…1800 mm (Basic)
- Safety Category 4, in accordance with IEC 61 496 and UL 91 496
- Safety Integrity Level (SIL) 3, in accordance with EN 61 508
- Housing dimensions:
  28.5 x 33.5 mm (Micro)
  40 x 48 mm (Basic)

Description of function

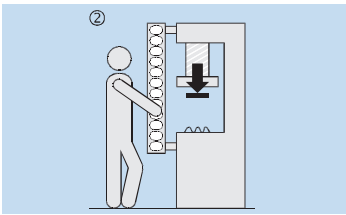
EDM

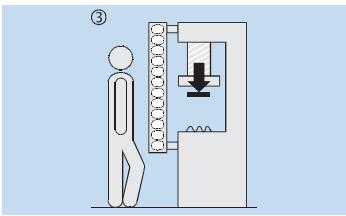
The external device monitor control verifies if the contactors are actually disabled at the time of the safety device intervention.



Reset

The C 4000 Micro provides ideal access guarding of hazardous areas such as robot work cells, automated conveying, storage and transport systems. The C 4000 Micro has selectable manual or automatic modes. In manual reset mode, if the light beam is interrupted, the equipment stops and can no longer be used until the operator activates the reset button.



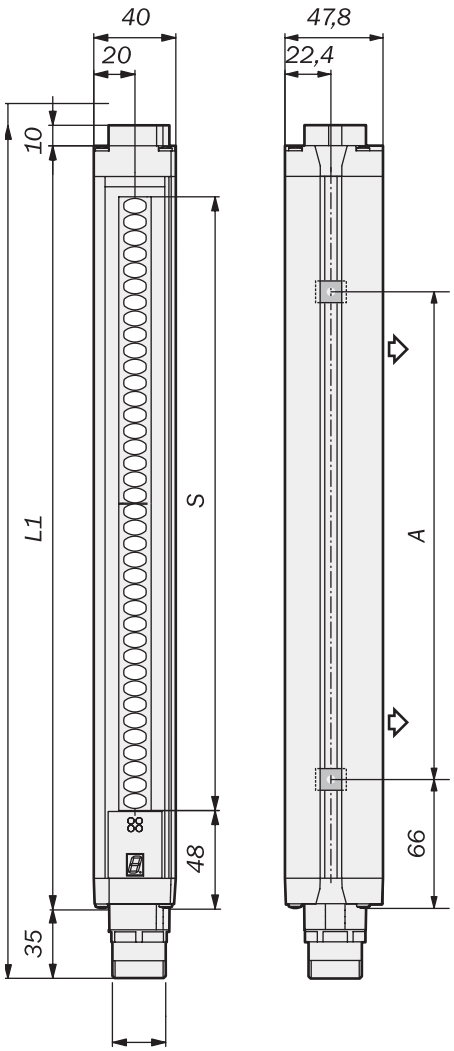


Technical specifications

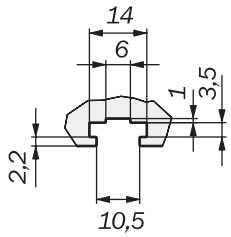
	C 4000 Micro	C 4000 Basic
Supply voltage	24 V DC ± 10%	24 V DC ± 10%
Power consumption	800 mA	350 mA
Wavelength	950 mm	950 mm
Number of beams	*	*
Resolution	14 mm/30 mm	14 mm/30 mm
Protective field height	150 - 1200 mm	300-1800 mm
Operating distance	0-6 m	0-6 m
Sender inputs	test	test
Receiver inputs	EDM, Restart	EDM
Switching outputs	2 OSSD PNP 500 mA	2 OSSD PNP 500 mA
Response time	*	*
Selectable functions	EDM, Restart	EDM
Protection class	IP 65	IP 65
Safety category	4	4
Synchronization	optical	optical
Dimensions	28.5 x 33.5 cm	40 x 48 cm
Operating temperature	0…50° C	0…50° C
Storage temperature	-25…70° C	-25…70° C
Tested to	IEC 61 496, EN 61 508	IEC 61 496, EN 61 508
Certifications	CE, DQS, cULus	CE, cULus

* see technical manual

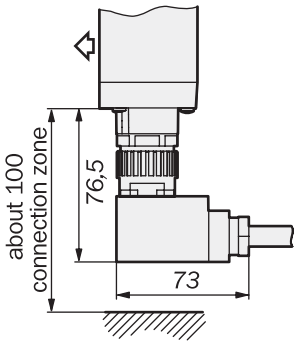
Drawings



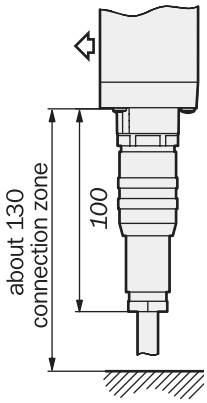
connector DIN 43651
(M 2 x 6 + TF)



Insert slot for lateral guide mount



M 26 x 6 + TF
angle connector block
with screw clamps

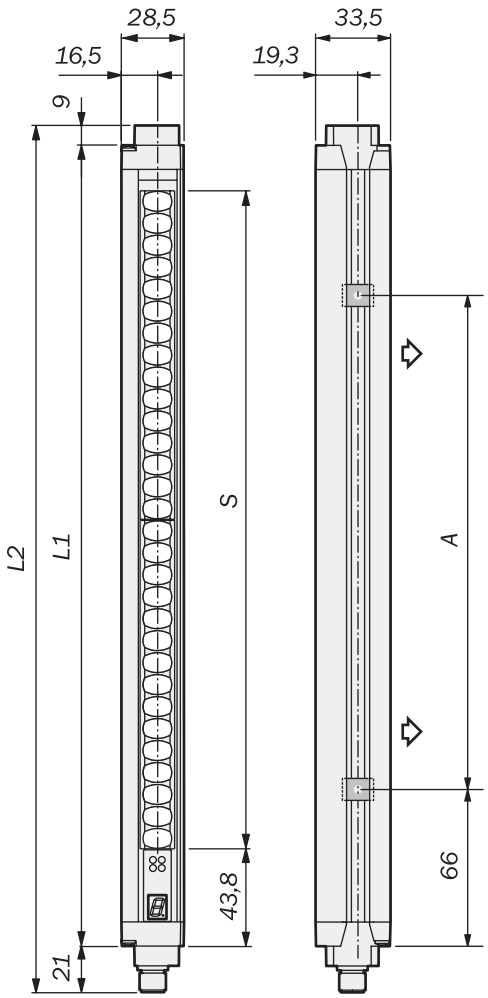


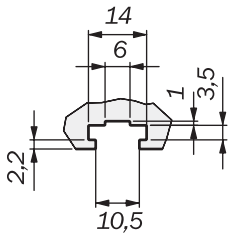
M 26 6 + TF
straight block
with crimp contacts

Basic

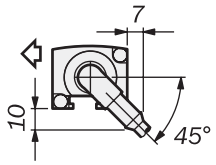
Height S (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure A (mm)
300	372	417	224
450	523	568	374
600	674	718	524
750	824	869	674
900	975	1020	824
1050	1125	1170	974
1200	1274	1319	1124
1350	1426	1471	1274
1500	1577	1622	1424
1650	1727	1772	1574
1800	1878	1923	1724

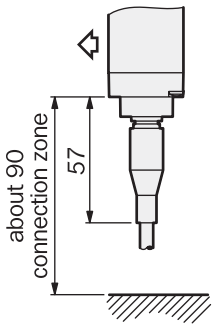
Drawings

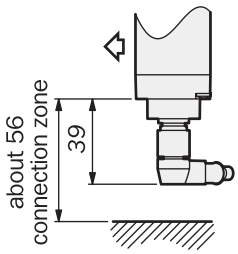




Insert slot for lateral guide mount



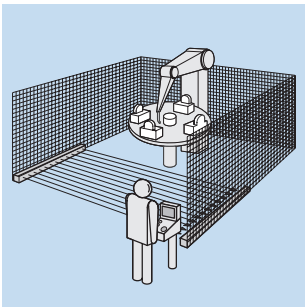




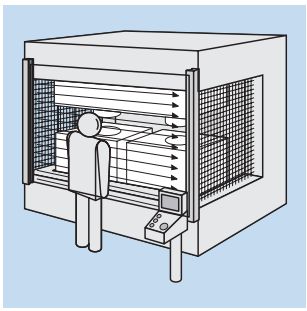
Height S (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure A (mm)
150	276	246	74
300	364	394	224
450	515	545	374
600	666	696	524
750	816	846	674
900	967	997	824
1050	1117	1147	974
1200	1266	1296	1124

Application examples

- Suitable for finger and hand protection
- Safeguards hazardous areas on packing machines
- Provides protection on power presses
- Safeguards printed circuit testing machinery

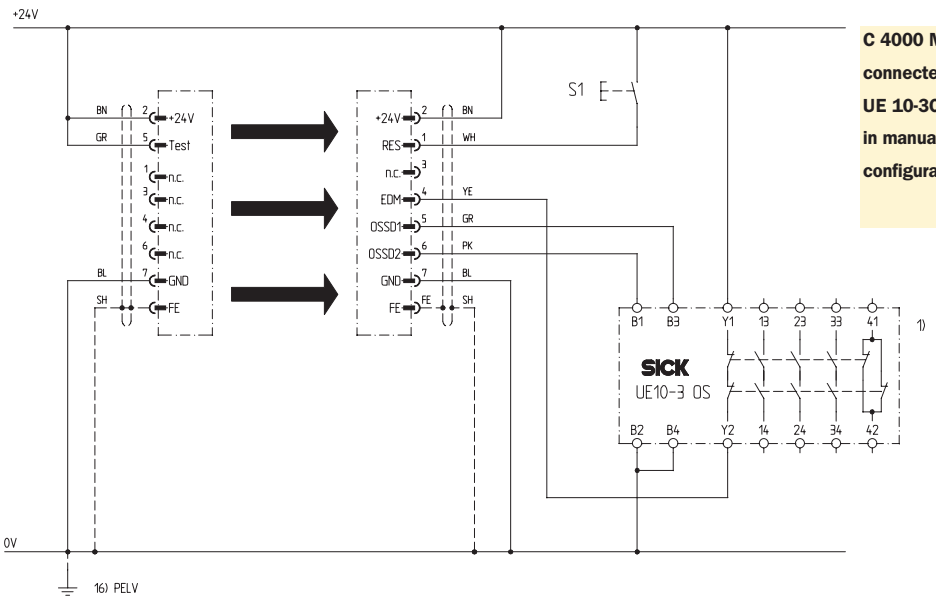


C 4000 Basic installed for safeguarding hazard points on automated machinery



C 4000 Micro installed for finger protection on a mechanical press

Connection example



C 4000 Micro connected to a UE 10-3OS relay in manual restart configuration

Safety light curtain C 4000 Standard

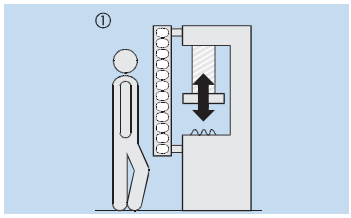
Features

- Resolution 14, 20, 30, 40 mm
- Beam coding minimizes optical interference from other light curtains.
- Easy integration, low wiring cost.
- Cascadable design- up to 3 linked light curtains are possible with one pair of output signals.
- Direct connection of emergency stop interlocks and reset control units
- Configure via CDS Software
- Safety Integrity Level (SIL) 3, in accordance with EN 61 508
- Dimensions: 38.5 x 47 mm

Description of function

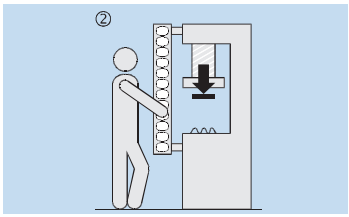
EDM

The external device monitor control verifies if the contactors are actually disabled at the time of the safety device intervention.

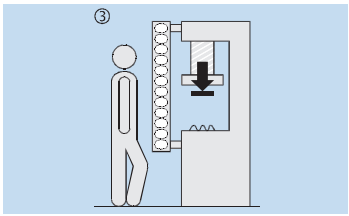


Beam coding/emergency stop

The beam coding function is used to eliminate reciprocal interference among several adjacent light curtains. Thanks to this function, it is no longer necessary to place physical protection between barriers in order to avoid interference.



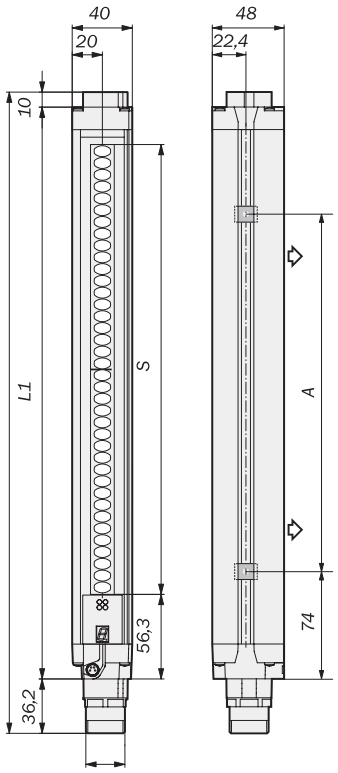
The C 4000 Standard safety light curtain is equipped with a port for a dual-channel emergency stop button. The emergency stop monitoring feature meets the requirements of Category 0, in accordance with EN 418.



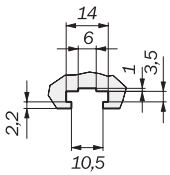
Technical specifications

	C 4000 Standard
Supply voltage	24 V DC +20%
Wavelength	950 nm
Resolution	14/20/30/40 mm
Protective field height	300-1800 mm
Operating distance	0…6 m (with resolution 14mm) 0…19 m (with resolution 20/30/40 mm)
Sender inputs	test
Receiver inputs	EDM, Restart
Switching outputs	2 OSSD PNP 500 mA
Selectable functions	EDM, Restart, pulse of emergency barrier, beam coding
Protection class	IP 65
Safety category	4
Synchronization	optical
Dimensions	38.5 x 47mm
Operating temperature	0…55° C
Storage temperature	-25…70° C
Tested to	IEC 61 496, EN 61 508
Certifications	CE, cULus, DQS

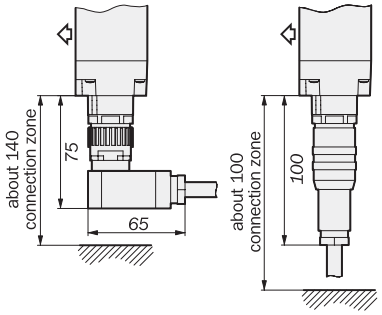
Drawings



Connector DIN 43 651 (M 26 11 + TF)



Insert slot for lateral guide mount

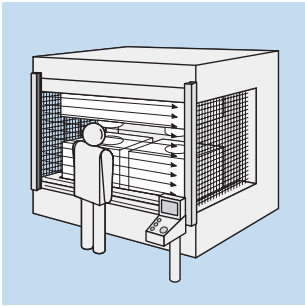


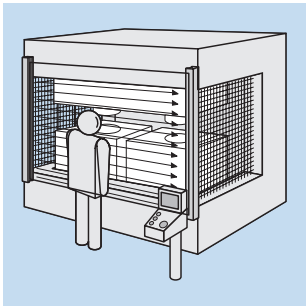
Connector M 26 11 + TF with contacts crimp

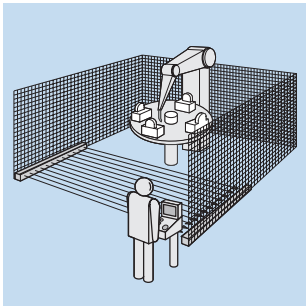
Height S (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure A (mm)
300	381	427	224
450	532	578	374
600	682	728	524
750	833	879	674
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424
1650	1736	1782	1574
1800	1887	1933	1724

Application examples

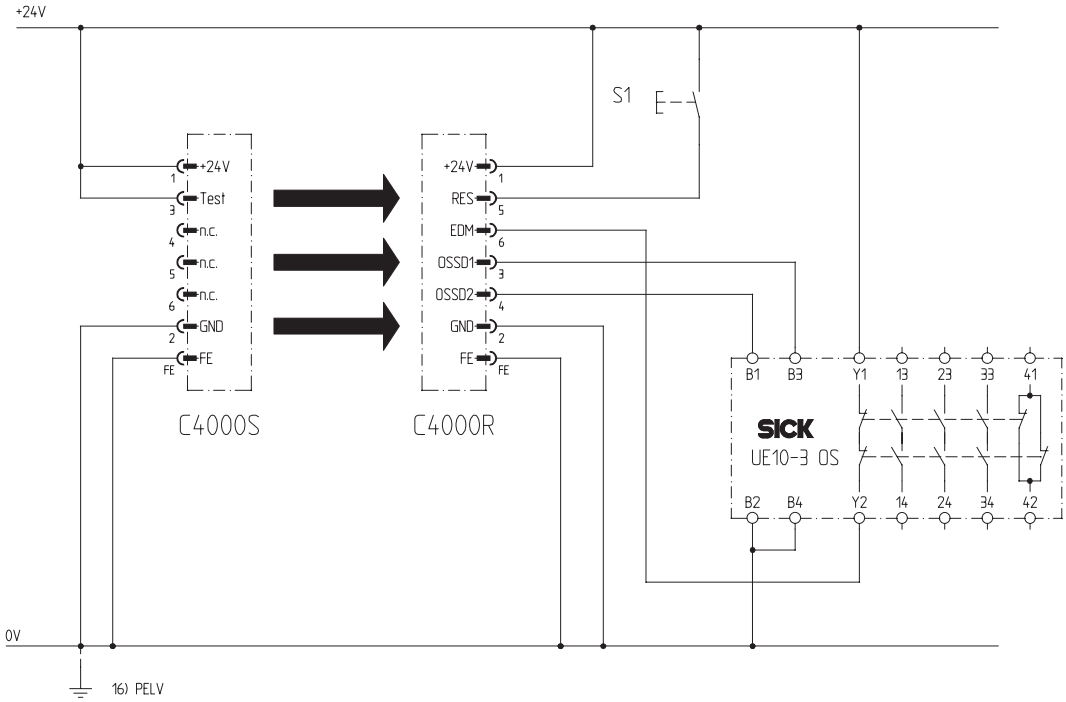
- Provides worker safety on power presses, etc.
- Suitable for finger and hand protection
- Safeguards hazardous areas on packing machines
- Provides protection on power presses
- Safeguards printed circuit testing machinery





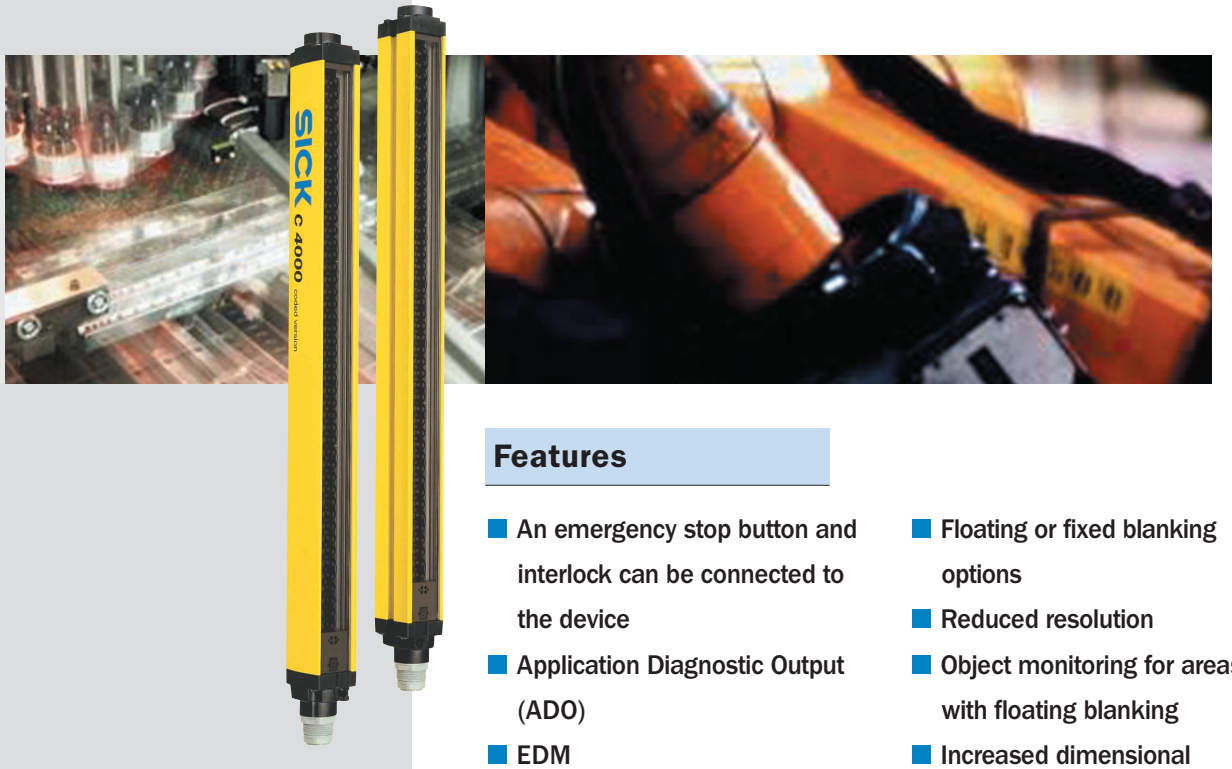


Connection example



Example of connection between safety light curtain C 4000 Standard and safety module UE 10-3 OS

Safety light curtain C 4000 Advanced



Features

- An emergency stop button and interlock can be connected to the device
- Application Diagnostic Output (ADO)
- EDM
- Beam coding
- The seven-segment display enables easy alignment and simplified diagnosis
- Cascadable design- with up to 3 linked safety light curtains
- Floating or fixed blanking options
- Reduced resolution
- Object monitoring for areas with floating blanking
- Increased dimensional tolerance for areas with fixed blanking
- Safety Integrity Level (SIL) 3, in accordance with EN 61 508

Description of function

EDM

The external device monitor control verifies if the contactors are actually disabled at the time of the safety device intervention.

Beam coding

The beam coding function is used to eliminate reciprocal interference among several adjacent light curtains. Thanks to this function, it is no longer necessary to place physical protection between light curtains in order to avoid interference.

Emergency stop

The C 4000 Advanced is equipped with a port for a dual-channel emergency stop button. The emergency stop monitoring feature meets the requirements of stop Category 0, in accordance with EN 418.

Floating blanking

The C 4000 Advanced safety light curtain is capable of excluding areas with two or more adjacent beams (figure 1).

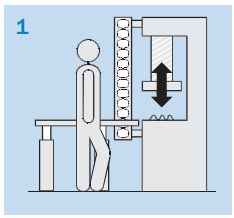
The blanking field may be fixed or floating. In the case of floating blanking, an object can move within the protected field (figure 2) without the curtain changing to red. Thus, the safety light curtain can sense if the object is inside or outside the excluded area (figure 3).

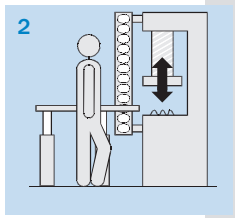
Increased dimensional tolerance

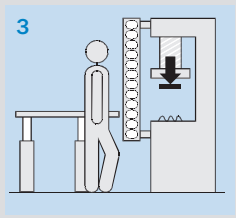
This function allows the operator to configure a dimensional tolerance for the fixed blanking. Therefore, objects can be directed in the protected field from one side of the fixed blanking, such as feeding material via a conveyor belt (figure 4) and (figure 5).

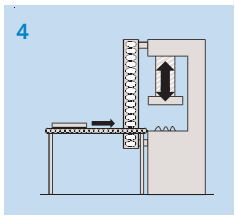
Fixed blanking

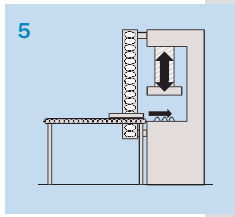
The C 4000 Advanced safety light curtain is capable of excluding in fixed mode one or more of the adjacent beams. The blanking area is not part of the protected field. Therefore, excluded objects should be in the blanking area at all times (figure 7). If the object is removed from the protected field, the curtain stops the hazardous motion (figure 8) because safety can no longer be guaranteed.

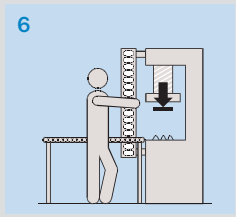


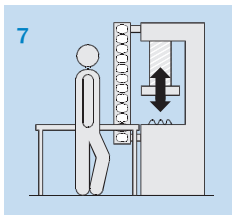










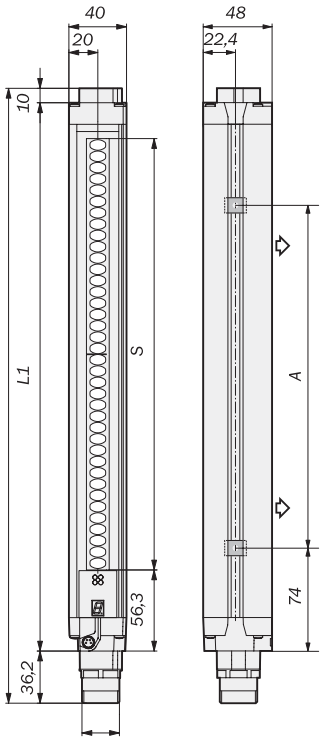


Technical specifications

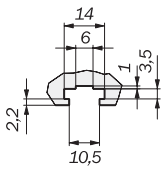
	C 4000 Advanced
Supply voltage	24 V DC +20%
Wavelength	950 nm
Number of beams	see table 1
Response time	see table 2
Resolution	14/20/30/40 mm
Protective field height	300-1800 mm
Operating distance	0…6 m (with resolution 14 mm) 0…19 m (with resolution 20/30/40 mm)
Sender inputs	test
Receiver inputs	EDM, restart
Switching outputs	2 OSSD PNP 500 mA
Selectable functions	EDM, restart, E-stops, blanking, reduced resolution
Protection class	IP 65
Safety category	4
Dimensions	40 x 48 mm
Operating temperature	0…55° C
Storage temperature	-25…70° C
Tested to	IEC 61 496, EN 61 508
Certifications	CE, cULus, DQS

Drawings

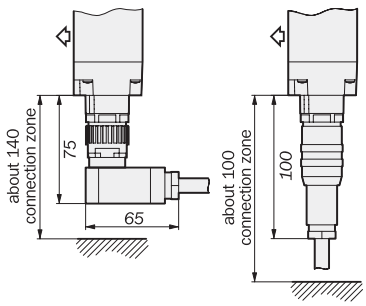
Height S (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure A (mm)
300	381	427	224
450	532	578	374
600	682	728	524
750	833	879	674
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424
1650	1736	1782	1574
1800	1887	1933	1724



connector DIN 43 651 (M 26 11+ TF)



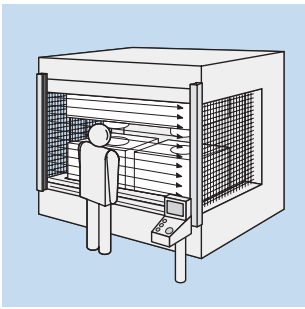
Insert slot for lateral guide mount

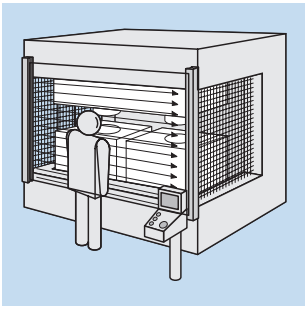


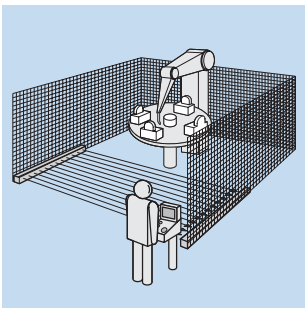
connector M 26 11+ TF with contact crimp

Application examples

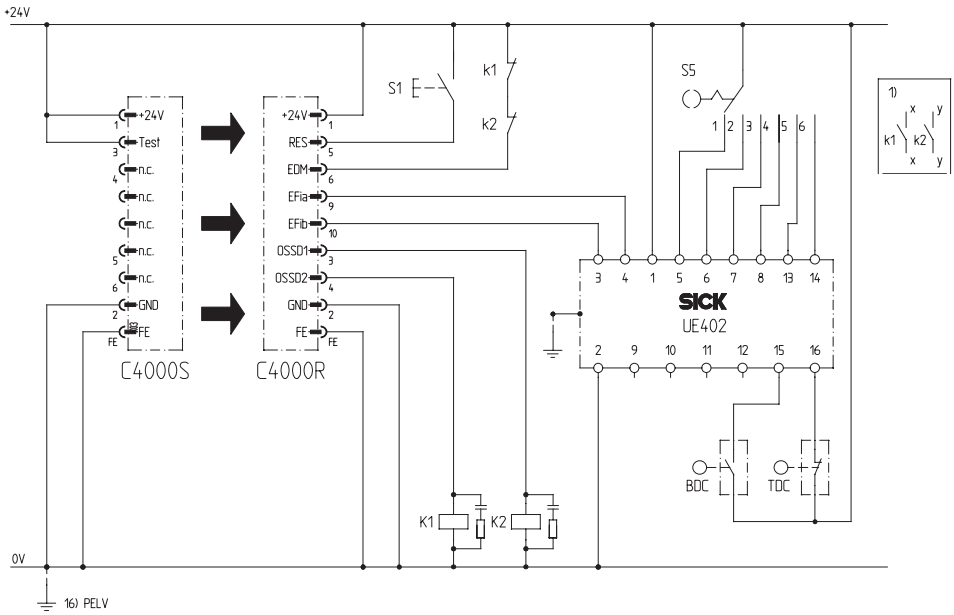
- Ideal press brakes and other power press applications
- Suitable for finger and hand protection
- Safeguards hazardous areas on packing machines
- Provides protection on power presses
- Safeguards printed circuit testing machinery





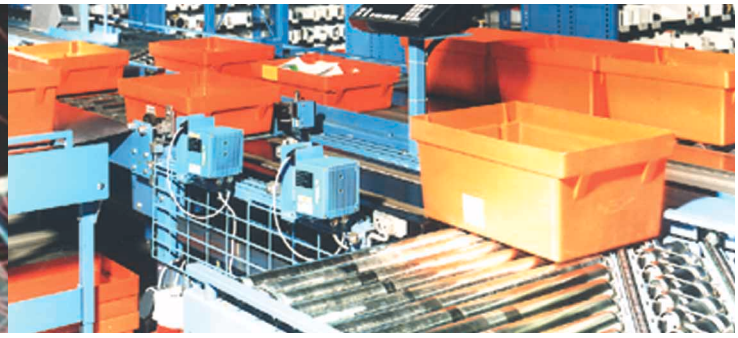


Connection example



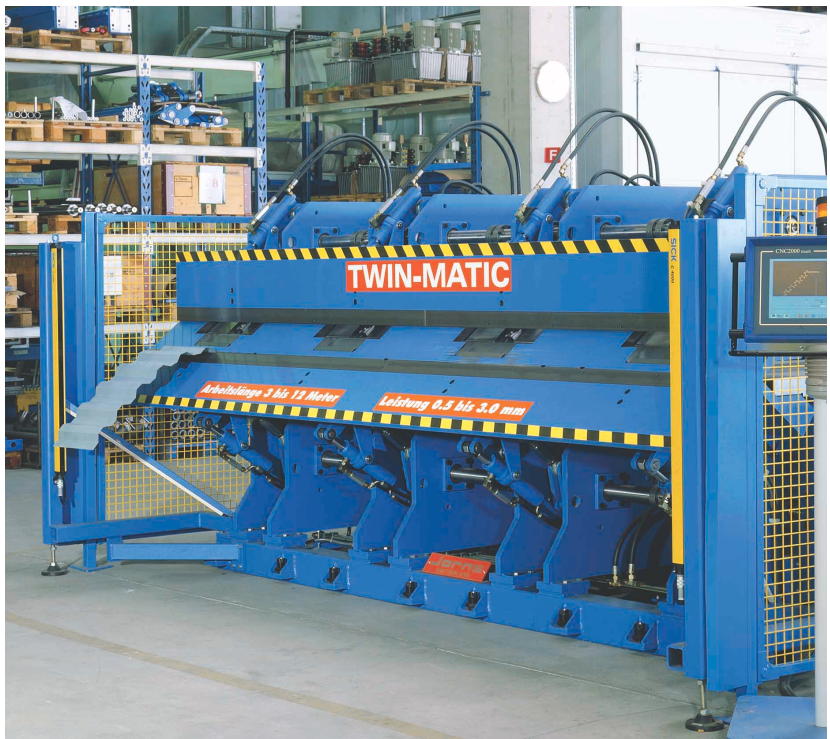
Example of connection between safety light curtain C 4000 Advanced and switching amplifier UE 402

Safety interface
UE 402



Features

- Compatible with the C 4000 Standard (PSDI) /Advanced safety light curtain
- Offers six presettable operating modes
- PSDI
- Protected field evaluation bypass
- Teach blanking function

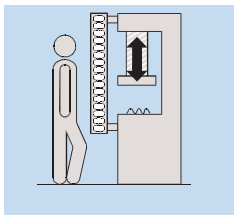


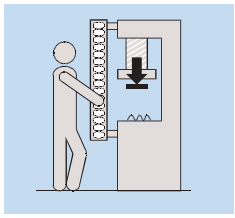
Description of function

Bypass

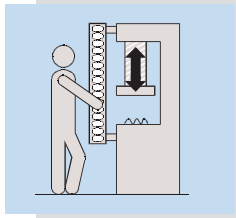
In some applications, safety curtain protected field analysis should be temporarily excluded. For example: in a safe preparation operating mode, when the operating speed is very slow (e.g., walking speed). If the bypass is enabled, the safety curtain indicator is:

● green and the receiver seven-segment display indicates →





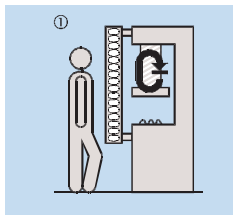
Bypass disabled

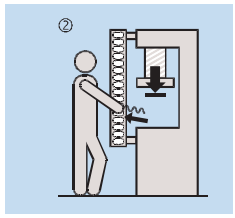


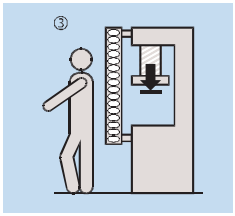
Bypass enabled

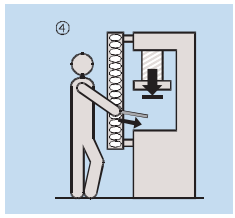
PSDI

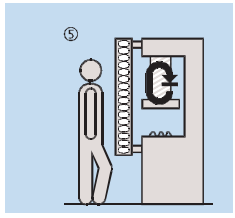
During timed operation, the machine waits at the TCD (Top Dead Center) point for a specific number of user interventions. After a predefined number of interruptions, the safety curtain automatically initiates machine motion. 2.) Dual-cycle operation indicates that the safety curtain blocks the movement after the first user intervention. 4.) The safety curtain does not initiate the motion again until after the user has completed the second intervention.











Note: The timed operation function is configurable only for curtains with ≤ 30 mm actual resolution during operation.

Technical specifications

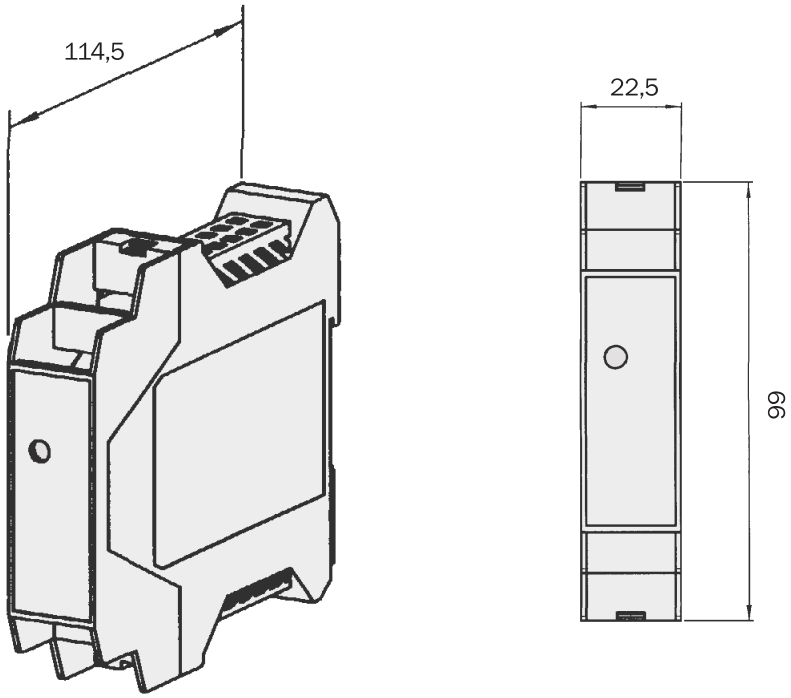
	UE 402		
	minimum	**typical**	**maximum**
Supply voltage	19.2 V	24 V	28.8 V
Power consumption	110 mA		
Inputs in A1 to A6, MCC-BDC and MCC-tdc			
Switching voltage HIGH	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Switching voltage LOW	-30 V	0 V	5 V
Input current LOW	-3 mA	0 mA	0.5 mA
Change overtime in A1 in A6			2s
Bouncing time of contact			25 ms
Inputs in B1 to B2, outputs B1 and B2			
Cable resistance			30 Ω
Cable capacitance			10 nF
Bouncing time of contacts			25 ms
Protection class	IP 67		
Safety category	4		
Operating temperature	0…55° C		
Storage temperature	-25…70° C		
Certifications	CE, UL		

Product selection table

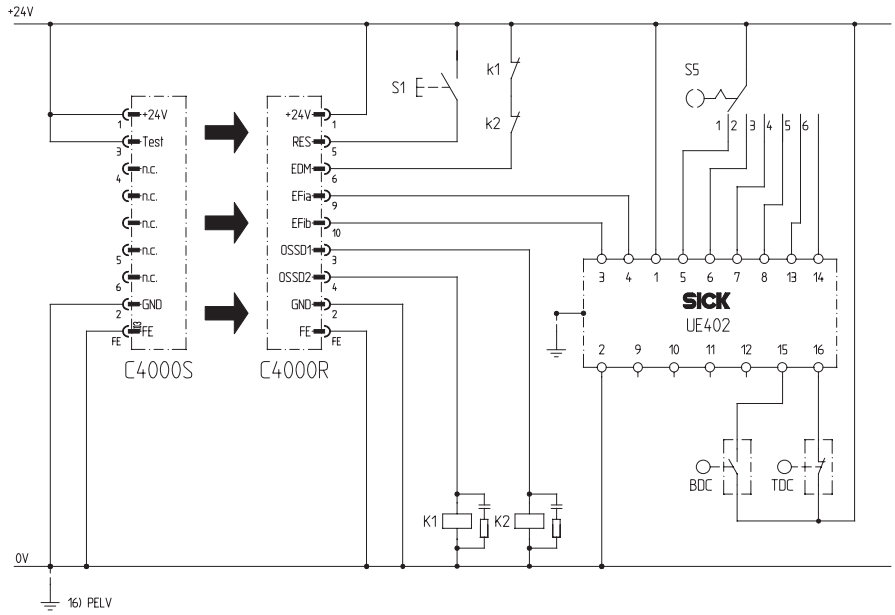
UE 402	**Part number: 1 023 577**	**Switching amplifier for C 4000 Standard/Advanced**

We recommend contacting Customer Service for product selection

Drawings

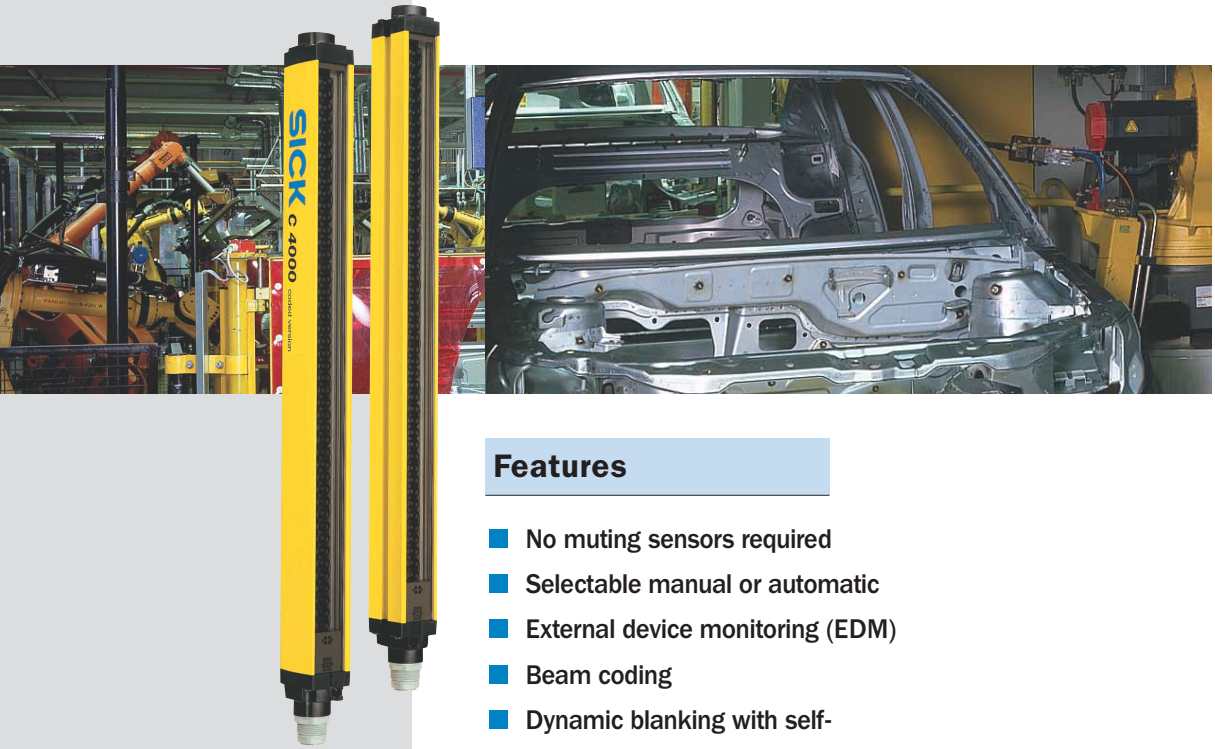


Connection example



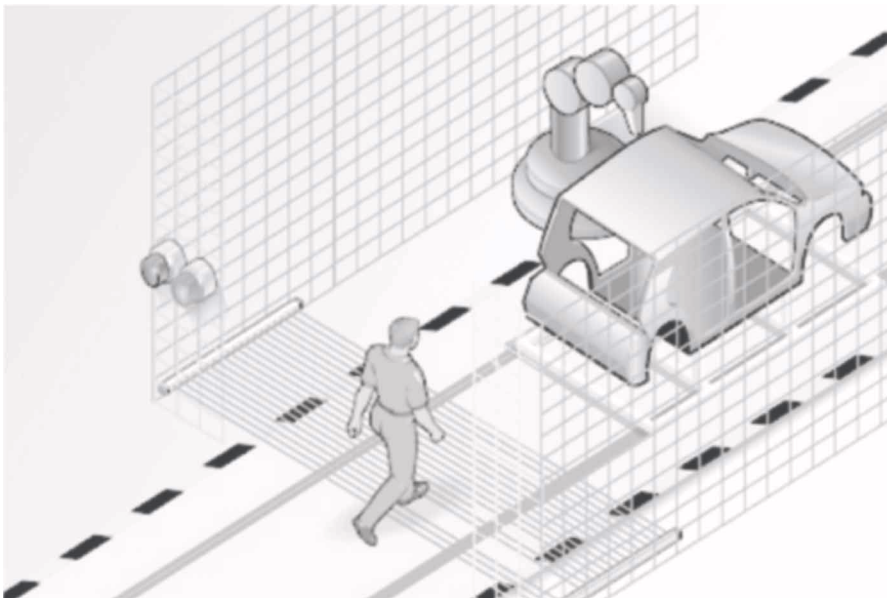
Example of connection between safety light curtain C 4000 Advanced and safety module UE 402

Safety light curtain C 4000 Entry/Exit



Features

- No muting sensors required
- Selectable manual or automatic
- External device monitoring (EDM)
- Beam coding
- Dynamic blanking with self-learning technology that excludes objects within the protected field.
- Application diagnostic output
- Safety Integrity Level (SIL) 3, in accordance with EN 61 508



Description of function

EDM

The external device monitor control verifies if the contactors are actually disabled at the time of the safety device intervention.

Sender and receiver

The C 4000 Entry/Exit safety curtain consists of two units: the sender and the receiver. The protected field is located between the two units and is defined by the field length and width. The protected field width is determined by the length of the light beam between the sender and the receiver, and should not exceed the maximum range allowed.

The sender and the receiver self-synchronize optically. An electrical connection between the two units is not needed.

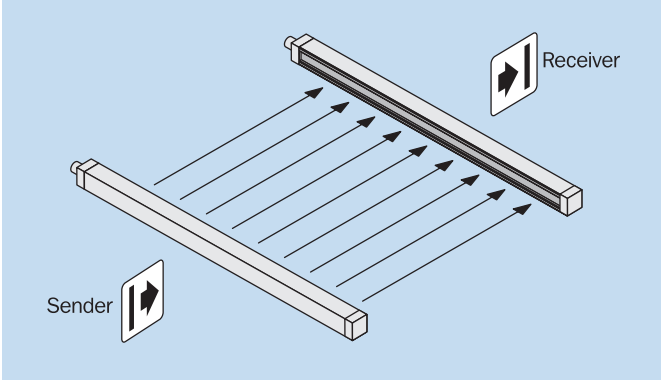
All optical and electronic components and assemblies are housed in a slim and torsionally rigid housing.

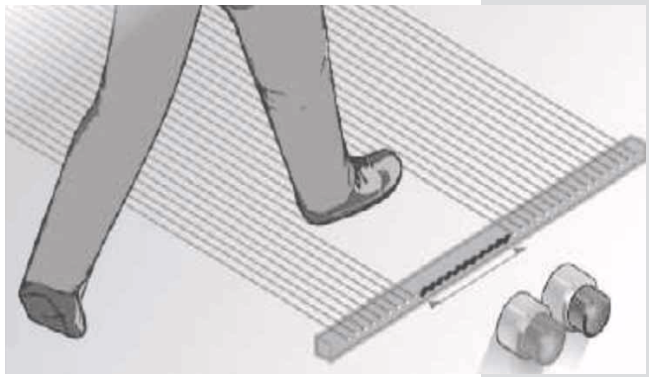
Dynamic blanking

This function is designed to reliably differentiate between workers and objects moving through an assembly line – protecting areas where objects cross a path and workers require access to systems or machinery. If an operator enters the protected filed, the C 4000 Entry/Exit's safety function is activated.

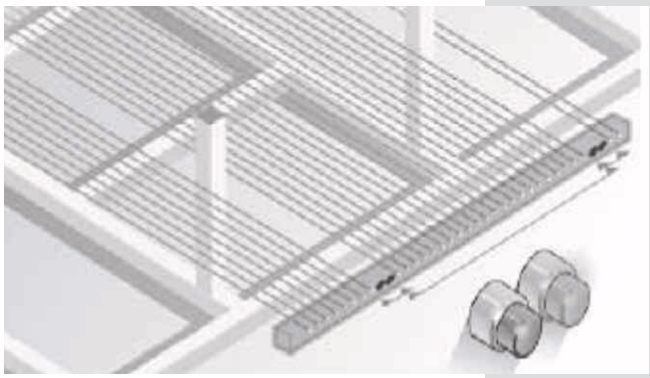
Dynamic blanking is assured along the entire protected field and in either access direction.

When objects pass through the controlled field, the C 4000 motors the motion speed, which should not exceed 2 m/s. Objects should enter the protected field from the same direction; during this process the C 4000 automatically learns the distance between objects and monitors the objects until they exit the field.





It is possible to configure the size of dynamic areas. The maximum size of the area is 150 mm, with resolution up to 20 mm.

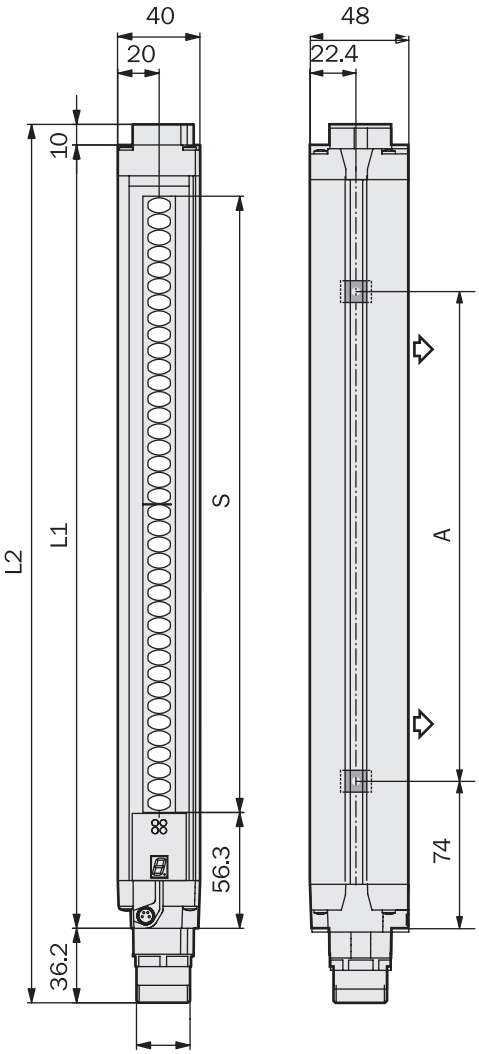


Transport of carts with one, two or three posts.

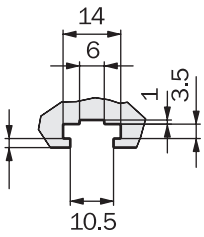
Technical specifications

	C 4000 Entry/Exit
Supply voltage	24 V DC ± 20%
Wavelength	950 nm
Resolution	20 mm
Protective field height	from 900 mm to 1500 mm
Operating distance	0.5…19 m
Switching outputs	2 OSSD PNP 1
Selectable functions	EDM, Restart, pushbutton reset, dynamic blanking
Protection class	IP 65
Safety category	4
Synchronization	optical without separate synchronization
Operating temperature	0…55° C
Storage temperature	-25…70° C
Tested to	IEC 61496-1/2
Certifications	CE, cULus

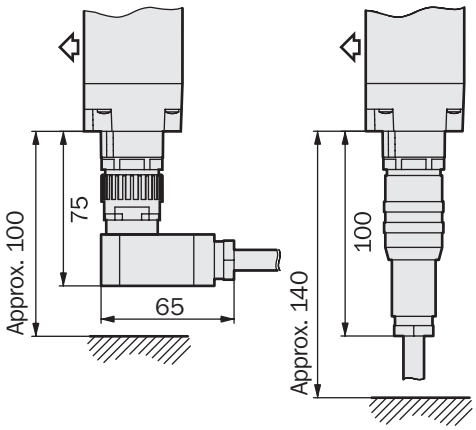
Drawings



Connector DIN 43 651 (M26x11 + FE)



T-slot dimensions



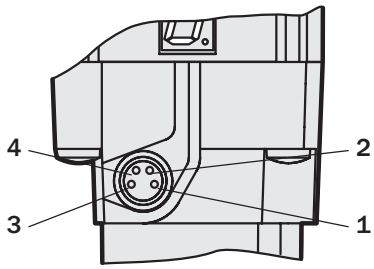
Connector M26 x 11 + FE with clamps to crimp

Protected field height S (mm)	L1 (mm)	L2 (mm)	A (mm)
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424

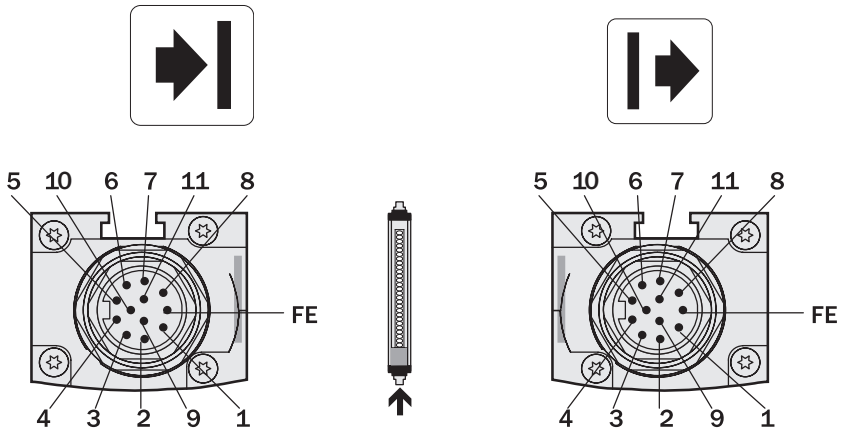
Accessories: C 4000

Connectors

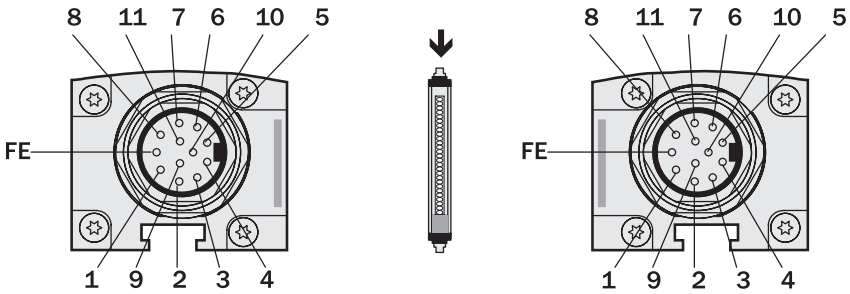
Part number	C 4000 Standard/Advanced
6 020 757	Hirsch. 11p + FE, crimp - straight -female
6 020 758	Hirsch. 11p + FE, crimp - 90°- female
2 022 544	Hirsch. 11p + FE, crimp - straight - cable 2.5 m
2 022 545	Hirsch. 11p + FE, crimp - straight - cable 5 m
2 022 546	Hirsch. 11p + FE, crimp - straight - cable 7.5 m
2 022 547	Hirsch. 11p + FE, crimp - straight - cable 10 m
2 022 548	Hirsch. 11p + FE, crimp - straight - cable 15 m
2 022 549	Hirsch. 11p + FE, crimp - straight - cable 20 m
2 022 550	Hirsch. 11p + FE, crimp - straight - cable 30 m
6 021 191	Connector 11 poli + PE straight - male
6 021 192	Connector 11 poli + PE angled - male



M8x4 (serial interface)

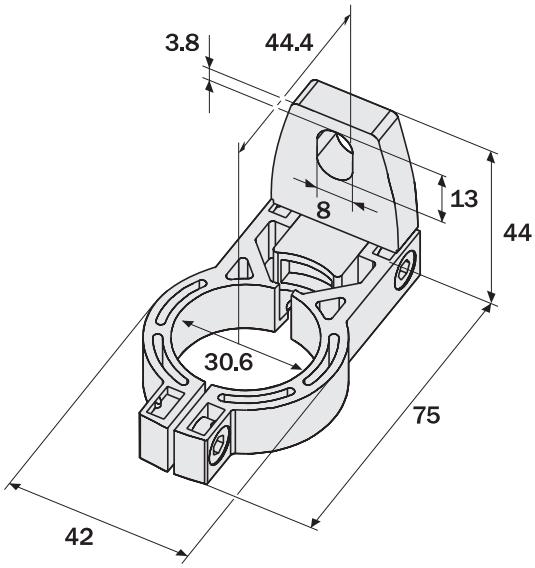


System connection M 26 11+FE

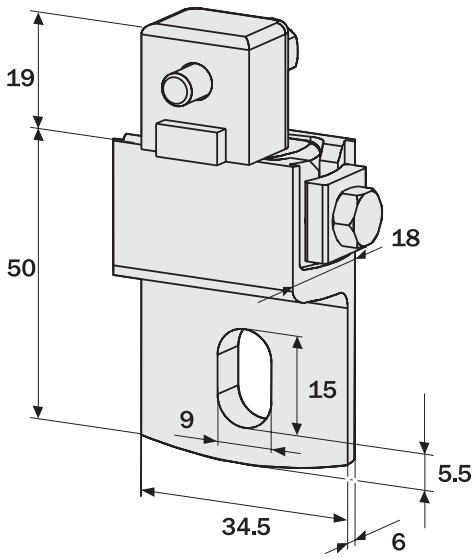


Extension connection M 26 11+FE

Brackets

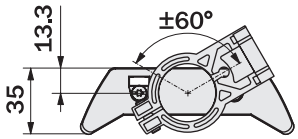


C 4000 Mounting Kit
Swivel Brackets
Part number 2 019 659

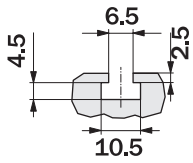


C 4000 Mounting Kit
Side Brackets
Part number 2 019 506

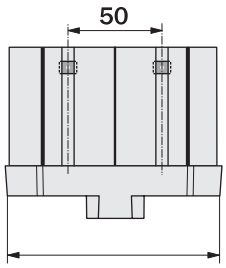
Mirrors



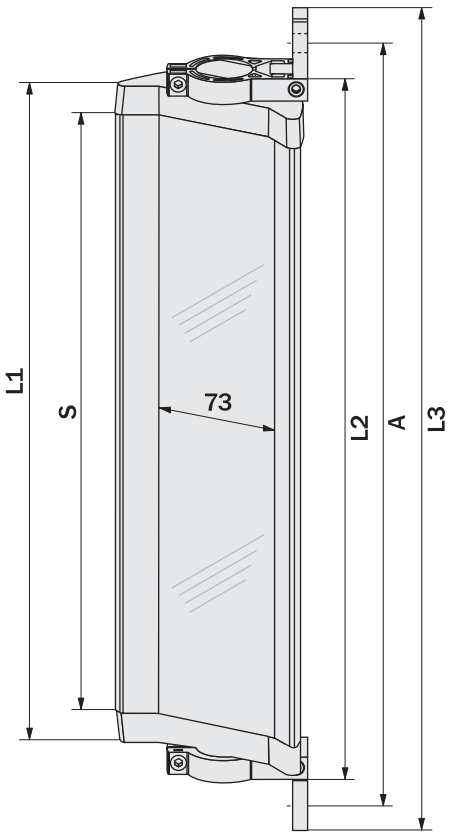
Mounting bracket with swivel mount



T-slot

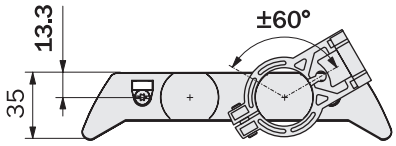


PNS 75

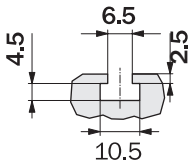


Mirror height (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure L3 (mm)	Measure A (mm)
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810 1	790
1840	1872	1896	1960	1940

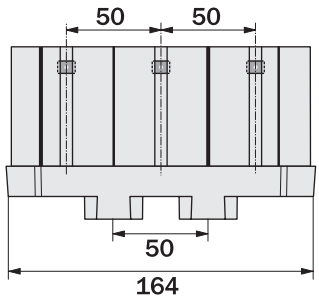
Mirrors



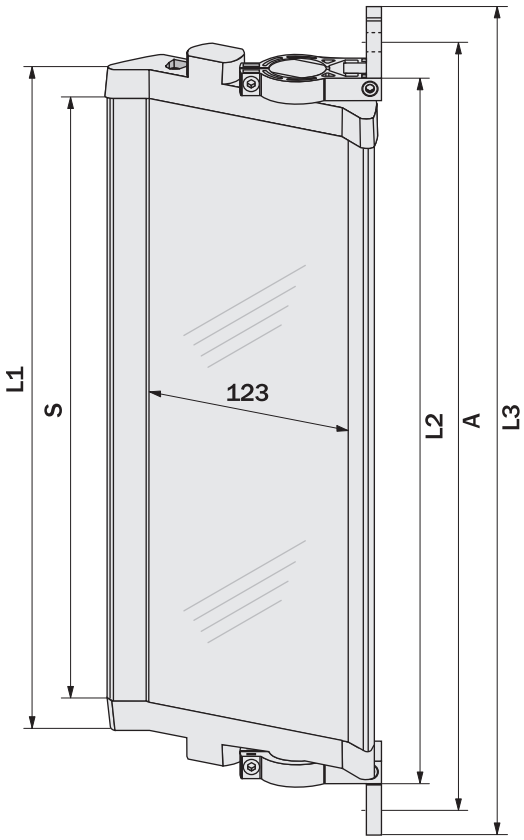
Mounting bracket with swivel mount



T-slot



PNS 125



Mirror height (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure L3 (mm)	Measure A (mm)
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

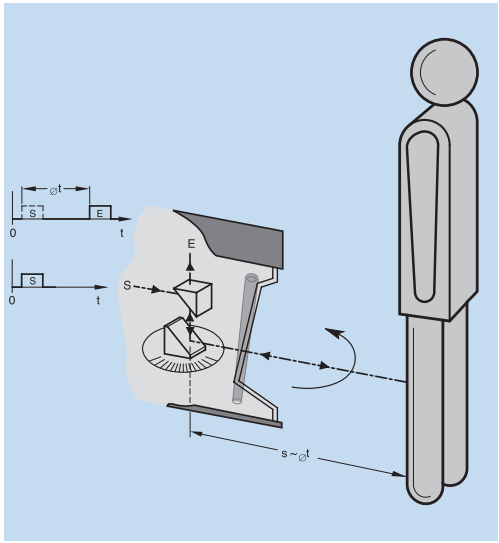
Safety laser scanner PLS

Features

- Software guided configuration
- Safety Category 3, as per IEC 61 496
- Warning zone up to 50 m and Safety zone area up to 4 m, 180° radius
- Up to 15 monitoring cases available when using the LSI controller

Description of Function

The PLS safety laser scanner is designed to protect people and property… such as a machine or vehicle hazard zone. It is ideal for monitoring hazardous areas in enclosed spaces. It scans its surroundings using an infrared laser beam. The sensor operates on the principle of reflex time-of-flight. When the light encounters an object, the light is reflected and received by the laser scanner. The PLS determines its distance from the object by measuring the time elapsed from emission to reception.



Technical specifications

	PLS
Supply voltage	24 V DC ± 20%
Power consumption (without load)	17 W
Wavelength	905 nm
Response time	≥ 80 ms
Resolution	70 mm at 4 m distance
Max. scan angle	180°
Operating distance	Safety zone 4 m Warning zone 50 m
Laser protection class	Class 1
Switching outputs	2 OSSD PNP 250 mA 1 AUX 100 mA (non-safety)
Protection class	IP 65
Safety category	3
Operating temperature	0…55° C
Storage temperature	-25…75° C
Tested to	IEC 61 496-1, -3
Certifications	CE, DQS, cULus

Product Selection Table

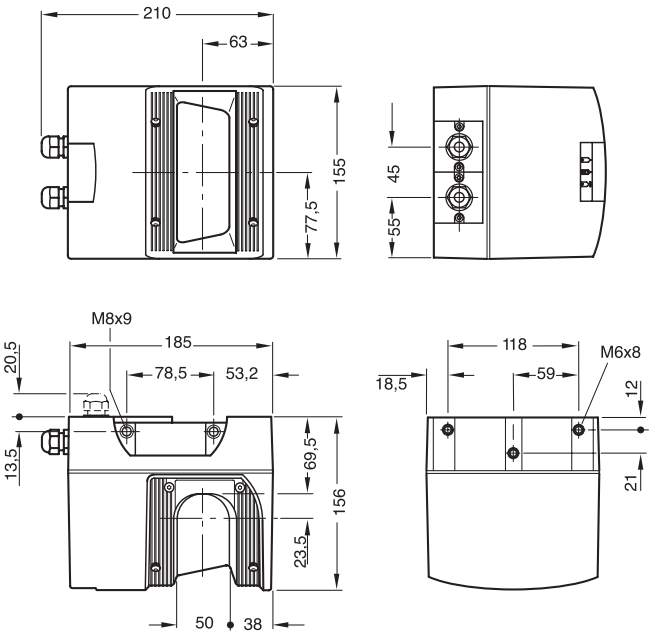
Safety area 4 m, resolution 70 mm

Safety area 1.5 m, resolution 70 mm
(Impossible to connect it to the LSI controller)

PLS 101-312	PLS 109-317
Part number	Part number
1 016 066	1 022 253

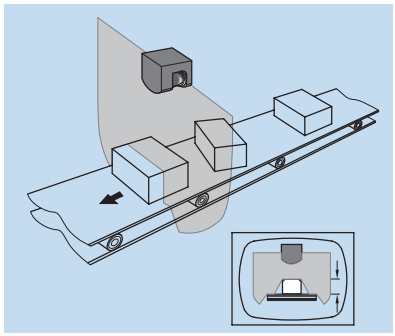
We recommend contacting Customer Service for product selection

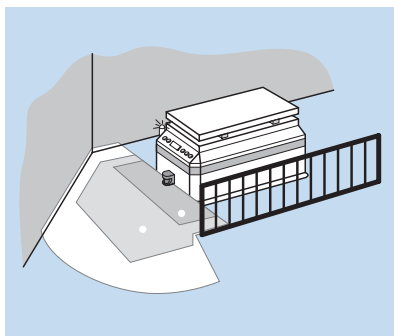
Drawings



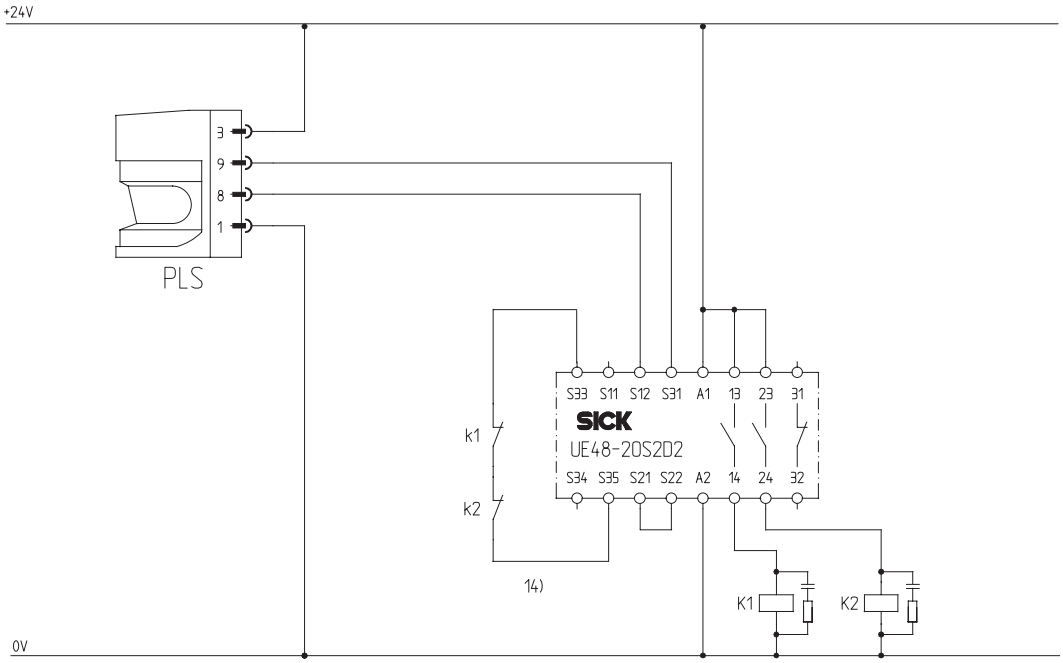
Application example

- Used for the protection of conveyor areas
- Robot cell zone protection
- Mobile vehicle protection (e.g. AGV) and object contour measurement

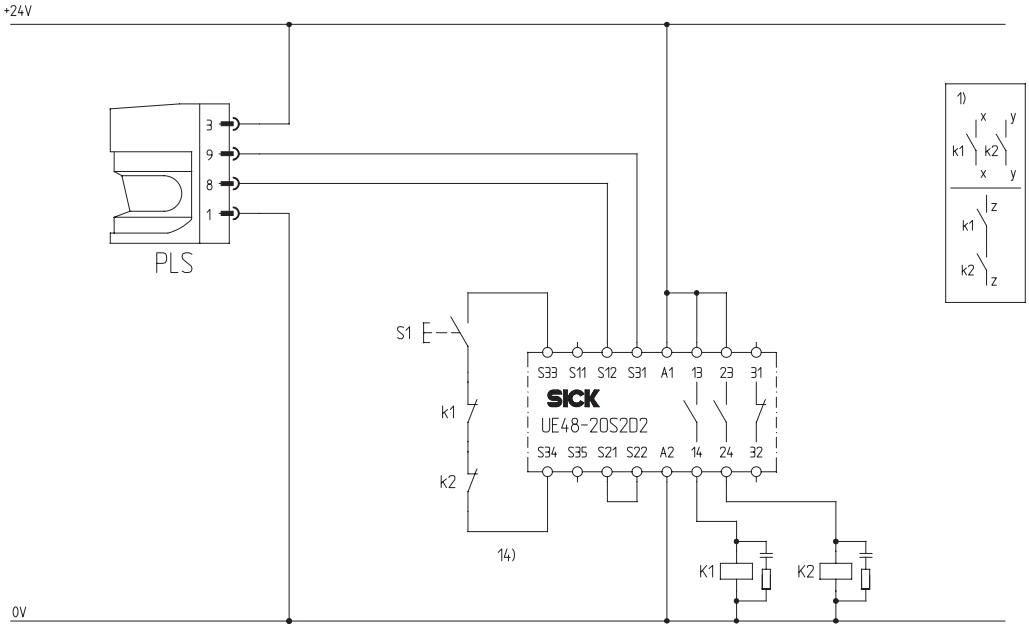




Connection example

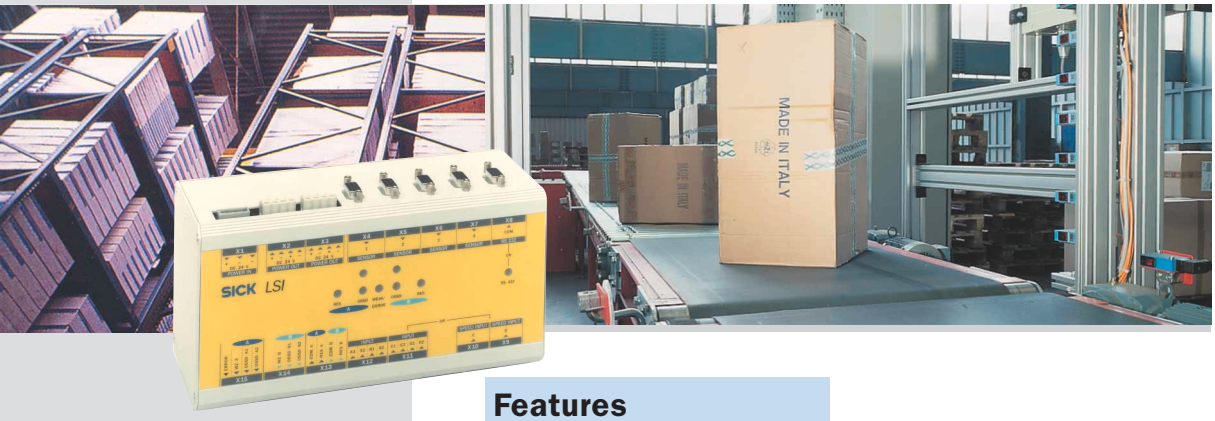


PLS connected to the UE 48-20S Safety Relay configured for automatic restart



PLS connected to the UE 48-20S Safety Relay configured for manual restart

Laser scanner interface LSI



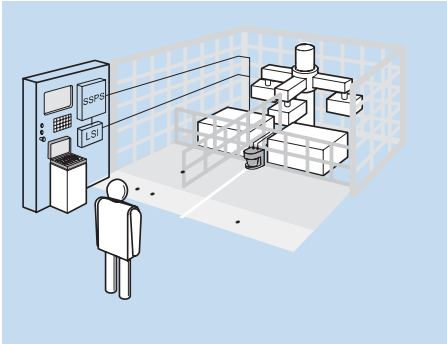
Features

- Optional setting of up to 15 monitoring cases
- External Device Monitoring (EDM)
- Incremental encoder inputs
- Automatic or manual restart
- Optional connection of up to four PLS laser scanners
- Eight safety zones and eight warning zones configurable via user software

Description of function

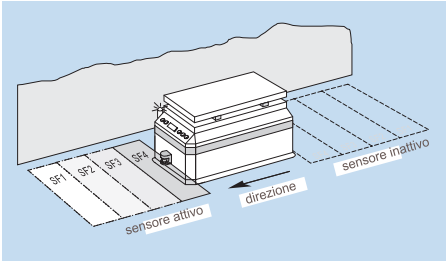
EDM

The external device monitor control verifies if the relays are actually disabled at the time of the safety device intervention.



Monitoring cases

By combining several ports, it is possible to define up to 15 interchangeable monitoring. An ideal solution for mobile applications.



Technical specifications

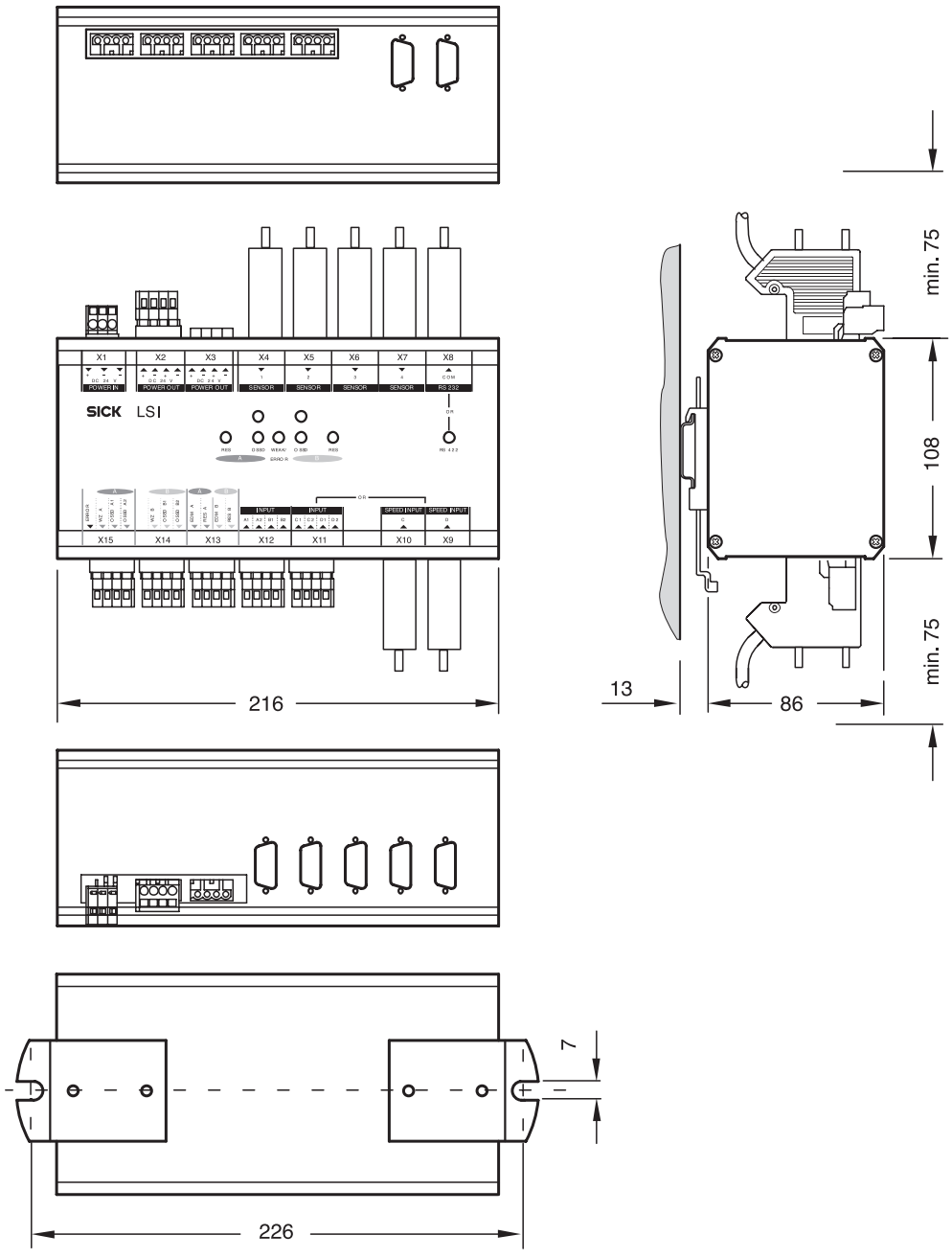
	LSI
Supply voltage	24 V DC ± 20%
Power consumption	< 15 W (excluding PLS and load) < 63 W (with 1 PLS and max load) < 80 W (with 2 PLS and max load) < 97 W (with 3 PLS and max load) < 114 W (with 4 PLS and max load)
Response time	adjustable min. 190 ms (PLS with LSI)
Switching outputs	Warning zone: 1 PNP 100 mA Safety zone: 2 PNP, 2 channels, 250 mA
Protection class	IP 20
Safety category	3
Operating temperature	0…50° C
Storage temperature	-25…70° C
Tested to	IEC 61 496
Certifications	CE, DQS, cULus

Product selection table

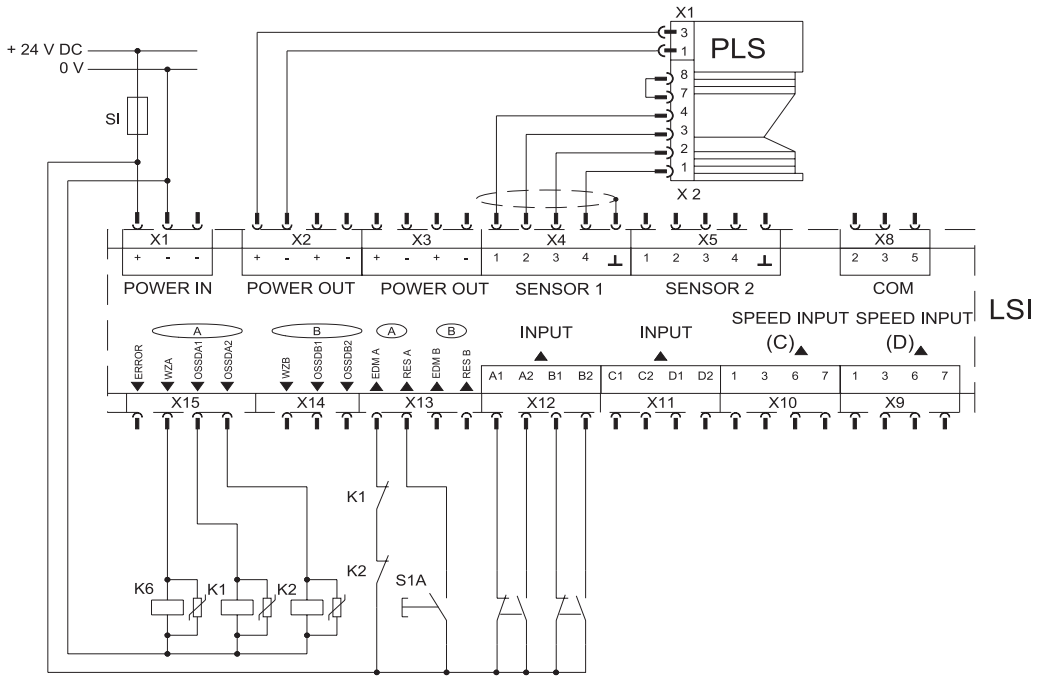
LSI 101-112	Interface for 2 PLS 101-312	Part number1 016 063
LSI 101 11 4	Interface for 4 PLS 101-312	Part number1 016 065

We recommend contacting Customer Service for product selection

Drawings



Connection example



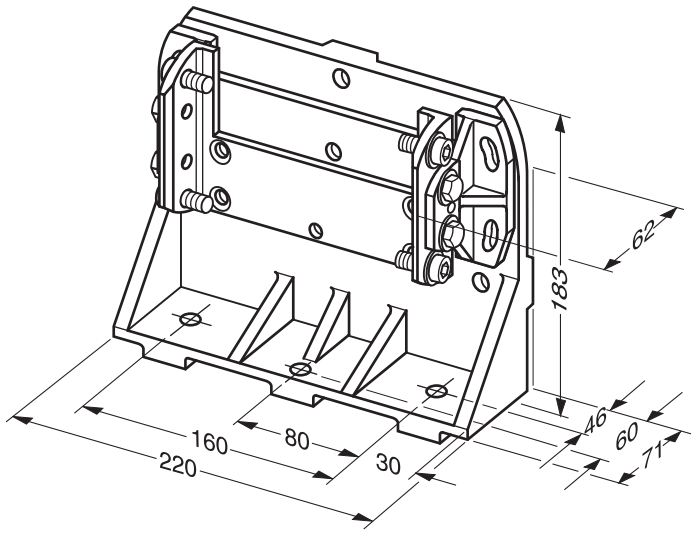
Example of connection between safety laser scanner PLS and laser scanner interface LSI

Accessories: PLS

Connectors

Part number	PLS/LSI Connector Sets
2 019 066	Set B - connector PLS/LSI L = 3 m
2 019 067	Set C - connector PLS/LSI L = 5 m
2 019 068	Set D - connector PLS/LSI L = 10 m
2 019 069	Set E - connector PLS/LSI L = 15 m
2 019 070	Set F - connector PLS/LSI L = 20 m
2 022 271	Replacement front window

Brackets

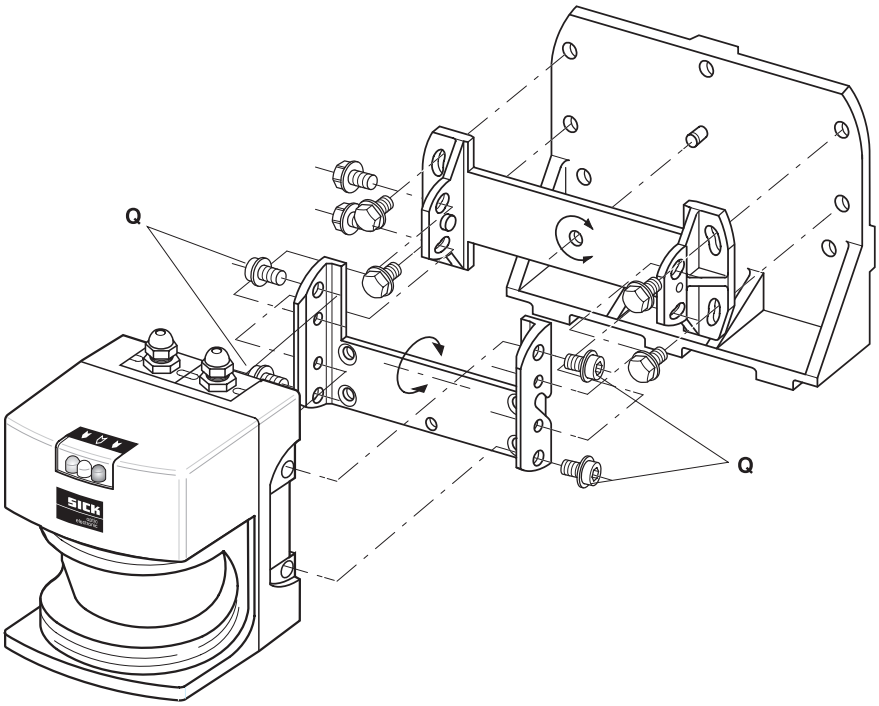


Part number	PLS
2 015 623	Mounting bracket n. 1*
2 015 624	Mounting bracket n. 2**
2 015 625	Mounting bracket n. 3***

*	Mounting bracket to wall for fixed position
**	Mounting bracket to wall for orientation on 2 axes
***	Mounting bracket for floor

Mounting bracket 1 is required when using Mounting bracket 2 and 3.
Mounting bracket 2 is required when using mounting bracket 3.

Brackets



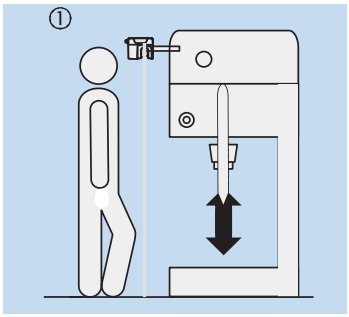
Safety laser scanner
S 3000

Features

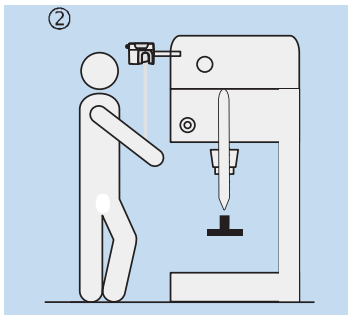
- Possible setting of up to eight safety zones and warning zones
- Up to 7 m safety zone area scanning
- The universal software platform enables easy installation and commissioning
- Modular system
- Seven-segment display enables fast and easy diagnostics for devices
- Scanning angle of 190°
- The only safety laser scanner approved for vertical applications
- Selectable resolution
- Master/slave connection
- Possible to configure up to 16 monitoring cases
- Integrated functional components require substantially reduced wiring
- Protection of personnel and detection of surrounding contours in one scanner (S 3000 Professional CMS)
- Measurement data output is possible via RS 422 interface in real-time with vehicle guidance (S 3000 Professional CMS)
- Safety Integrity Level (SIL) 2 in accordance with EN 61 508

Description of function

The S 3000 is an optical sensor designed for two-dimensional scanning of detection areas using infrared laser beams. The S 3000 operates according to the principle of time-of-flight measurement. It emits very short light pulses. An "electronic timer" operates at the same time. When the light encounters an object, the light is reflected and received by the safety laser scanner. The S 3000 determines distance from the object during the time elapsed from emission to reception (Δt).

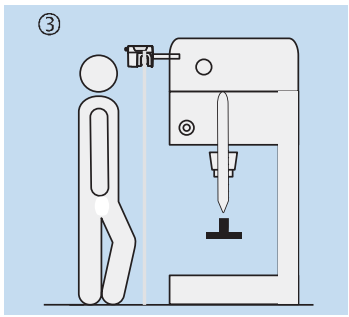


A standard rotation mirror within the S 3000 deflects light impulses to a 190° scanning field. Using the mirror rotation angle definition, the S 3000 identifies the object direction. Based on the object distance and direction, the safety laser scanner establishes the object's exact position.



External Device Monitoring (EDM)

The external device monitoring verifies if the contactors are actually disabled at the time of the safety device intervention.

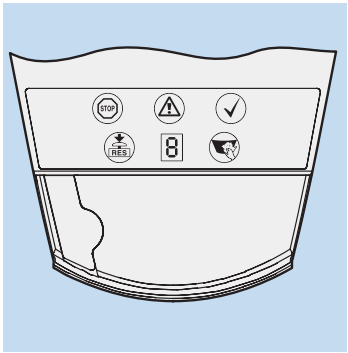


Restart Interlock

The machine – or vehicle hazard condition stops – as soon as an object enters the protected field. OSSDs (Output Signal Switch Device) are enabled only after the operator activates the reset and/or restart actuating device.

Multiple Evaluation

With a multiple evaluation, objects need to be detected by several scans before the S 3000 disables its OSSD. This reduces the chance of turning off the equipment due to objects falling inside the scan level, like spatter or other particles.



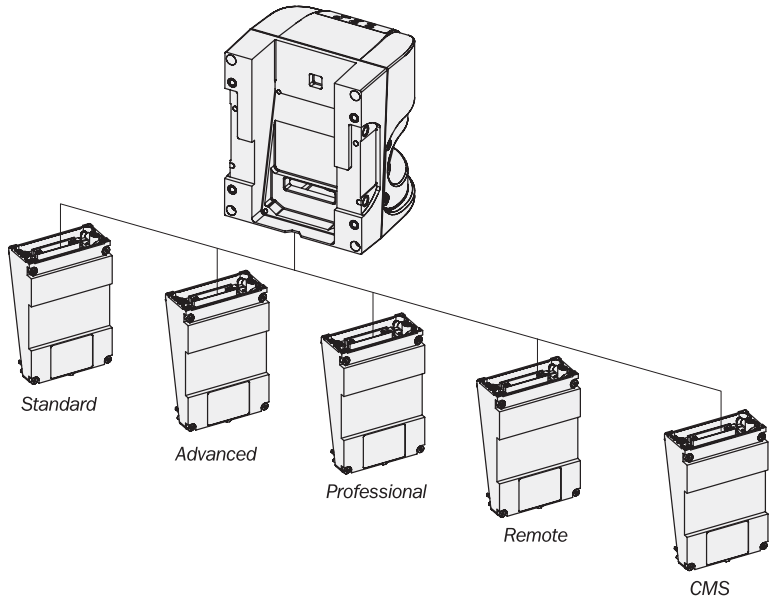
Light indicators and 7 segment display

Light indicators and 7 segment display are designed to show the S 3000 operating conditions and are located on the front of the safety laser scanner. The individual symbols located above the light indicators will be used hereafter in these instructions to describe the light indicators.

The meaning of the symbols is as follows:

- OSSD disabled (e.g., object present in the protected field, reset needed, lock-out)
- It is necessary to reset
- Interrupted alert field (object in the alert field)
- The front panel is dirty
- OSSD enabled (no object in the protected field)

Start of module



Technical specifications

	S 3000
Supply voltage	24 V DC ± 20%
Power consumption with maximum output	55 W
Wavelength	905 mm
Response time	60 ms or 120 ms
Resolution	30, 40, 50, 70, 150 mm
Max. scanning angle	190°
Operating distance	Safety zone up to 7 m Warning zone up to 49 m
Laser protection class	class 1
Switching outputs	2 OSSD PNP 1 auxiliary output
Protection class	IP 65
Safety category	3
Operating temperature	-10…50° C
Storage temperature	-25…70° C
Tested to	IEC 61496-1, -3, EN 61 508
Certifications	CE, cULus, BIA

Product selection table

S 3000 series safety area 5.5 m without system plug or cables		
1 023 546	S 30A-6011BA	S 3000 Standard
1 023 547	S 30A-6011CA	S 3000 Advanced
1 019 600	S 30A-6011DA	S 3000 Professional
1 023 548	S 30A-6011EA	S 3000 Remote
1 026 401	S 30A-6011DB	S 3000 Professional CMS

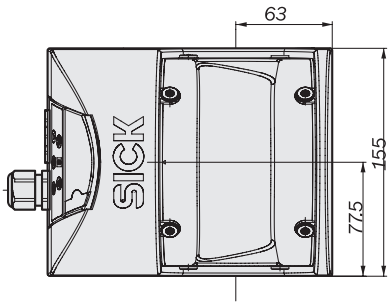
System plug and cables ordered separately

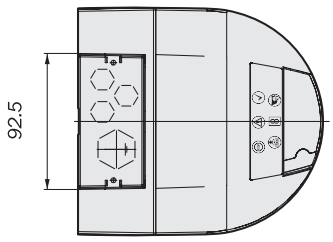
S 3000 series safety area 7 m without system plug or cables connector		
1 023 890	S 30A-7011BA	S 3000 Standard
1 023 891	S 30A-7011CA	S 3000 Advanced
1 023 892	S 30A-7011DA	S 3000 Professional
1 023 893	S 30A-7011EA	S 3000 Remote
1 026 402	S 30A-7011DB	S 3000 Professional CMS

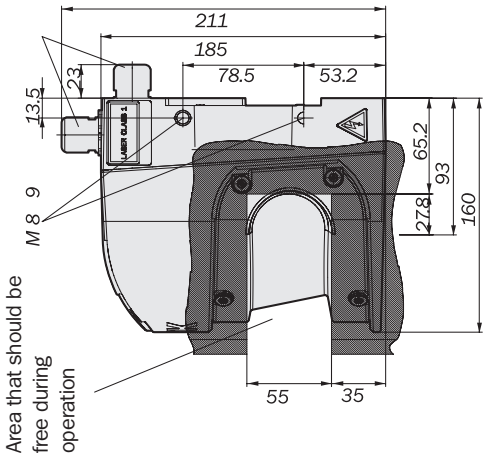
System plug and cables ordered separately

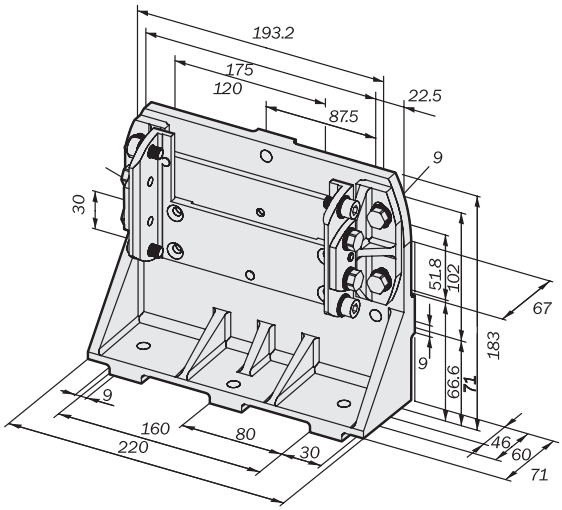
We recommend contacting Customer Service for product selection

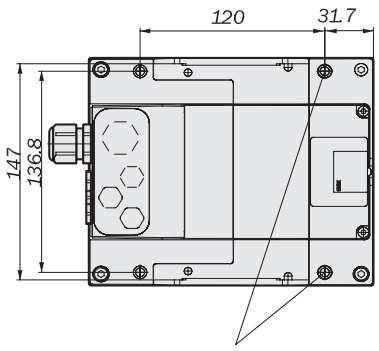
Drawings



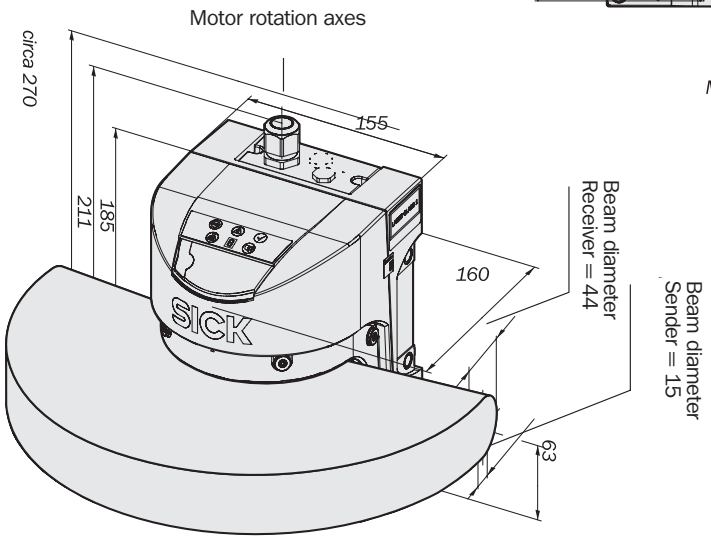








M 6 8 Assembly reference points



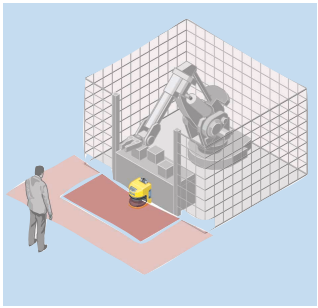
Optoelectronics Type 3

Application examples

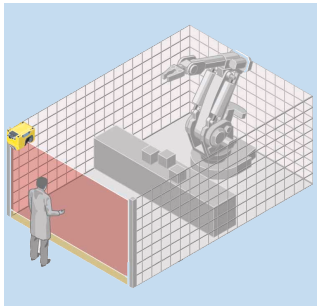
The examples listed are intended for project support only. Additional safety measures could be needed for your application.

In examples with protected field switching, you should take in consideration the possibility of a person already present in the protected field at the time of switching.

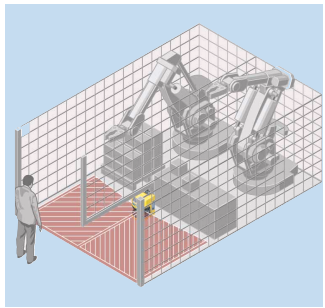
To assure dependable protection, switching should occur before the field becomes dangerous for the person present.



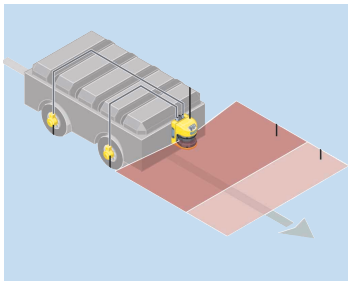
Hazard area protection with S 3000 Standard. The area is constantly monitored by the S 3000.



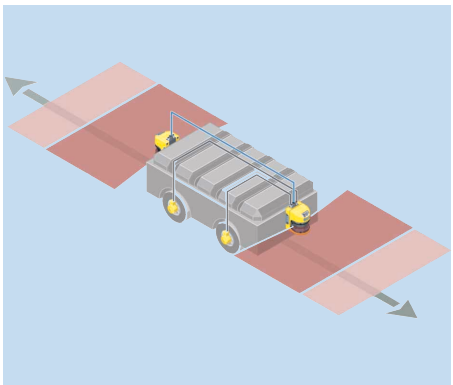
Access is under constant monitoring. To protect the S 3000 from handling, the floor may be used as reference point. The S 3000 becomes disabled if its alignment changes (e.g., due to a support modification).



The two areas subject to monitoring are switched by static control inputs that vary depending on the machine current process phase. For example, it is possible to monitor area 1 or area 2, both areas or neither of the two.

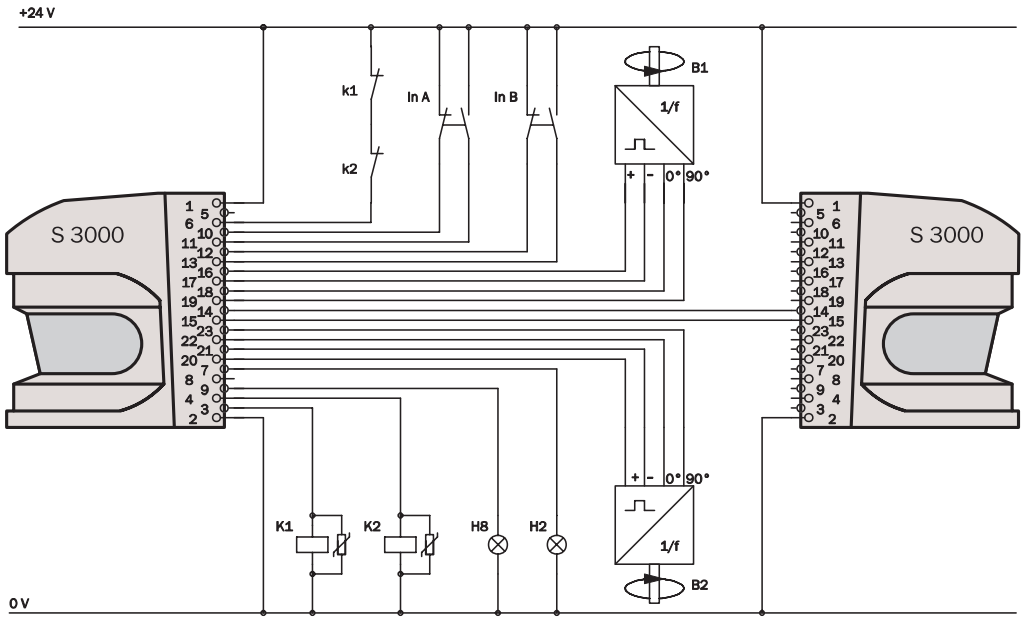


With incremental encoders, the S 3000 Professional is capable of detecting the vehicle speed using its dynamic control ports. A range of field sets designed for various speeds are configured in the S 3000, with protected and alert fields of different dimensions. The field sets are dynamically switched by motion speed.

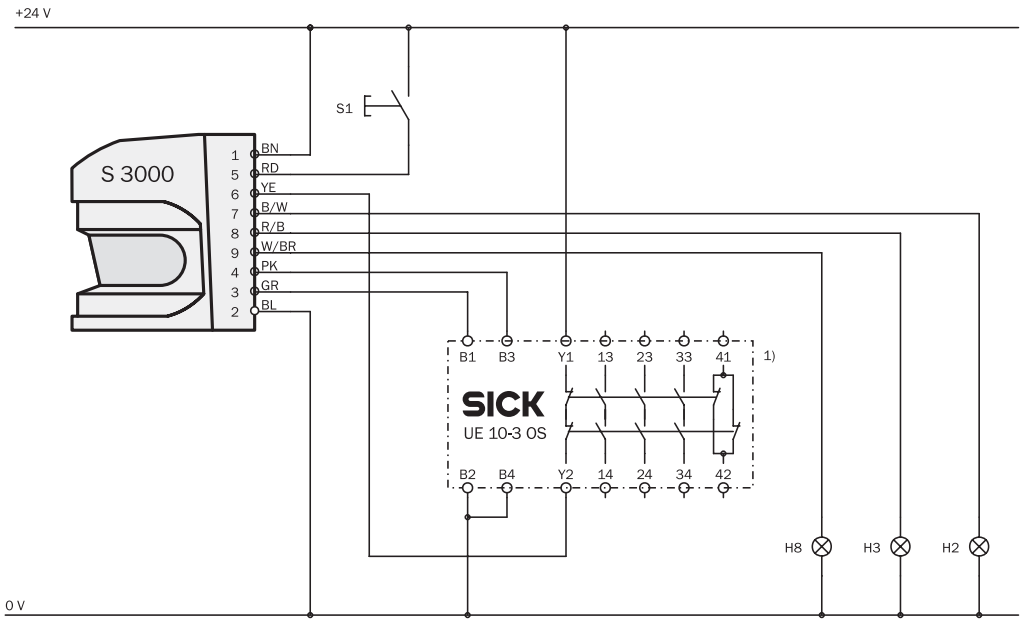


With incremental encoders, the S 3000 Professional is capable of detecting vehicle speed using its dynamic control ports. A range of field sets designed for various speed are configured in the S 3000. The field sets are dynamically switched by motion speed. The S 3000 Remote receives the incremental encoder values from the S 3000 Professional by way of the EFI interface. The second motion direction zones are monitored by the S 3000 Remote according to speed. As soon as an object enters the protected field, it disables the OSSD through S 3000 Professional EFI interface.

Connection examples

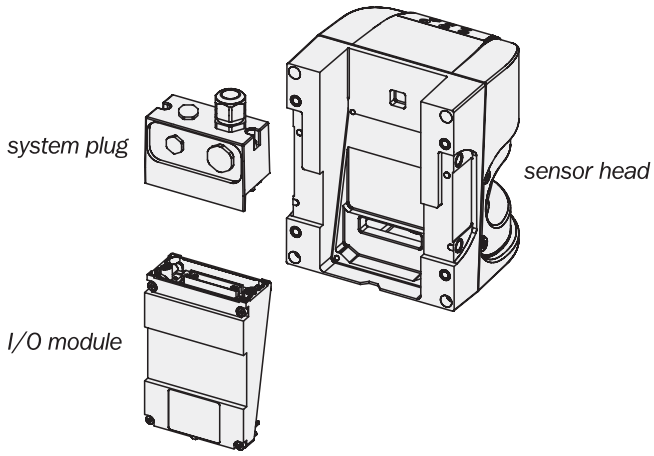


Example of a connection between the S 3000 Professional laser scanner and the S 3000 Remote laser scanner with incremental encoders for switching of the areas subject to monitoring.



Example of a connection between an S 3000 laser scanner and safety module UE 10-3 OS in manual restart configuration.

Accessories: S 3000

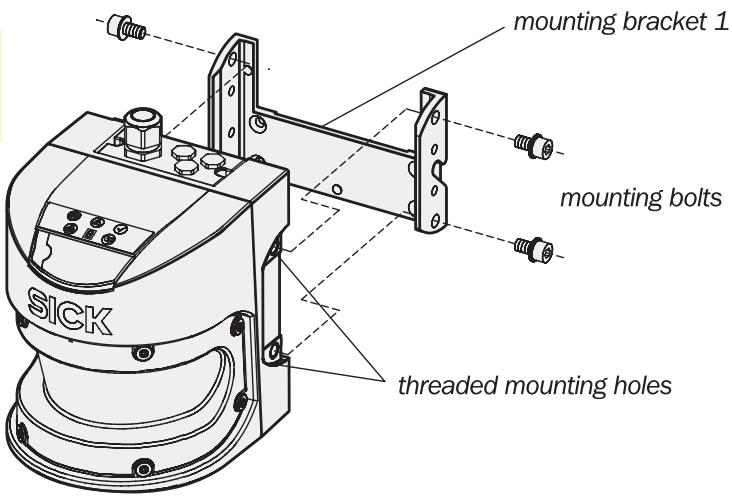


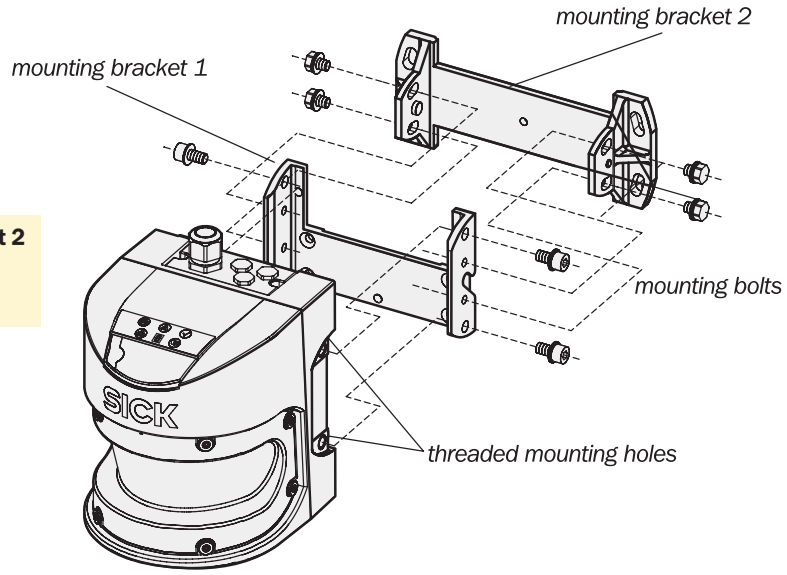
System plug and cables

2 023 797	SX0A-A0000B	For standard version, advanced, remote, no cable
2 027 170	SX0A-B0905B	For standard version, advanced, remote, 5 m, 9 pins
2 027 171	SX0A-B0910 B	For standard version, advanced, remote, 10 m, 9 pins
2 027 814	SX0A-B0920 B	For standard version, advanced, remote, 20 m, 9 pins
2 027 172	SX0A-B1305 B	For standard version, advanced, remote, 5 m, 13 pins
2 027 173	SX0A-B1310 B	For standard version, advanced, remote, 10 m, 13 pins
2 027 815	SX0A-B1320 B	For standard version, advanced, remote, 20 m, 13 pins
2 027 174	SX0A-B1705 B	For standard version, advanced, remote, 5 m, 17 pins
2 027 175	SX0A-B1710 B	For standard version, advanced, remote, 10 m, 17 pins
2 027 816	SX0A-B1720 B	For standard version, advanced, remote, 20 m, 17 pins
2 023 310	SX0A-A0000 D	For professional version no cable
2 027 176	SX0A-B1305 D	For professional version 5 m, 13 pins
2 027 177	SX0A-B1310 D	For professional version 10 m, 13 pins

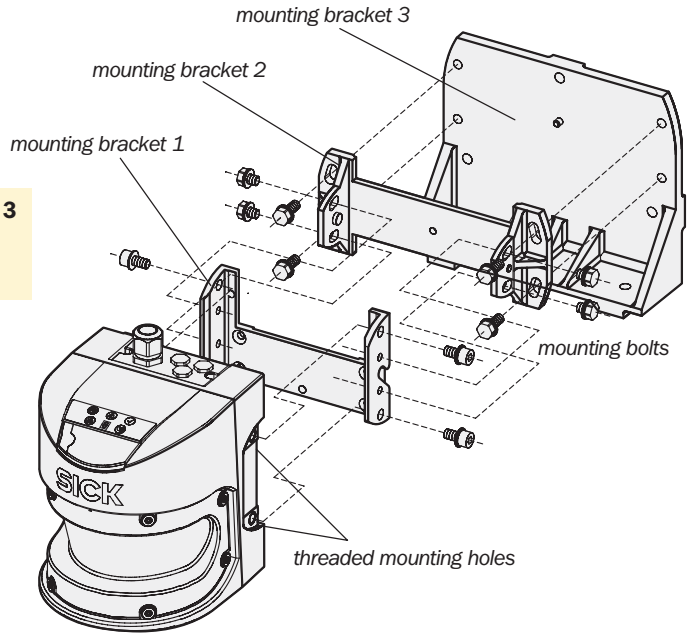
Mounting brackets

Mounting bracket 1
Part number
2 015 623





Mounting bracket 2
Part number
2 015 624



Mounting bracket 3
Part number
2 015 625

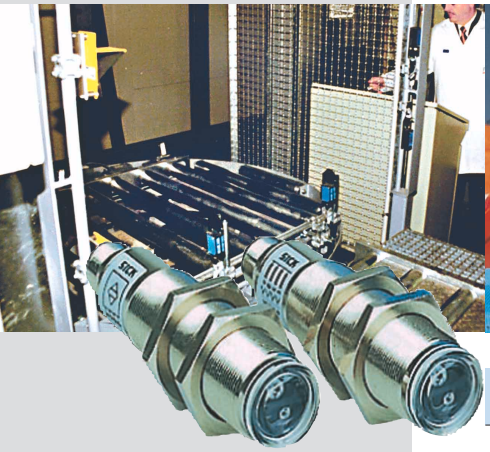
Sensor heads

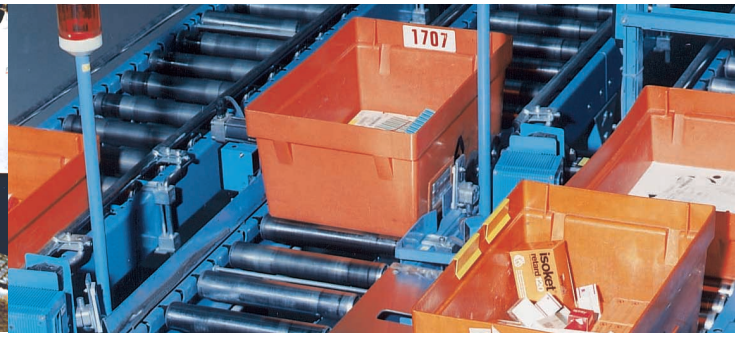
2 022 972	5.5 m sensor head
2 026 747	7 m sensor head

S 3000 I/O module

2 026 801	Standard module
2 026 802	Advanced module
2 022 827	Professional module
2 026 803	Remote module
2 030 915	Professional CMS module

Safety photoelectrics
VS/VE 18-2





Features

- Visible transmission light facilitates easy alignment
- Insensitive to secondary sources (HF lamps and flashing lights)

Applications

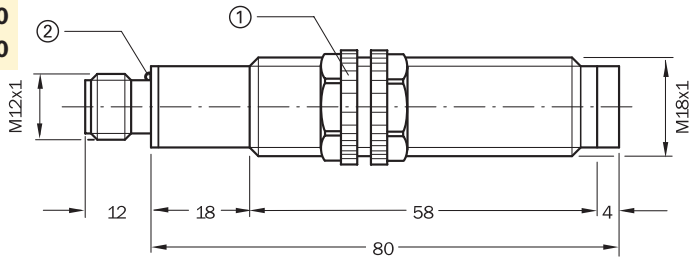
- Access controls to automated islands
- Access controls to loading zones

Technical Specifications

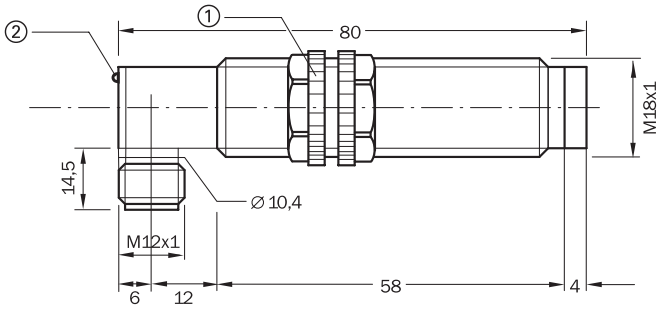
	VS/VE 18
Supply voltage	24 V DC - 30% + 20%
Power consumption	25…35 mA
Wavelength	LED, visible red light
Response time	Max. 2 ms (with resistance load)
Operating distance	0…16 m
Switching outputs	PNP 100 mA
Protection class	IP 67
Safety category	2
Operating temperature	-25…70°C
Tested to	IEC 61 496
Certifications	CE

Drawings

VS 18-2 D 5450
VE 18-2 0 4450



VS 18-2 D 5550
VE 18-2 0 4550



Product selection table

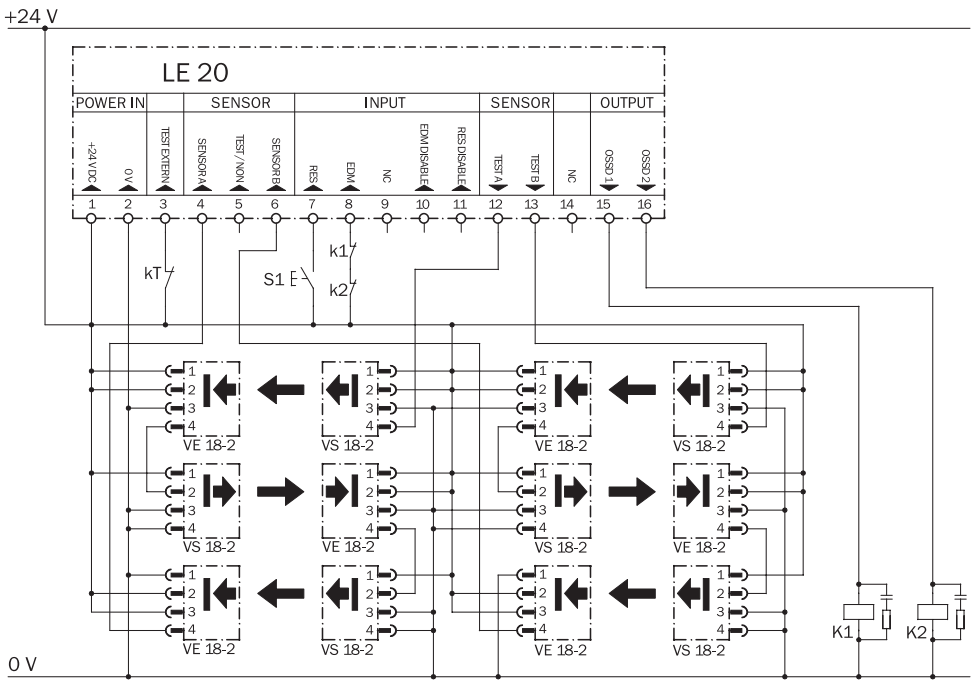
90° connector - 4 pins

4 pins - straight connector

VS/VE 18-2 0 4550	VS/VE - 18-2 0 4450

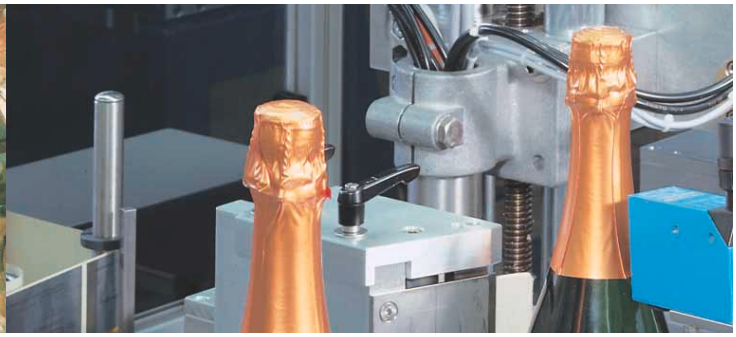
We recommend contacting Customer Service for product selection

Connection example



Examples of a connection between VS/VE 18-2 sensors and the LE 20 data processing unit

Safety photoelectrics
WS/WE 12-2



Features

- Infrared transmission LED ensures alignment
- Unaffected by secondary light sources
- Adjustable sensitivity

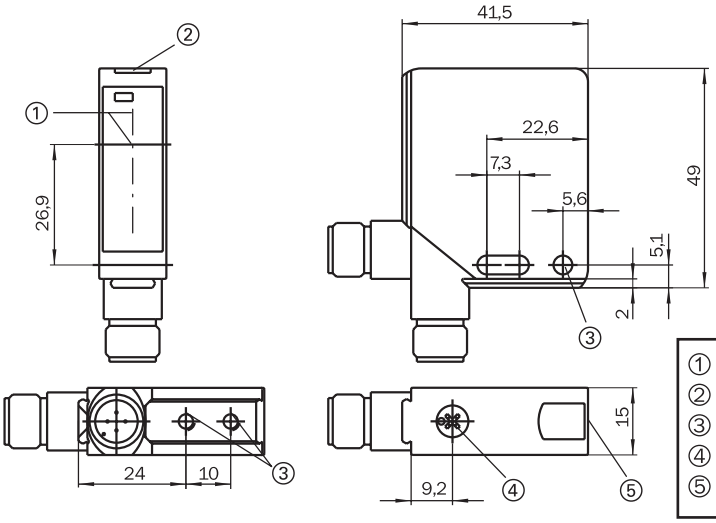
Applications

- Access controls to automated islands
- Access controls to loading zones

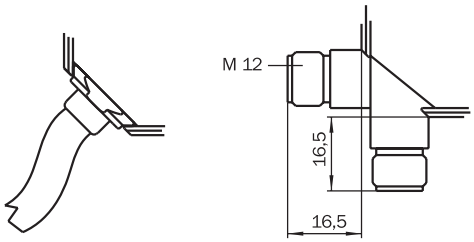
Technical specifications

	WS/WE 12-2
Supply voltage	24 V DC - 30% + 20%
Power consumption	25…35 mA
Wavelength	880 nm
Response time	0.5 ms
Operating range	0…10 m
Switching outputs	PNP 100 mA
Protection class	IP 67
Safety category	2
Operating temperature	-40…60° C
Storage temperature	-40…75° C
Tested to	IEC 61 496
Certifications	CE

Drawings



WS 12-2 D 460
WE 12-2 P 460



WS 12-2 D 160
WE 12-2 P 160

Product selection table

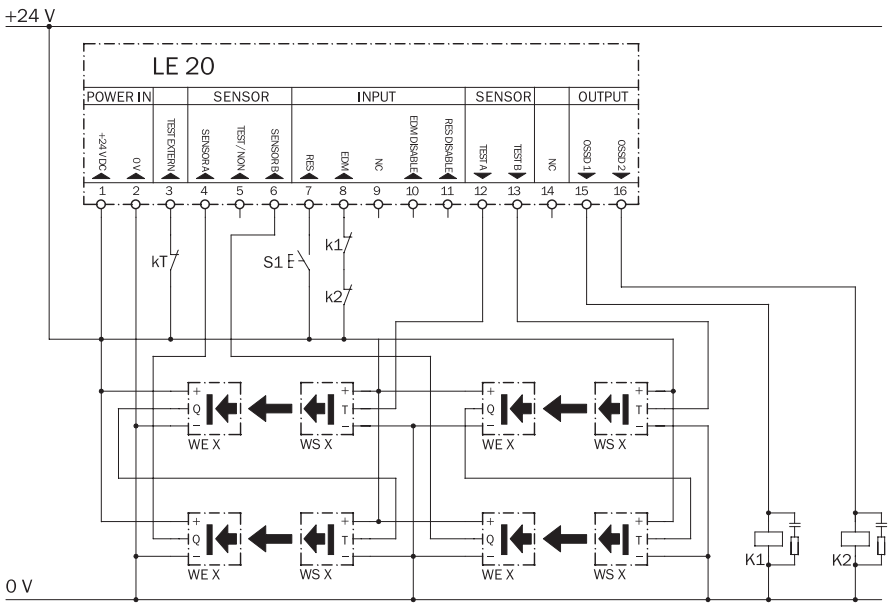
2 m cable

Connector 4 pins

WS/WE 12-2 P 160	WS/WE 12-2 P 460

We recommend contacting Customer Service for product selection

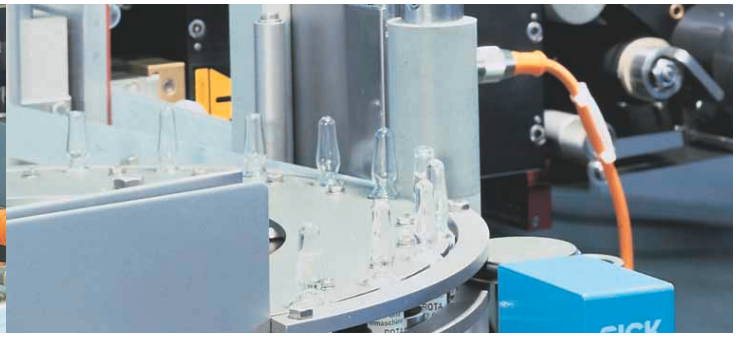
Connection example



Examples of a connection between WS/WE 12-2 sensors and the LE 20 data processing unit

Optoelectronics Type 2

Safety photoelectrics
WS/WE 18-2



Features

- Infrared transmission LED ensures alignment
- Unaffected by secondary light sources
- Message and alignment device by flashing
- Adjustable sensitivity

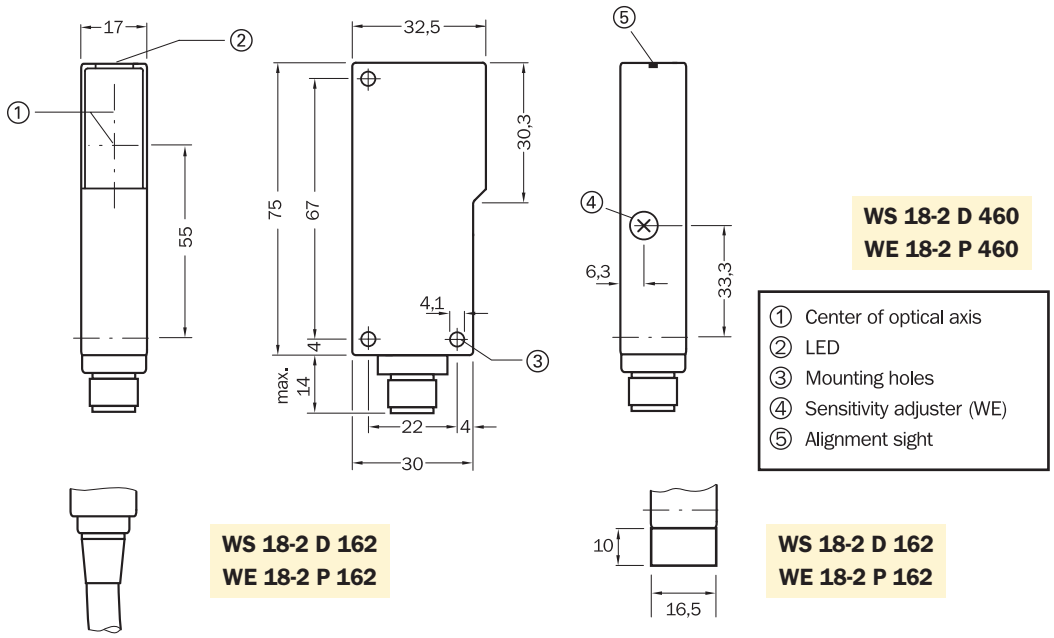
Applications

- Access controls to automated islands
- Access controls to loading zones

Technical Specifications

	WS/WE 12-2
Supply voltage	24 V DC - 30% + 20%
Power consumption	25…30 mA
Wavelength	880 nm
Response time	0.5 ms
Operating range	0…10 m
Switching outputs	PNP 100 mA
Protection class	IP 67
Safety category	2
Operating temperature	-40…60° C
Storage temperature	-40…75° C
Tested to	IEC 61 496
Certifications	CE

Drawings

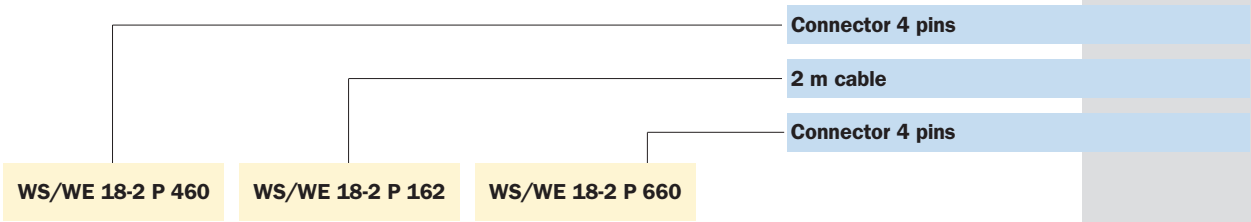


WS 18-2 D 460
WE 18-2 P 460

WS 18-2 D 162
WE 18-2 P 162

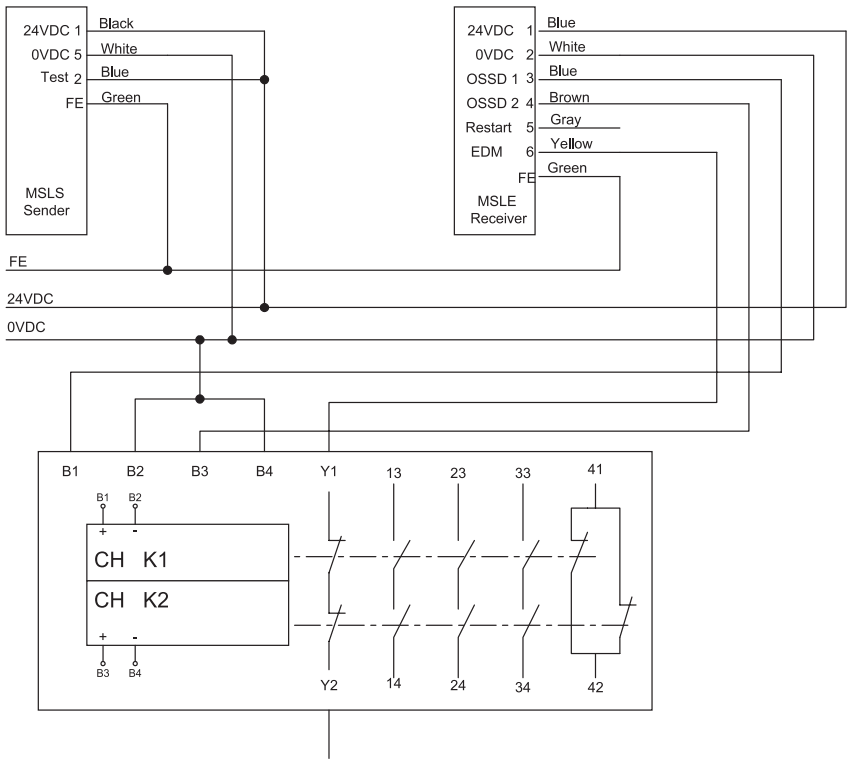
WS 18-2 D 162
WE 18-2 P 162

Product selection table

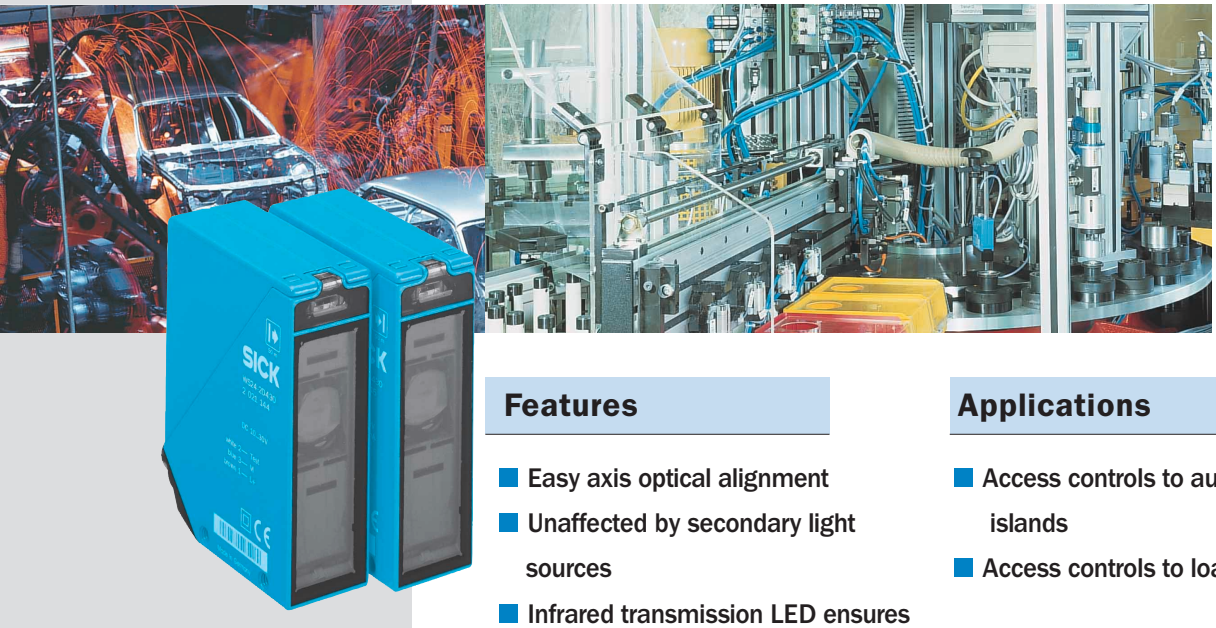


We recommend contacting Customer Service for product selection

Connection example



Safety photoelectrics
WS/WE 24-2



Features

- Easy axis optical alignment
- Unaffected by secondary light sources
- Infrared transmission LED ensures alignment

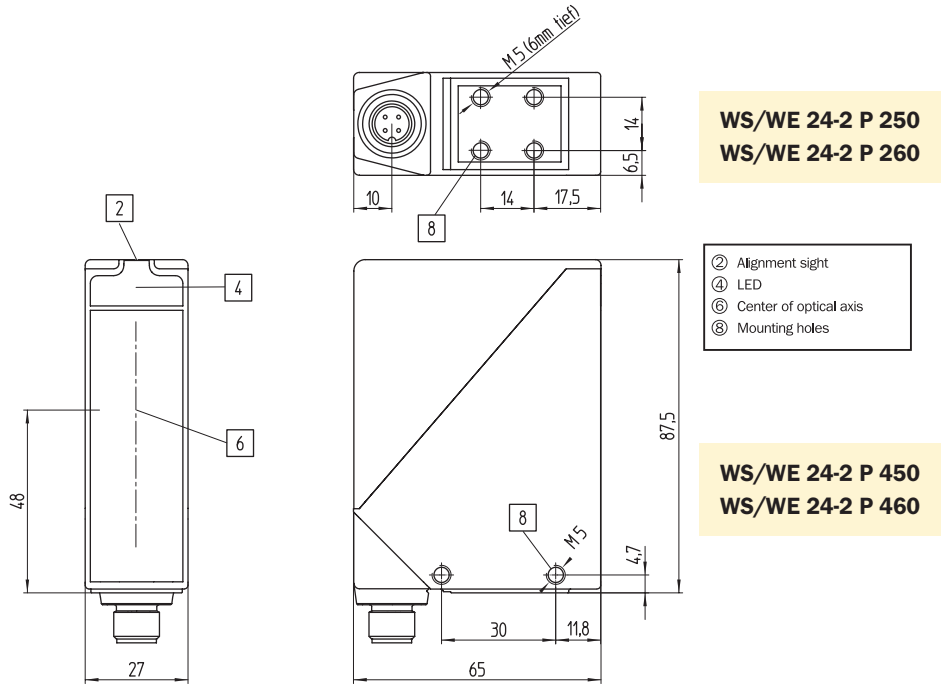
Applications

- Access controls to automated islands
- Access controls to loading zones

Technical Specifications

	WS/WE 24-2
Supply voltage	24 V DC ± 20%
Power consumption	150/170 mA
Light emission	LED, visible red light
Response time	0.5 ms
Operating range	0…50 m
Switching outputs	PNP 100 mA
Protection class	IP 67
Safety category	2
Operating temperature	-40…60° C
Storage temperature	-40…75° C
Tested to	IEC 61 496
Certifications	CE

Drawings



WS/WE 24-2 P 250
WS/WE 24-2 P 260

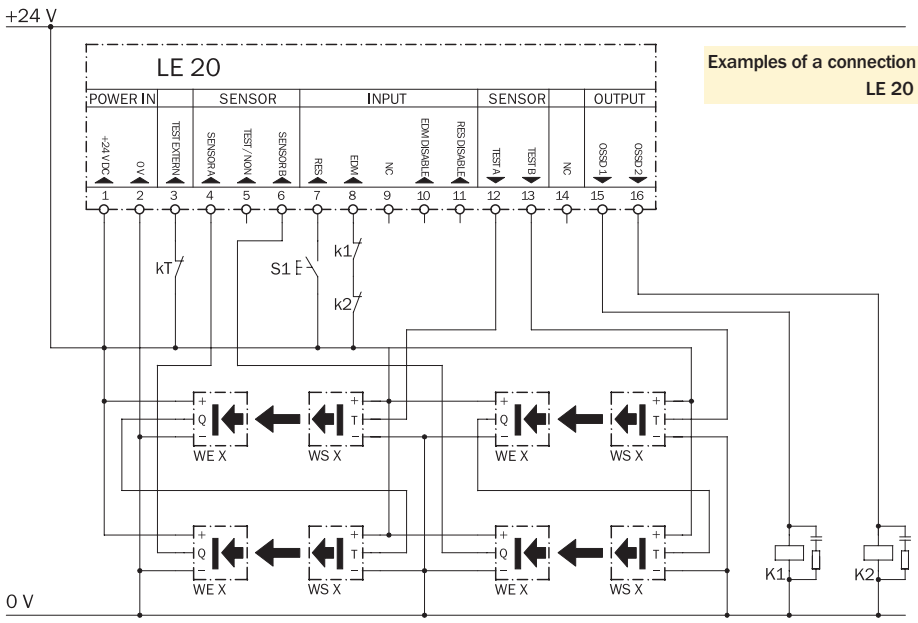
WS/WE 24-2 P 450
WS/WE 24-2 P 460

Product selection table

Terminal block			
Terminal block			
Connector 4 pins			
Connector			
WS/WE 24-2 P 250	**WS/WE 24-2 P 260**	**WS/WE 24-2 P 450**	**WS/WE 24-2 P 460**

We recommend contacting Customer Service for product selection

Connection example



Examples of a connection between WS/WE 24-2 sensors and the LE 20 data processing unit

Safety photoelectrics
WS/WE 27-2

Features

- Visible transmission light facilitates easy alignment
- Adjustable sensitivity
- Unaffected by secondary light sources
- Optional front heating

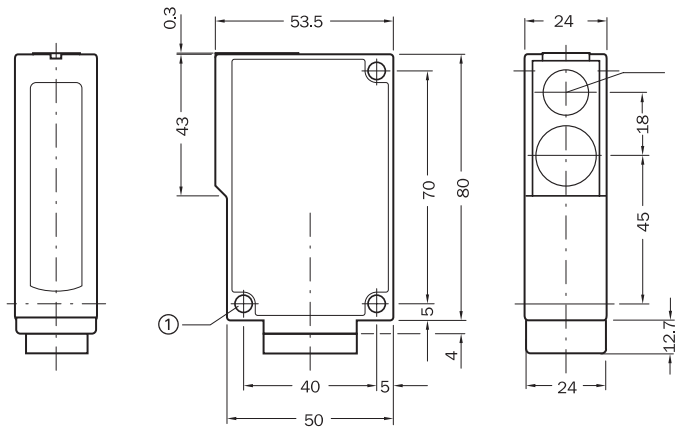
Applications

- Access controls to automated islands
- Access controls to loading zones

Technical Specifications

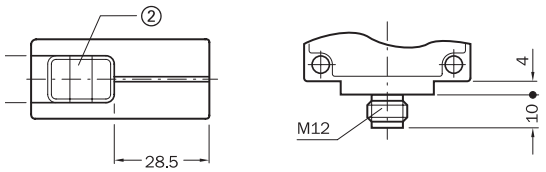
	WS/WE 27-2
Supply voltage	24 V DC - 30% + 20%
Power consumption	35/45 mA
Wavelength	LED, visible red light
Response time	0.5 ms
Operating distance	0…35 m
Switching outputs	PNP 100 mA
Protection class	IP 67
Safety category	2
Operating temperature	-40…60° C
Storage temperature	-40…75° C
Tested to	IEC 61 496
Certifications	CE

Drawings



WS 27-2 D 730
WS 27-2 D 750

WE 27-2 F 730
WE 27-2 F 750



WS 27-2 D 450 S 05
WE 27-2 F 460

WE 27-2 F 450 S 05
WS 27-2 D 460

Product selection table

Connector 7 pins

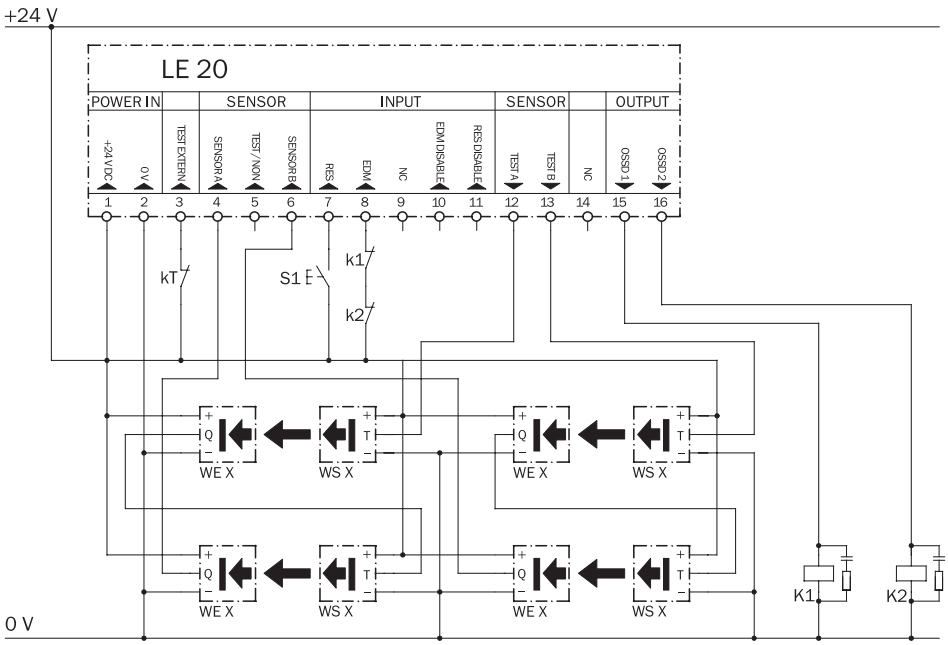
Connector 7 pins

Connector 4 pins heated lens

WS/WE 27-2 F 730	WS/WE 27-2 F 750	WS/WE 27-2 F 450 S 05

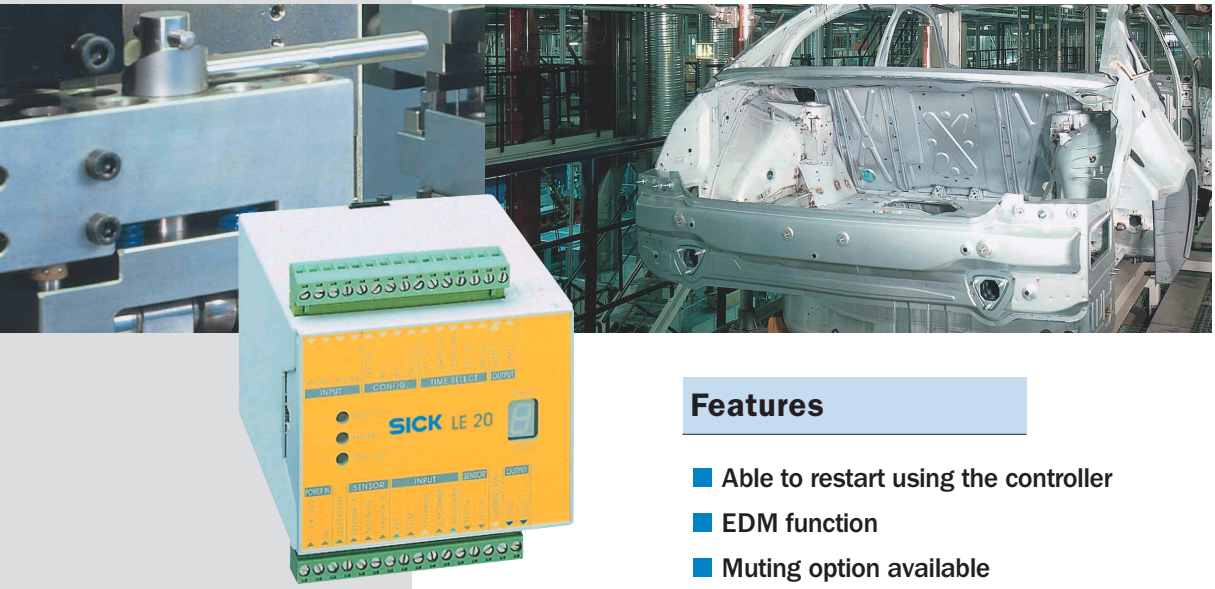
We recommend contacting Customer Service for product selection

Connection example



Examples of a connection between WS/WE 27-2 sensors and the LE 20 data processing unit

Safety evaluation unit LE 20



Features

- Able to restart using the controller
- EDM function
- Muting option available
- Suitable for all Category 2 applications

Description of Function

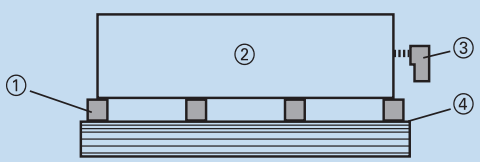
Single beam safety photoelectric cell test

The proper operation of the single safety photoelectric cells with Test is checked after power up. The processing unit sends a test signal through the TEST A and TEST B connections to the photoelectric cell's emitter and checks the receiver's reply through the SENSOR A and SENSOR B signal ports.

Once in operation, all the single photoelectric cells with Test are automatically monitored every 2 s. This Test cycle is active only if the TEST/NO access is open or connected to a 0 V. In case of an error, both OSSD 1 and OSSD 2 on/off outputs of the processing unit immediately change to off. The test does not affect the protective function of the connected photoelectric cells, i.e., the photoelectric cell cascade.

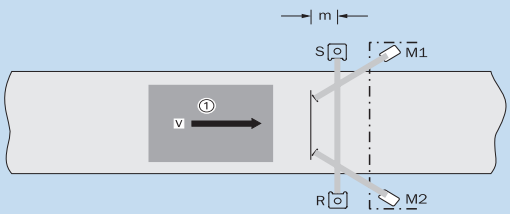
LE 20 Muting

The LE Muting safety processing unit is used when specific objects, i.e., pallets loaded with material, have to cross a dangerous area. During the entire crossing, potential alarm signals, identified by the safety photoelectric cell, are not taken into consideration. At the same time, other muting sensors detect the presence of the material to be transported. Depending on the type of sensors and on their layout, it is possible do distinguish objects from individuals. Two, three or four sensors may be connected to the safety processing unit. The Override function is used to remove objects left behind due to a Muting function error from the controlled area. The safety device may be released regardless of the light beam interruption.



① = Pallet ② = Material ③ = Muting sensor ④ = Transport plane

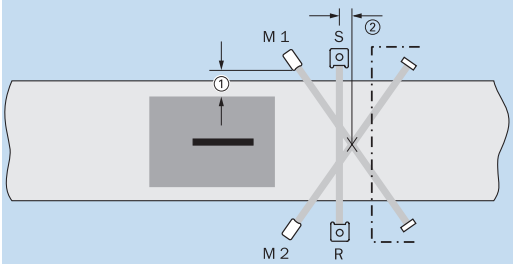
The sensor should only detect the material and not the conveyance (pallet or vehicle), to prevent personnel on the conveyance from entering the danger zone.



① = Material S = Sender v = Belt speed [m/s]
R = Receiver m = Minimum distance [m] M 1, M 2 = Muting sensor

As internal evaluation of the sensor signals takes some time, the material must be detected before the light beams of the photoelectric safety switch.

Cross-over arrangement of muting sensors

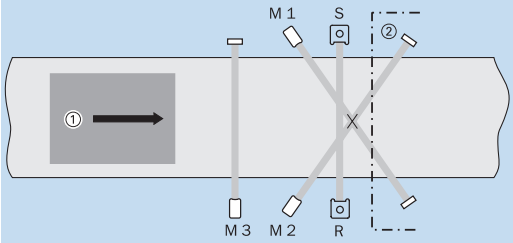


① = Distance between edge of object and muting sensor as short as possible
② = Distance between safety light beam and crossover point of muting beams as short as possible

When the object is being conveyed forwards, the crossover point of the beams should be behind the safety light beams.

When the object is being conveyed forwards and backwards, the cross-over point of the muting sensors must be within the safety light beam.

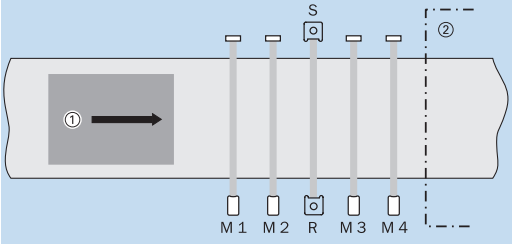
Cross-over arrangement with 3 muting sensors



① = Pallet of material ② = Danger zone S = Sender R = Receiver
M 1 .. M 3 = Muting sensors

Safety evaluation unit LE 20-Muting with muting sensors in cross-over arrangement with direction detector

Arrangement of 4 muting sensors in series



① = Pallet of material ② = Danger zone S = Sender R = Receiver
M 1 .. M 4 = Muting sensor

Safety evaluation unit LE 20-Muting with muting sensors in series

Possible monitoring: Sequence

Technical Specifications

	LE 20
Supply voltage	24 V DC -30%/+20%
Power consumption	100 mA (standard version); 150 mA (version with muting)
Response time	max. 5 ms + sensor response time
Concurrence monitoring	3 s or infinite (version with muting only)
Self test cycle time	2 s
Switching outputs	2 OSSD PNP 500 mA
Override lamp	24 V DC, 1…10 W (version with muting only)
Muting lamp	24 V DC, 1…10 W (version with muting only)
Protection class	IP 20, IP 65 (optional)
Safety category	2
Operating temperature	-20…60° C
Storage temperature	-25…75° C
Tested to	IEC 61 496
Certifications	CE, cULus

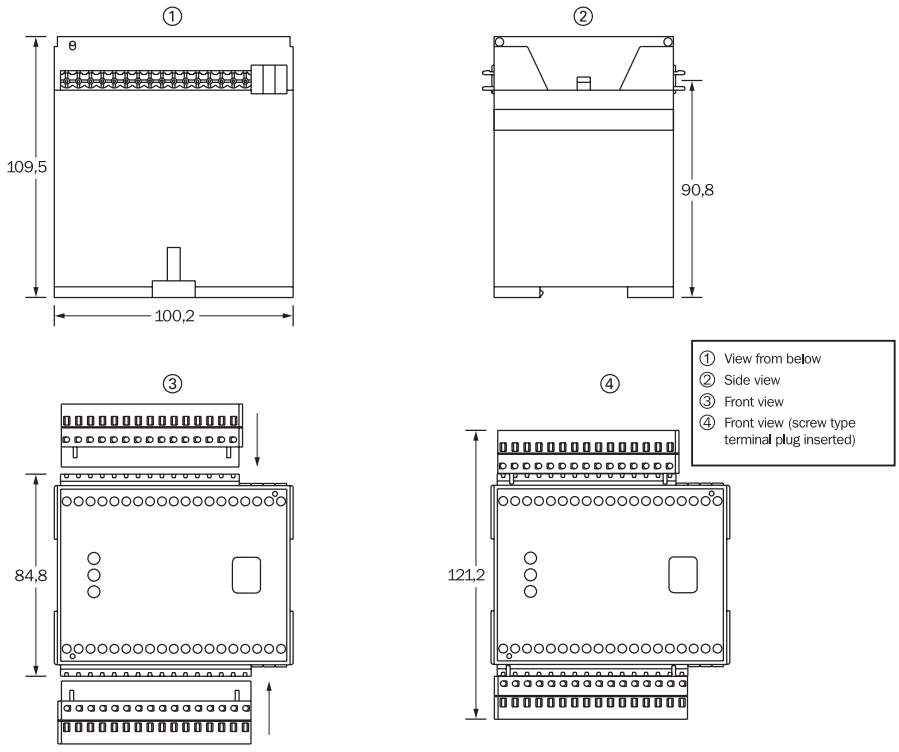
Product Selection Table

LE 20	
1	IP 65
2	IP 20
1	Without MUTING
2	With MUTING
1	Without connector
2	Terminal block 16 screw pins
4	Terminal block 16 crimp pins

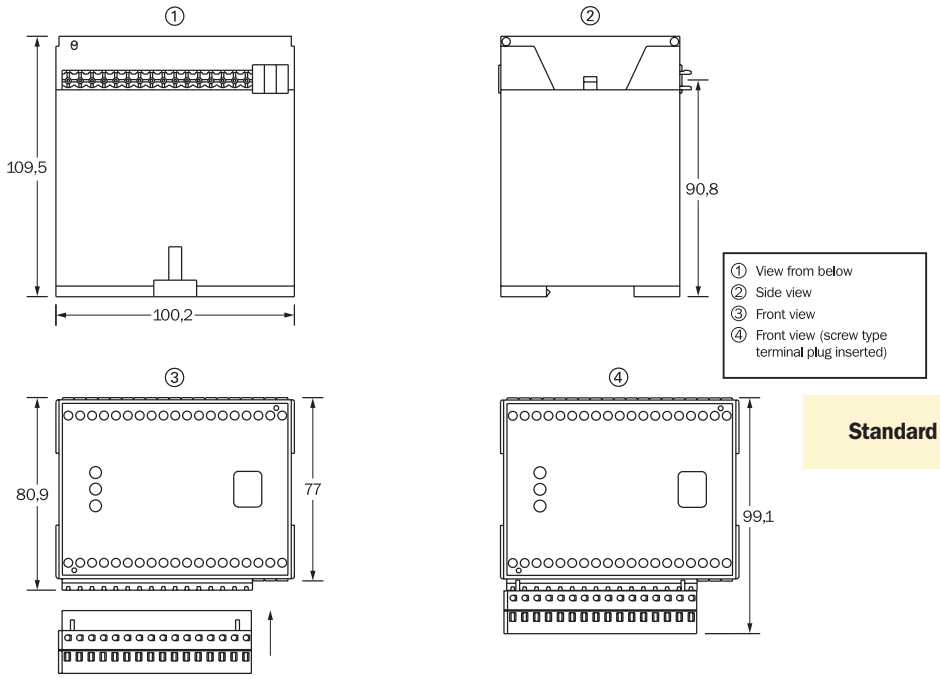
LE 20 2 6 2 1

We recommend contacting Customer Service for product selection

Drawings

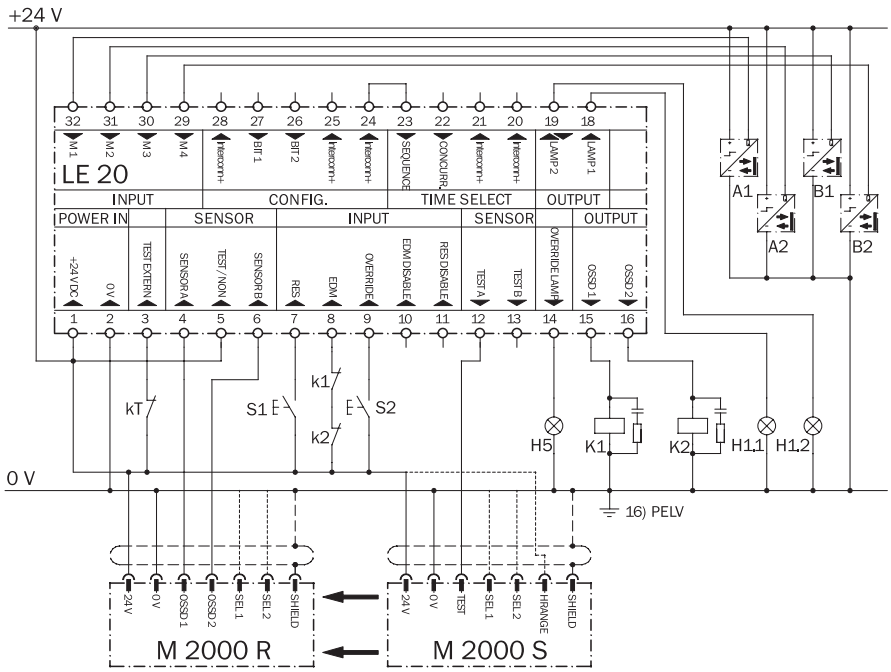


Drawings



Standard

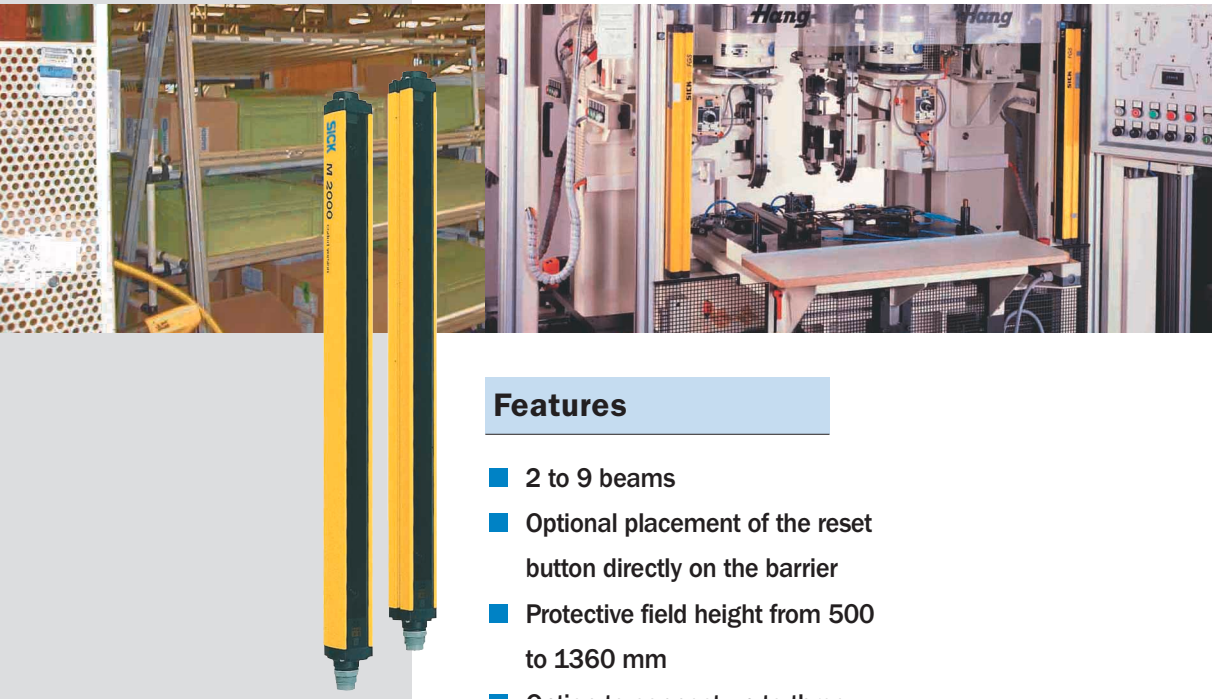
Connection example



M = Muting sensor R = receiver S = sender

LE 20 muting data processing with M 2000 and 4 Muting sensors

Perimeter safety light barrier M 2000



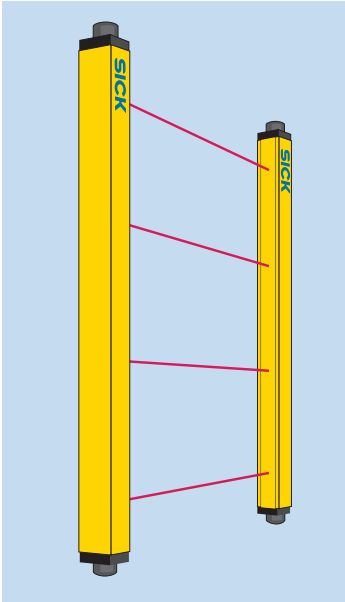
Features

- 2 to 9 beams
- Optional placement of the reset button directly on the barrier
- Protective field height from 500 to 1360 mm
- Option to connect up to three cascadable systems
- Safety Category 2, in accordance with IEC 61496
- EDM

Description of Function

EDM

The external device monitor control verifies if the final switching device is actually disabled at the time of the safety device intervention.



Restart

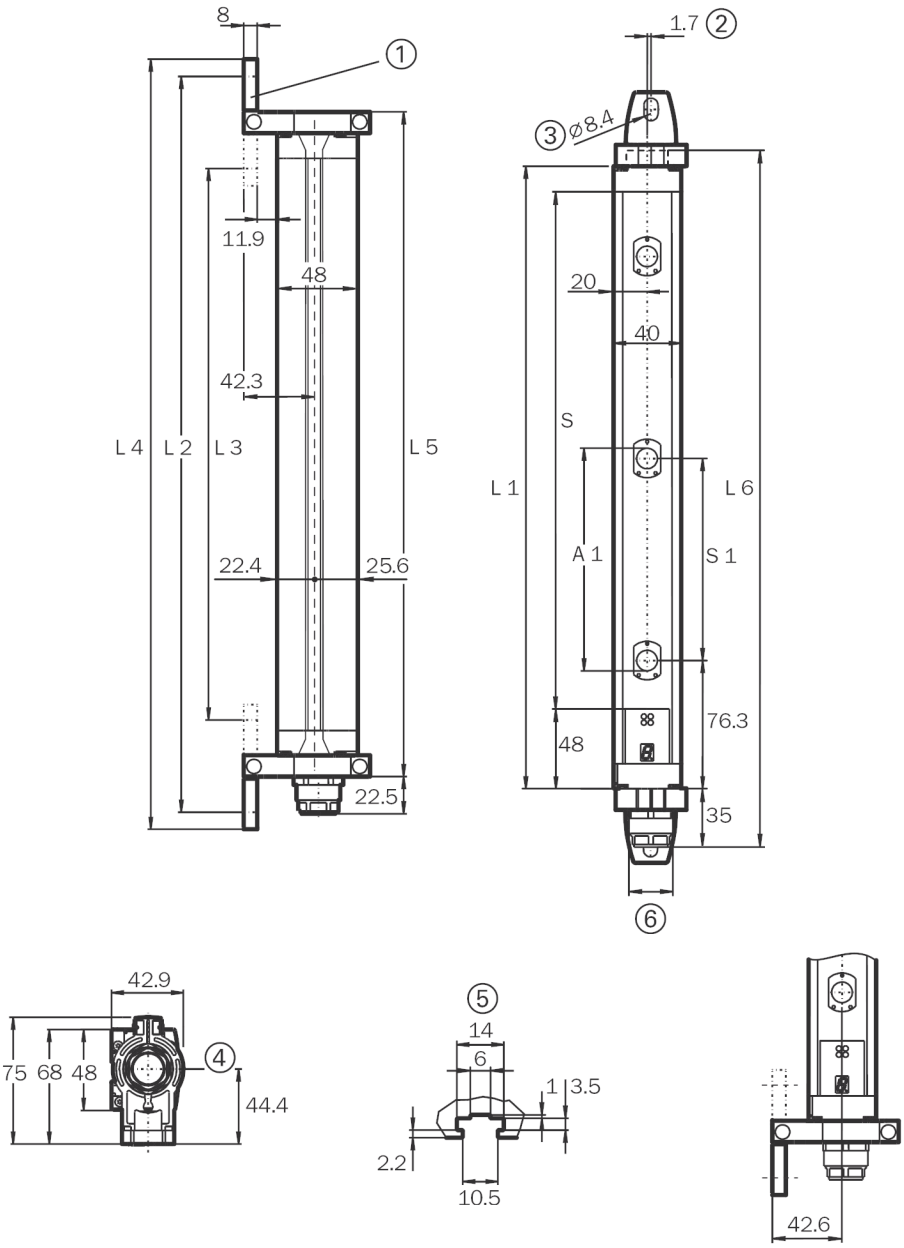
The M 2000 safety barrier allows both automatic and manual restart, and offers the option of connecting the reset button directly on the barrier connector.

Technical specifications

	M 2000
Supply voltage	24 V DC ± 20%
Power consumption	Sender: 3.7 W - Receiver: 5 W - Version M 2000 A/P: 7.5 W
Wavelength	950 nm
Number of beams	from 2 to 9
Resolution	300, 400 or 500 mm
Protective field height	from 500 to 1360 mm
Operating distance	0…25 m / 0…70 m
Sender inputs	test
Receiver inputs	EDM, restart
Switching outputs	2 OSSD PNP 500 mA
Function selection	Restart, EDM
Protection class	IP 65
Safety category	2
Synchronization	optical
Dimensions	48 x 40 cm
Operating temperature	0…55° C
Storage temperature	-25…70° C
Tested to	IEC 61 496
Certifications	CE, UL, CSA, DQS

We recommend contacting Customer Service for product selection

Drawings

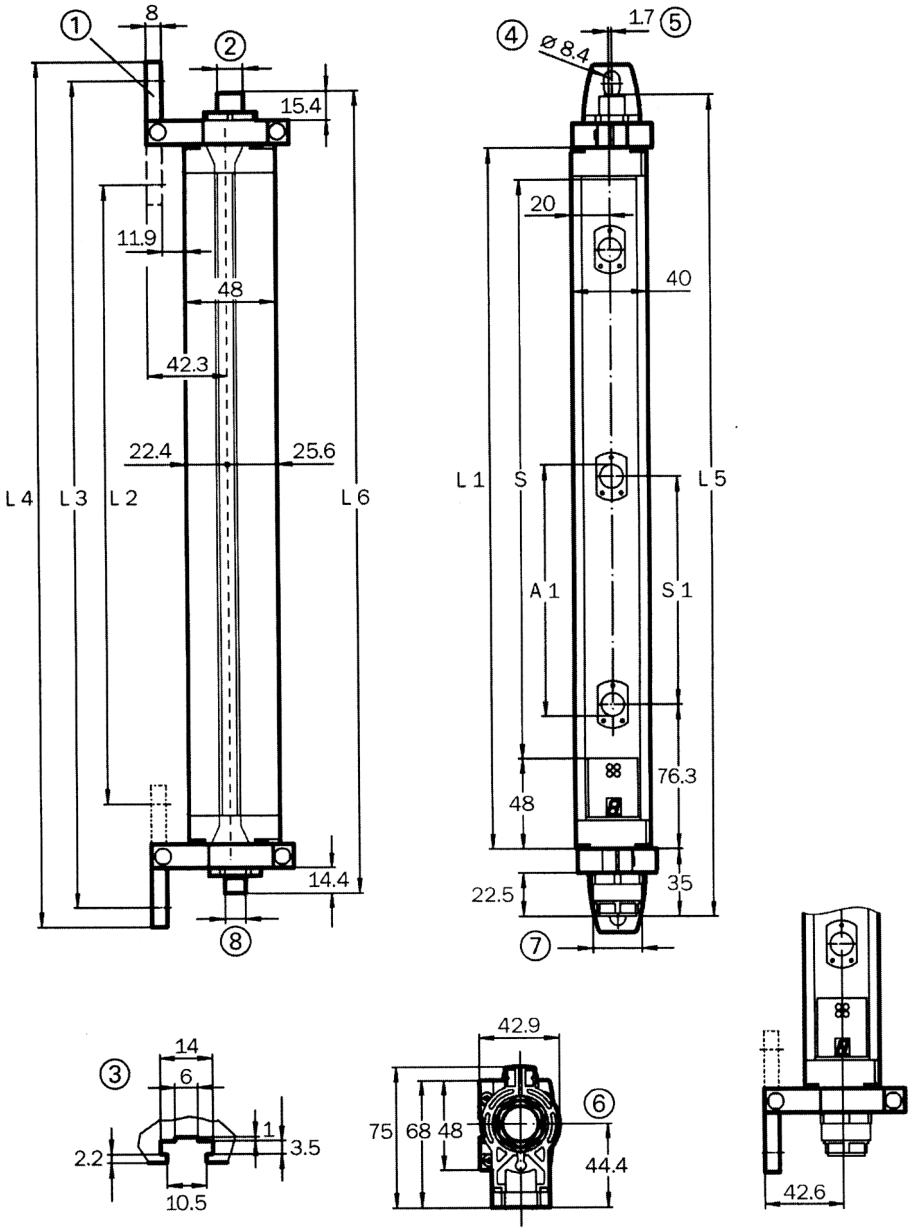


Standard Version

N	S1	A1	S	L1	L2	L3	L4	L5	L6
2	500	--	--	630	697	588	718	655	675
3	400	--	--	931	998	888	1019	956	976
4	300	--	--	1031	1098	989	1119	1056	1076
8	--	116	778	851	919	809	939	877	896
6	--	170	842	916	983	874	1004	941	960
7	--	170	999	1073	1140	1031	1161	1098	1118
8	--	170	1156	1231	1298	1189	1319	1256	1275
9	--	170	1313	1388	1455	1346	1476	1413	1433

① Clamp 180°, rotating (mounting kit 2)
② Center line offset
③ M8 hexagon screw DIN 933 with waster DIN 9021 (hot supplied)
④ Alignment
⑤ Slide nut channel for side mounting
⑥ Hirschmann connector DIN 43651 (standard)

Drawings

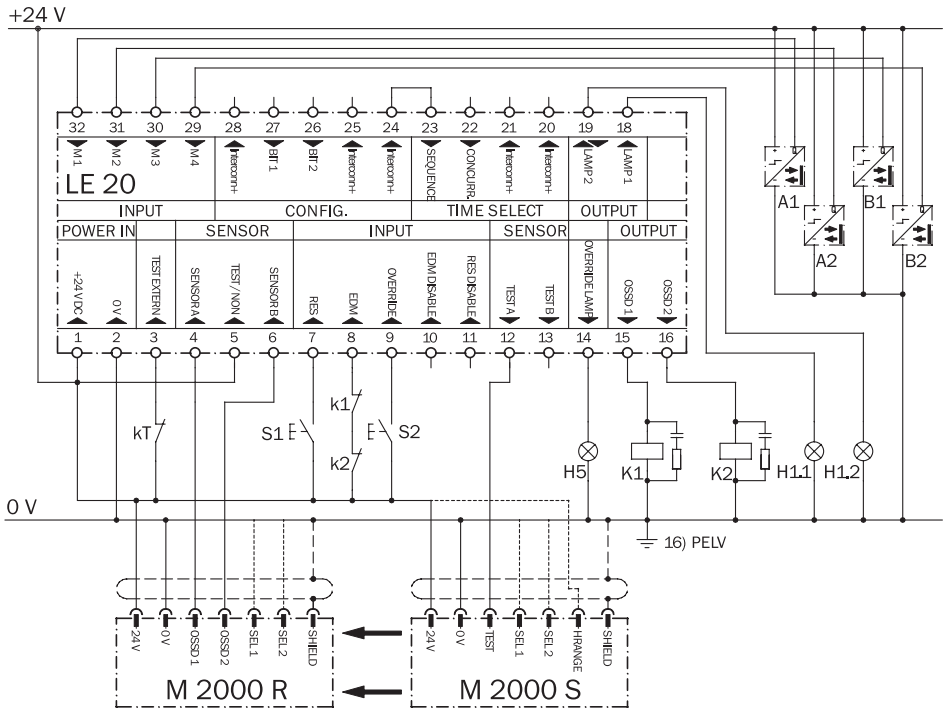


Version with manual reset

N	S1	A1	S	L1	L2	L3	L4	L5	L6
2	500	--	--	630	588	697	718	694	686
3	400	--	--	931	888	998	1019	995	987
4	300	--	--	1031	998	1089	1119	1095	1087
8	--	116	778	851	809	919	919	915	907
6	--	170	842	916	874	983	1004	979	971
7	--	170	999	1073	1031	1140	1161	1137	1129
8	--	170	1156	1231	1189	1189	1319	1294	1286
9	--	170	1313	1388	1346	1346	1476	1452	1444

① Clamp 180°, rotating (mounting kit 2)
② Connector M12 x 1 (standard)
③ Slide nut channel for side mounting
④ M8 hexagon screw DIN 933 with washer DIN 9021 (not supplied)
⑤ Center line offset
⑥ Alignment
⑦ Hirschmann connector DIN 43651 (standard)
⑧ Connector M12 x 1

Connection example

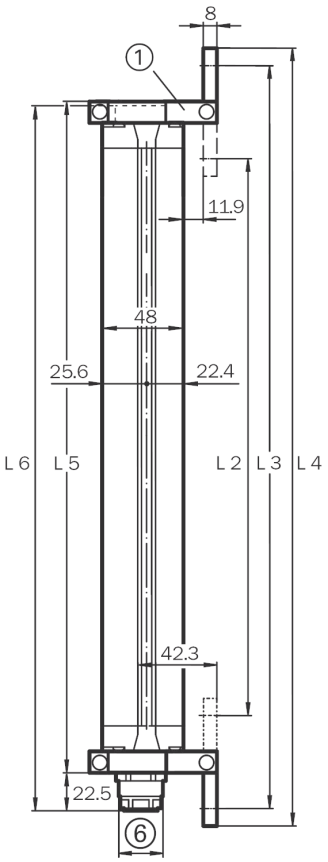


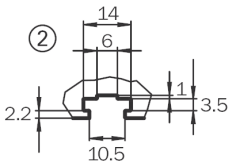
LE 20 muting data processing unit with M 2000 and 4 Muting sensors

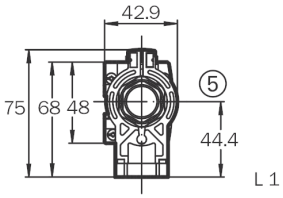
M 2000 A/P

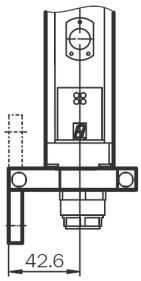
The active/passive safety barrier has a 500 mm resolution and a range from 0 to 6 m. This device's emitter and receiver are in the same case and need to be combined with a frontal mirror. The beam from the emitter is reflected by the mirror to coincide with the receiver. The mirror represents the passive component of the system and requires no electrical connection.

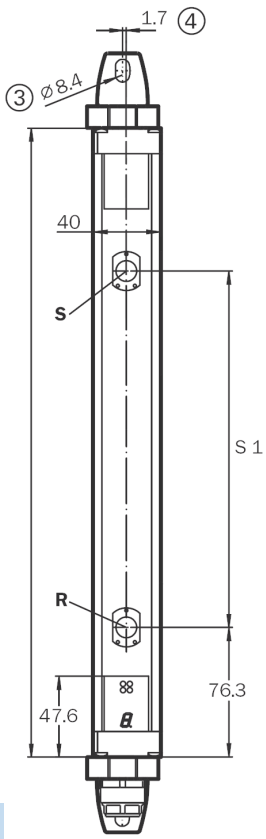
Drawings





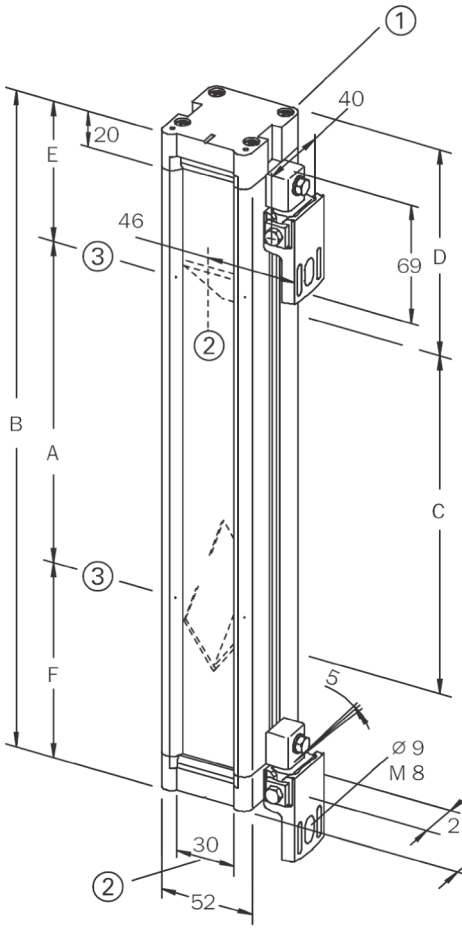






Active/Passive Version

N	S1	L1	L2	L3	L4	L5	L6
2	500	653	611	720	741	678	700

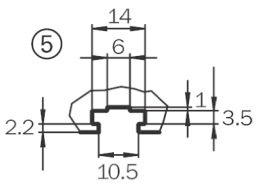


M2000Z

① Clamp 180°, rotating (mounting kit 2)
② Connector M12 x 1 (standard)
③ M8 hexagon screw DIN 933 with waster DIN 9021 (not supplied)
④ Center line offset
⑤ Alignment
⑥ Hirschmann connector DIN 43651 (standard)

PSZ

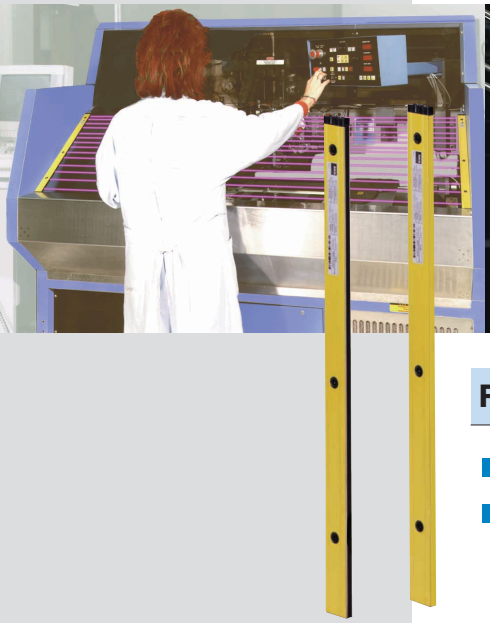
① Rating plate on rear
② Optical axis (= center of front screen)
③ Center of beam
④ Center of groove
⑤ Slide nut groove



Mirror for M 2000 A/P

	A	B	C	D	E	F
PSZ01-1501	500	668	481	105	81	87

Safety light grid
LGT



Features

- Relay outputs
- Up-to-date microprocessor technology and specially designed ICs (ASIC)
- Easy to mount and adjust
- Modular connection system
- Only three components (control unit, sender, and receiver strips)
- Two sensor pairs can be connected to one control unit
- Double protective field height by cascading
- Large signal reserve
- EC approval

Technical specifications

	LGT
Supply voltage	24 V DC ± 20% 5 V_{pp}[1)]
Power consumption	< 13 W/16 V A
Resolution	30 mm
Wavelength	880 nm
Protection class	IP 65 (LGTE/LGTS), IP 54 (LGTN with housing); IP 20 (LGTN DIN Rail Mount)
Safety category	2
Response time	≤ 50 ms
Operating temperature	-10…55° C
Storage temperature	-25…70° C
Tested to	pr EN 50 100
Certifications	CE, TÜV

[1)]Caution: With high-energy over voltages between the DC supply and PE potential (≥ 0.5 kV), it is advisable to change over to the AC supply and/or to mount the sensor strips such that they are insulated. If interference occurs, the sensor cables must also be installed such that they are separated from the cable channel causing the interference.

Product selection table

LGT Selection Table

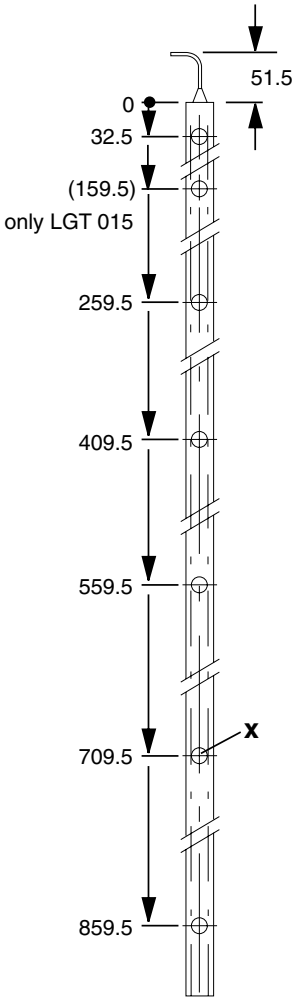
Protective field height (mm)	Device type	Part number
155	LGTS 015-051	1 013 413
	LGTE 015-051	1 013 414
305	LGTS 030-111	1 013 415
	LGTE 030-111	1 013 416
455	LGTS 045-171	1 013 417
	LGTE 045-171	1 013 418
605	LGTS 060-231	1 013 419
	LGTE 060-231	1 013 420
755	LGTS 075-291	1 013 421
	LGTE 075-291	1 013 422
905	LGTS 090-351	1 014 423
	LGTE 090-351	1 013 424

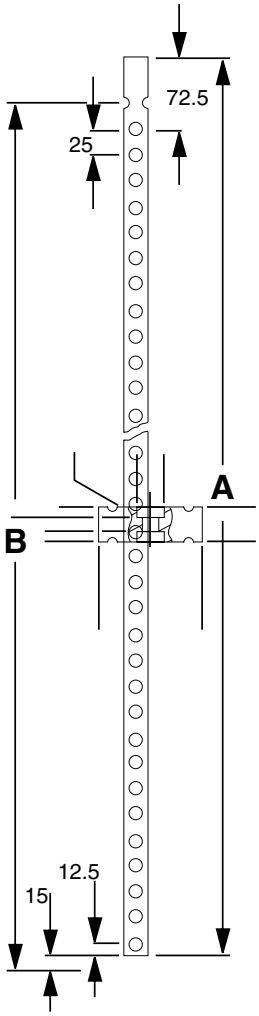
Control unit and LGTE/LGTS Connection Cables Selection Table

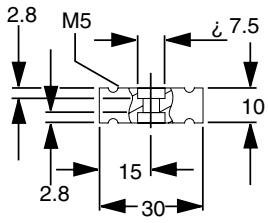
Type	Designation	Part number
LGTN 101-311	Control unit 115/230 V AC or 24 V DC, with housing	6 010 521
LGTN 101-511	Control unit 24 V DC only, with housing	6 010 683
LGTN 101-321	115/230 V AC or 24 V DC, DIN rail mount	6 008 526
LGTN 101-521	Control unit, 24 V DC only, DIN rail mount	6 008 527
LGTE/LGTS	Connection cables	
	(2 cables required per protective field)	
	2.5 m	6 009 923
	5.0 m	6 009 924
	10.0 m	6 009 926
	15.0 m	6 008 410
	20.0 m	6 008 411

We recommend contacting Customer Service for product selection

Drawings







x = mounting holes

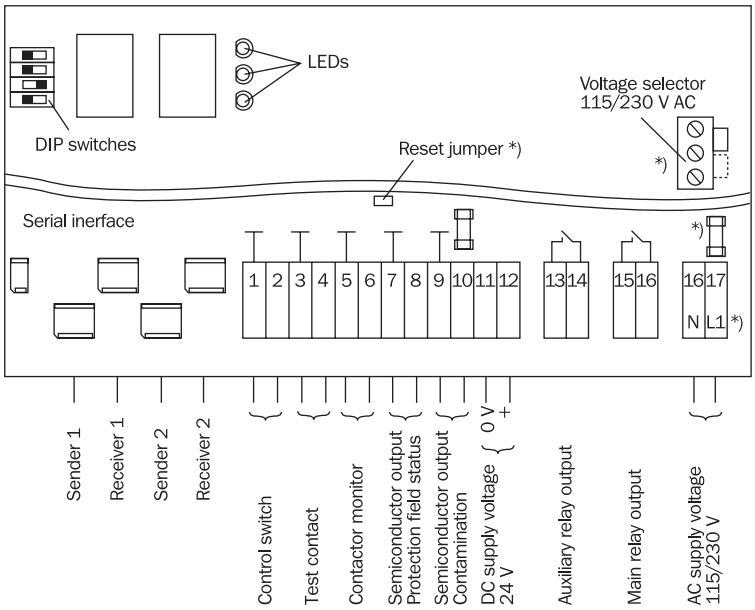
1) Upper protective field limit is indicated by groove in housing

2) Lower protective field limit is 15 mm from end of housing

3) Dimensions are in mm

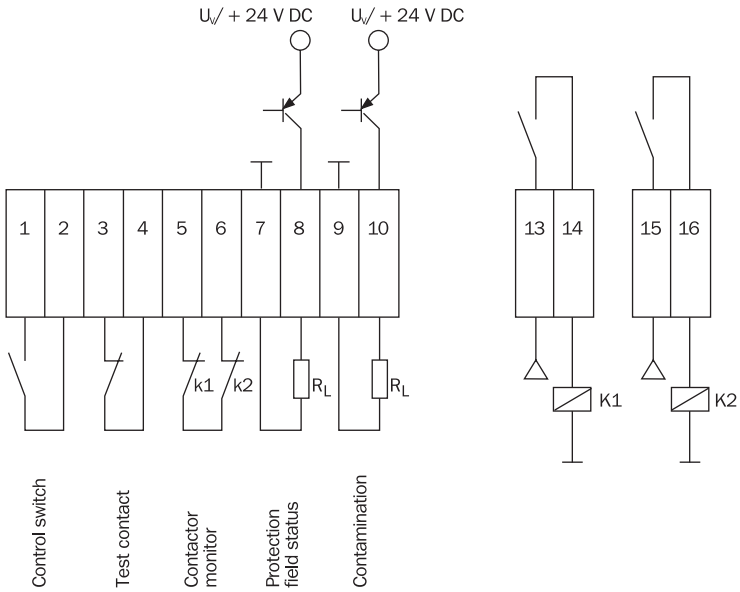
LGT type	# of beams	A housing length (mm)	B protection zone height (mm)
015	5	185	155
030	11	335	305
045	17	485	455
060	23	635	605
075	29	785	755
090	35	935	905

Connection example



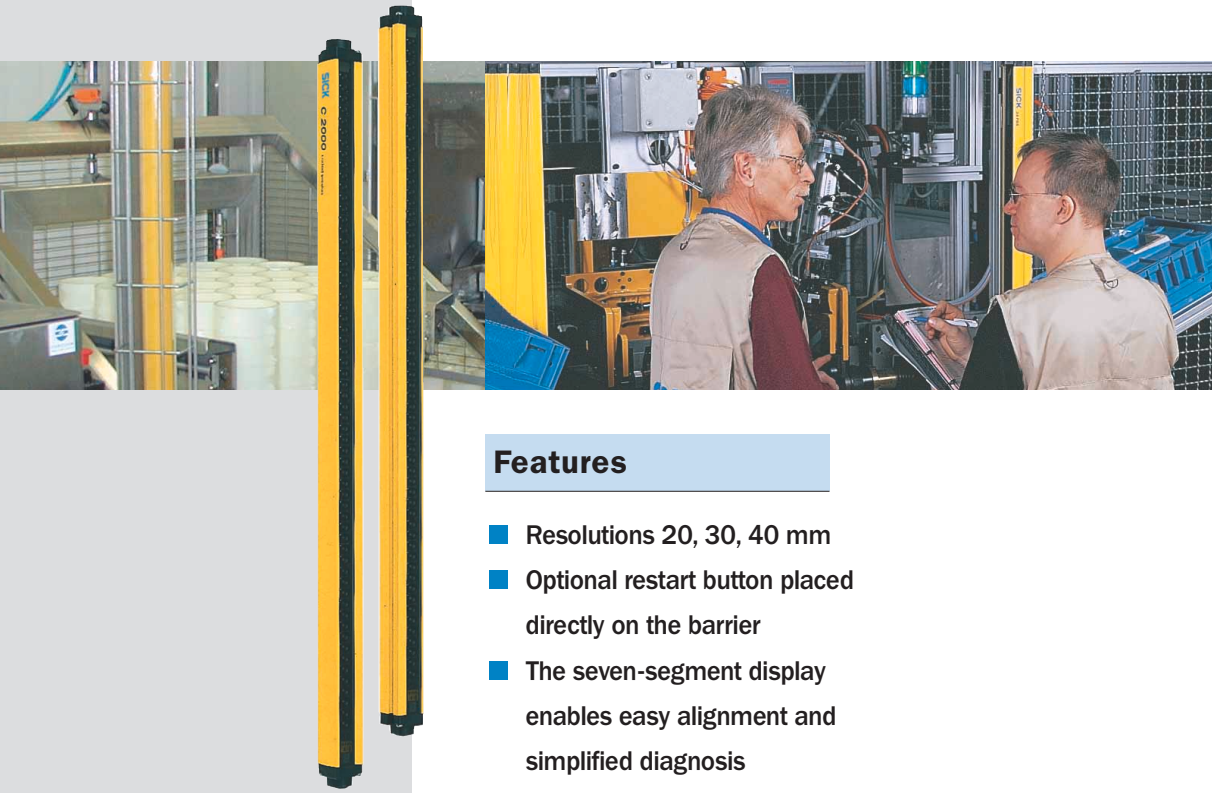
*) not available with all variants

LGTN connection diagram



Connection of two sensors

Safety light curtain
C 2000



Features

- Resolutions 20, 30, 40 mm
- Optional restart button placed directly on the barrier
- The seven-segment display enables easy alignment and simplified diagnosis
- Protected field height from 150 to 1200 mm with 20 mm resolution, and from 150 to 1800 mm for models with 30 and 40 mm resolution
- Option to connect up to three cascadable systems
- Safety Category 2, in accordance with IEC 61 496
- Housing dimensions:
  28.5 x 33.5 mm (up to 1200 mm)
  38.5 x 47 mm (up to 1800 mm)

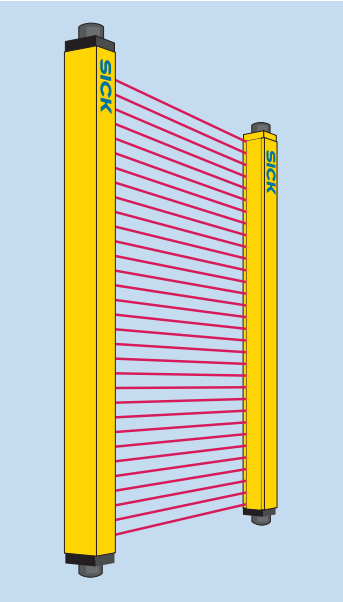
Description of Function

EDM

The external device monitoring control verifies if the final switching device are actually disabled at the time of the safety device intervention.

Restart

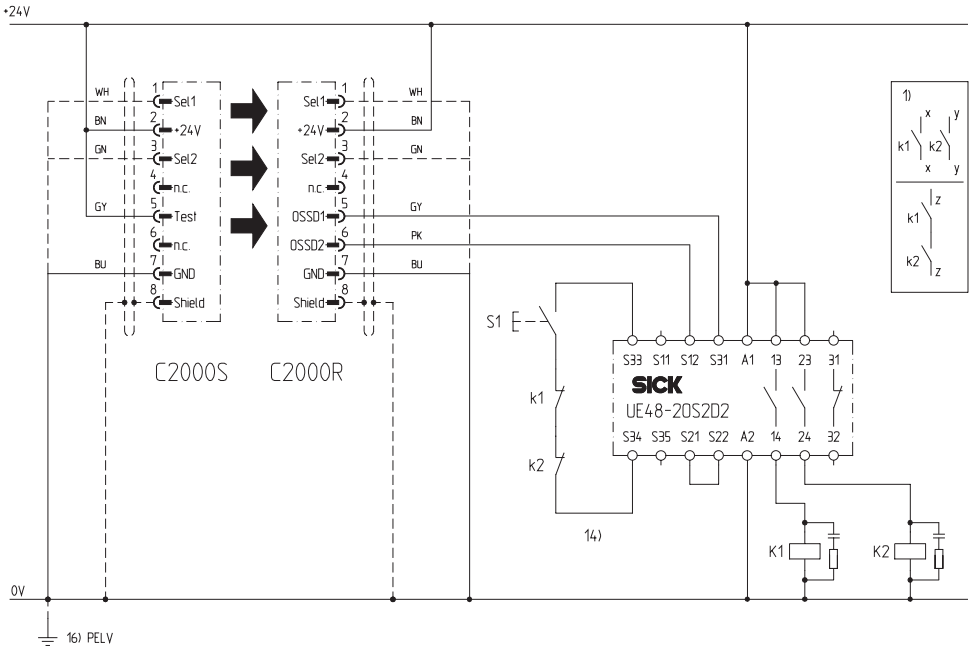
The C 2000 safety barrier allows both automatic and manual restart, and offers the option of connecting the reset button directly on the barrier connector.



Technical specifications

	C 2000
Supply voltage	24 V DC ± 20%
Power consumption	Sender: 6.2 W - Receiver: 8 W
Wavelength	950 nm
Resolution	20, 30, 40 mm
Protective field height	from 150 to 1800 mm
Operating distance	0…6 m / 2.5…19 m
Sending inputs	test
Receiving inputs	EDM, restart
Switching outputs	2 OSSD 500 mA
Function selection	Restart, EDM
Protection class	IP 65
Safety category	2
Synchronization	optical
Dimensions	28.5 x 33.5 mm/38.5 x 47 mm
Operating temperature	0…55° C
Storage temperature	-25…75° C
Tested to	IEC 61 496
Certifications	CE, UL, CSA, DQS

Connection example

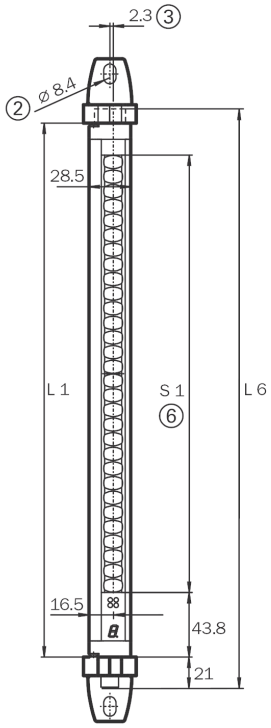


Example of a connection between the C 2000 safety screen and the UE 48-2 OS safety module

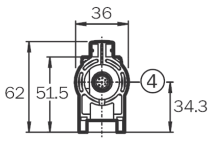
Applications

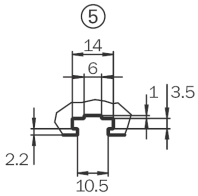
- Protection of hands for manual, assembly and textile equipment

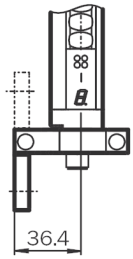
Drawings



S1	L1	L2	L3	L4	L5	L6
150	246	204	313	334	271	276
300	364	322	432	452	390	394
450	515	473	582	603	540	545
600	666	623	733	754	691	696
750	816	774	884	904	841	846
900	967	924	1034	1055	992	997
1050	1117	1075	1185	1205	1142	1147
1200	1266	1224	1334	1354	1292	1298
1350	1426	1384	1494	1514	1452	1463
1500	1577	1535	1644	1665	1602	1614
1650	1727	1685	1795	1815	1752	1764
1800	1878	1836	1945	1966	1903	1915

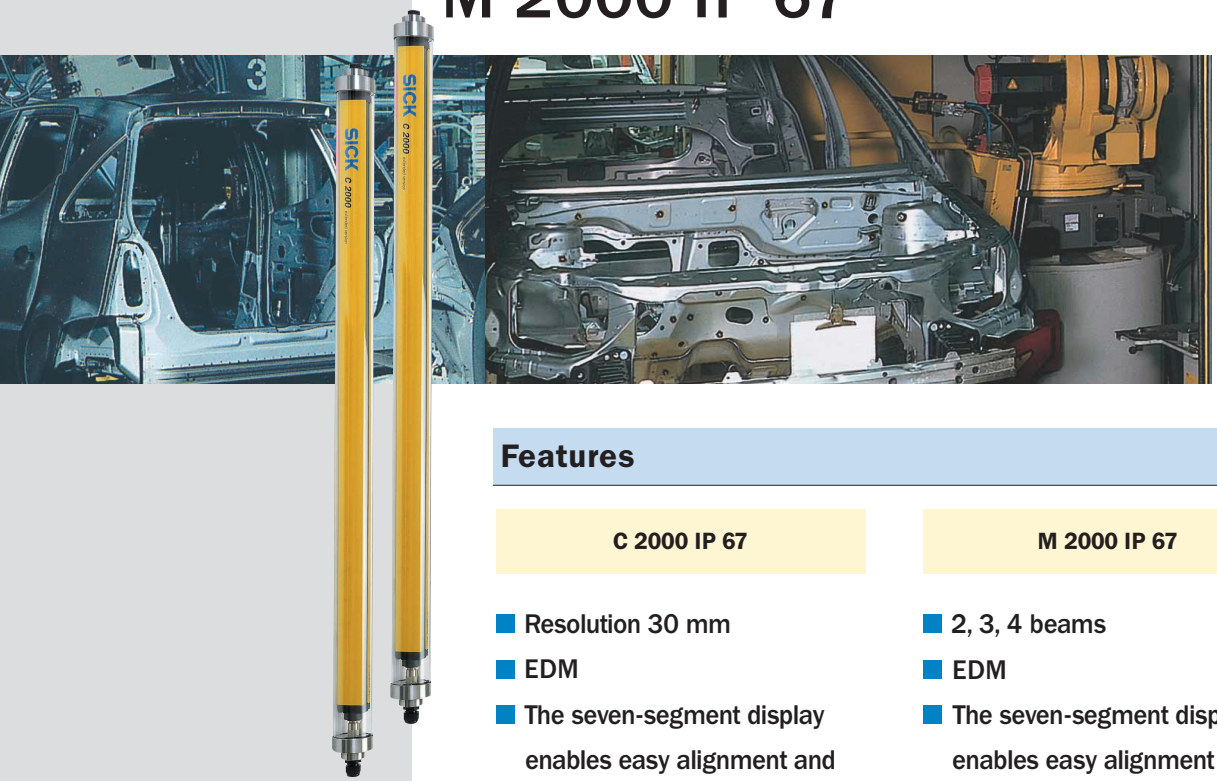






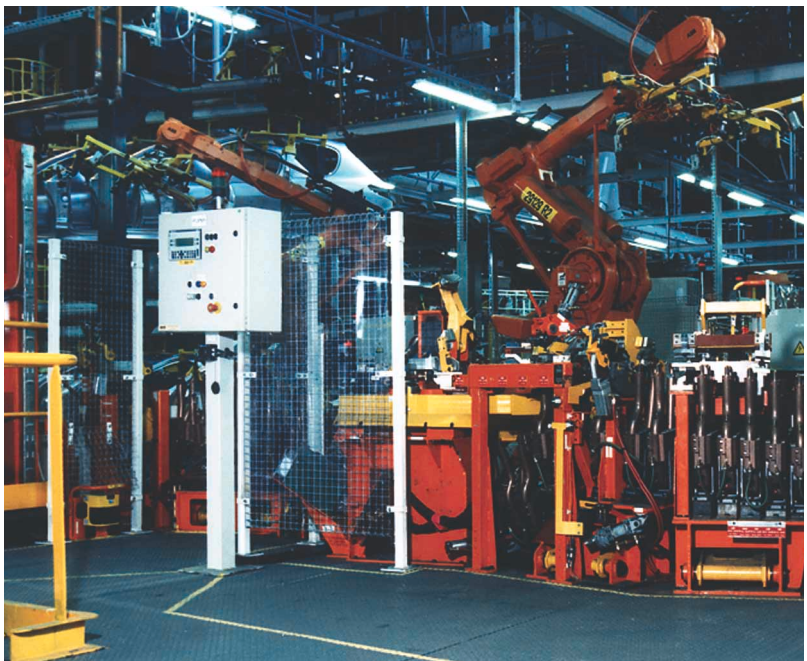
① Clamp 180°, rotating (mounting kit 2)
② Connector M12 x 1 (standard)
③ Center line offset
④ M8 hexagon screw DIN 933 with waster DIN 9021 (not supplied)
⑤ Slide nut channel for side mounting
⑥ Alignment
⑦ Connector M12 x 1 (standard)

Safety light curtain C 2000 IP 67 and multi-beam barrier M 2000 IP 67



Features

C 2000 IP 67	M 2000 IP 67
■ Resolution 30 mm	■ 2, 3, 4 beams
■ EDM	■ EDM
■ The seven-segment display enables easy alignment and simplified diagnosis	■ The seven-segment display enables easy alignment and simplified diagnosis
■ Protected field height from 150 to 1200 mm	■ Protected field height from 500 to 900 mm
■ Safety Category 2, in accordance with IEC 61 496	■ Safety Category 2, in accordance with IEC 61 496



Description of Function

EDM

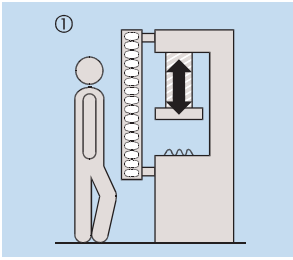
The external device monitoring control verifies if the final switching device are actually disabled at the time of the safety device intervention.

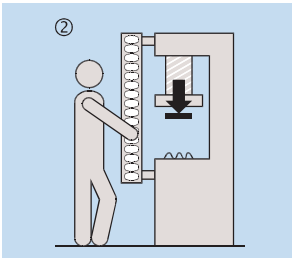
Restart

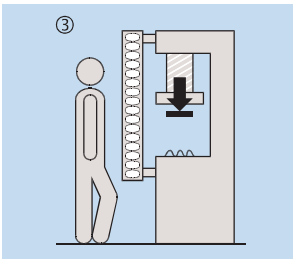
Using manual reset, the dangerous machinery (figure 1) caused by interruption of the light beam (figure 2) becomes blocked and can no longer be used until the operator activates the reset button.

Using automatic reset, the screen activates the equipment as soon as the optical beam is released.

When used with the C 2000 IP 67 safety screen or with the M 2000 multi-beam barrier, the IP 67 housing is designed to prevent contact with liquids; as a result, it is an ideal solution for the food industry.



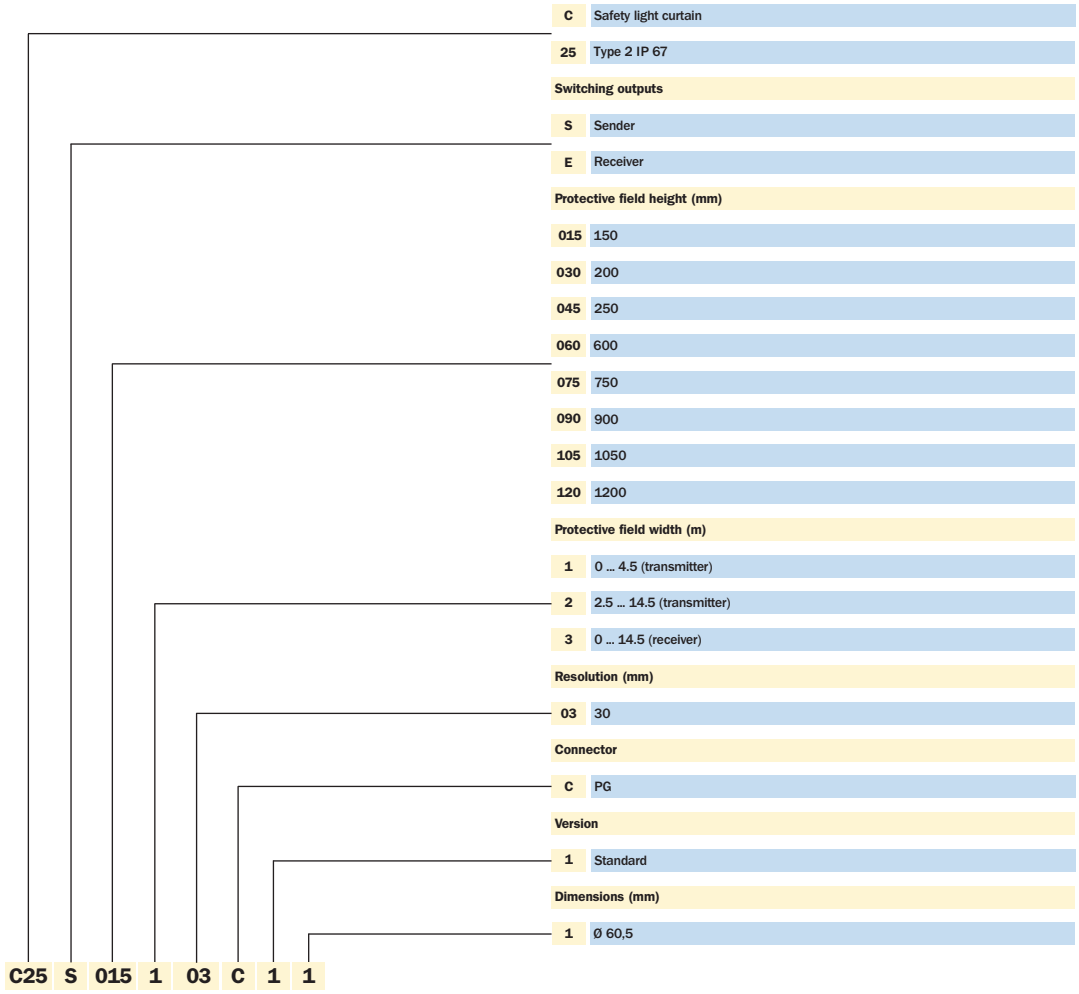




Technical specifications

	C 2000 IP 67	M 2000 IP 67
Supply voltage	24 V DC ± 20%	24 V DC ± 20%
Power consumption	590 mA	590 mA
Wavelength	950 nm	950 nm
Resolution	30 mm	300/400/500 mm
Protective field height	from 500 to 1200 mm	500/800/900 mm
Operating distance	0…4.5 m / 2.5…14.5 m	0…4.5 m / 0…19 m
Sender inputs	test	test
Receiver inputs	EDM	EDM
Switching outputs	2 OSSD 500 mA	2 OSSD 500 mA
Function selection	EDM	EDM
Protection class	IP 67	IP 67
Safety category	2	2
Synchronization	optical	optical
Dimensions	Ø 60.5 mm	Ø 60.5 mm
Operating temperature	0…55° C	0…55° C
Storage temperature	-25…75° C	-25…75° C
Tested to	IEC 61 496	IEC 61 496
Certifications	CE, UL, CSA	CE, UL, CSA

C 2000 product selection table



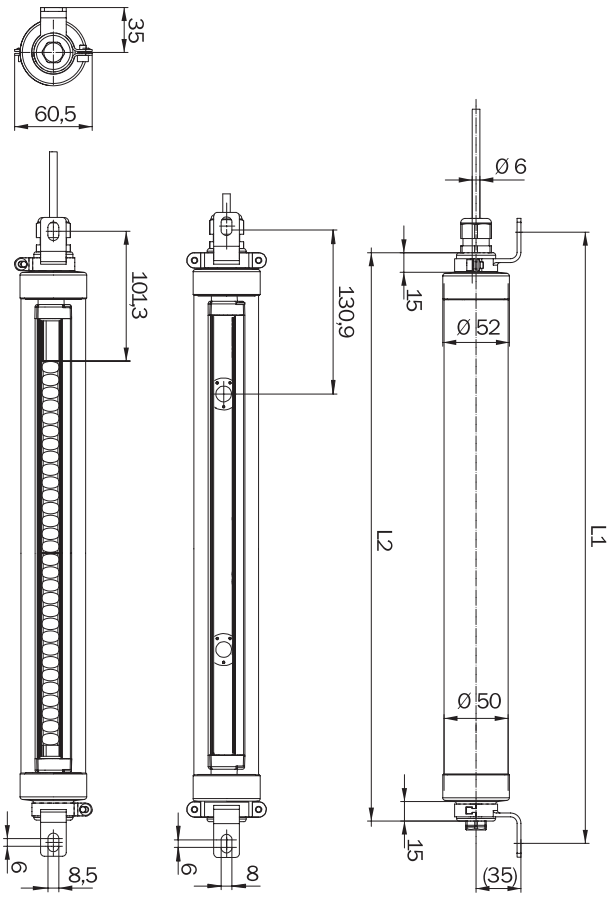
We recommend contacting Customer Service for product selection

M 2000 product selection table

2 beams	M 25 S 02 150 C 112	Part number 10 24 208
	M 25 E 02 150 C 112	Part number 10 24 209
3 beams	M 25 S 03 140 C 112	Part number 10 24 210
	M 25 E 03 140 C 112	Part number 10 24 211
4 beams	M 25 S 04 130 C 112	Part number 10 24 212
	M 25 E 03 120 C 112	Part number 10 24 213

We recommend contacting Customer Service for product selection

Connection example



L1 (mm)	L2 (mm)	Protective field height C 2000	Number of beams M 2000
357	324	150	-
476	443	300	-
626	593	450	-
777	744	600	2
927	894	750	-
1078	1045	900	3
1228	1195	1050	4
1382	1349	1200	-

Applications

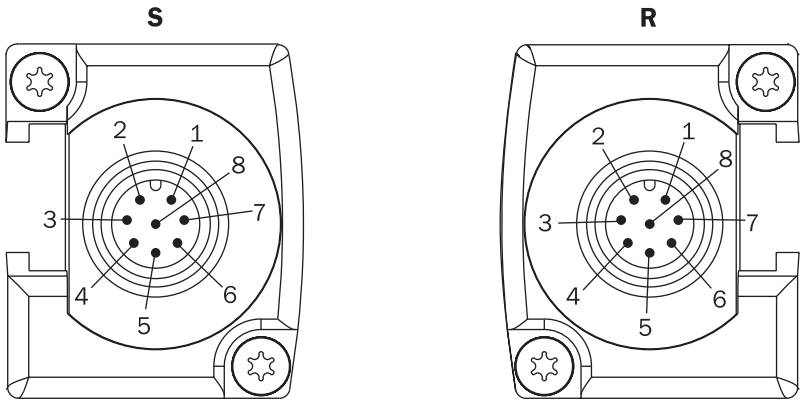
- Provides protection on dairy machinery or other applications where humidity poses a potential problem for safety devices.

Accessories: C 2000/M 2000

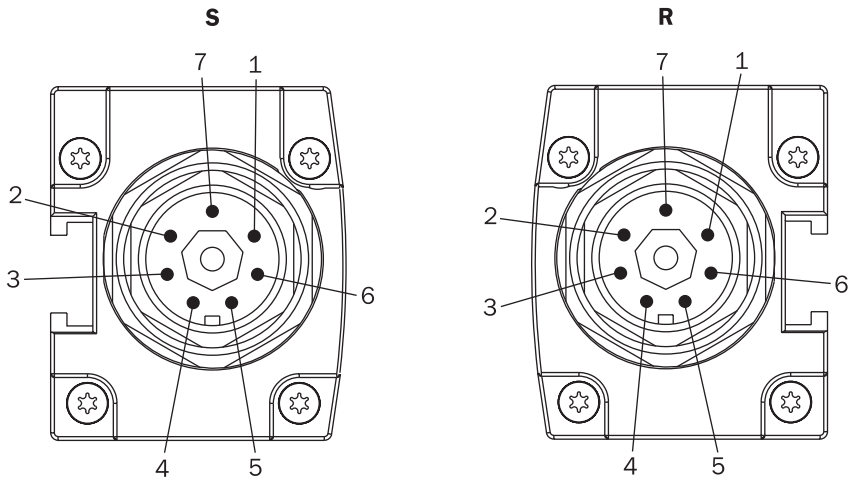
Connectors

Part number	C 2000/M 2000
6020872	M12 8*0.25 straight with 15 m cable
6020352	M12 8*0.25 straight with 10 m cable
6020353	M12 8*0.25 straight with 7.5 m cable
6020354	M12 8*0.25 straight with 5 m cable
6020537	M12 8*0.25 straight with 2.5 m cable
6021342	M12 8*0.25 90° with 5 m cable
6021343	M12 8*0.25 90 90° with 15 m cable

Part number	M 2000 Connector Hirschmann
6020757	11p+FE , crimp - straight-female
6020758	11p+FE , crimp - 90°- female
2022544	11p+FE , straight, 2.5 m cable
2022545	11p+FE , straight, 5 m cable
2022546	11p+FE , straight, 7.5 m cable
2022547	11p+FE , straight, 10 m cable
2022548	11p+FE , straight, 15 m cable
2022549	11p+FE , straight, 20 m cable
2022550	11p+FE , straight, 30 m cable



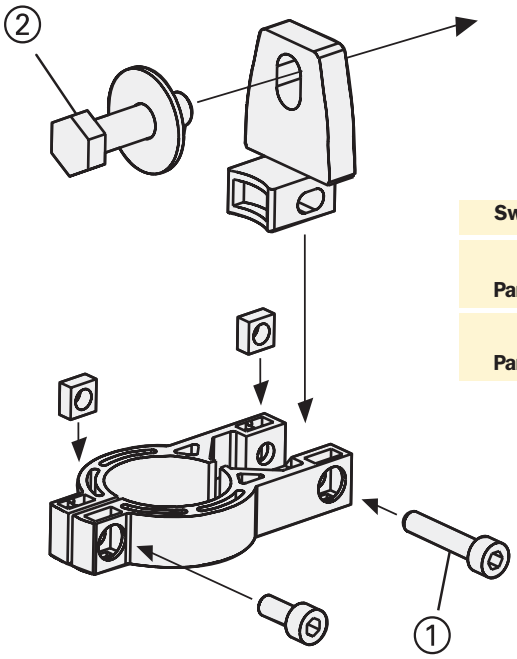
C 2000/M 2000



Hirschmann

M 2000

Brackets

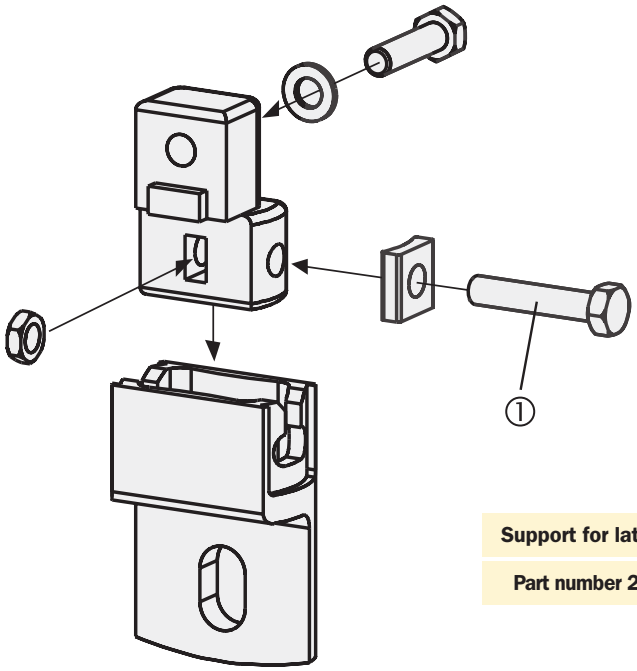


Swivel mount bracket

For small profile
Part number 2 019 649

For large profile
Part number 2 019 659

① Clamping screw (adjuster)
② M8 mounting screw (not included)

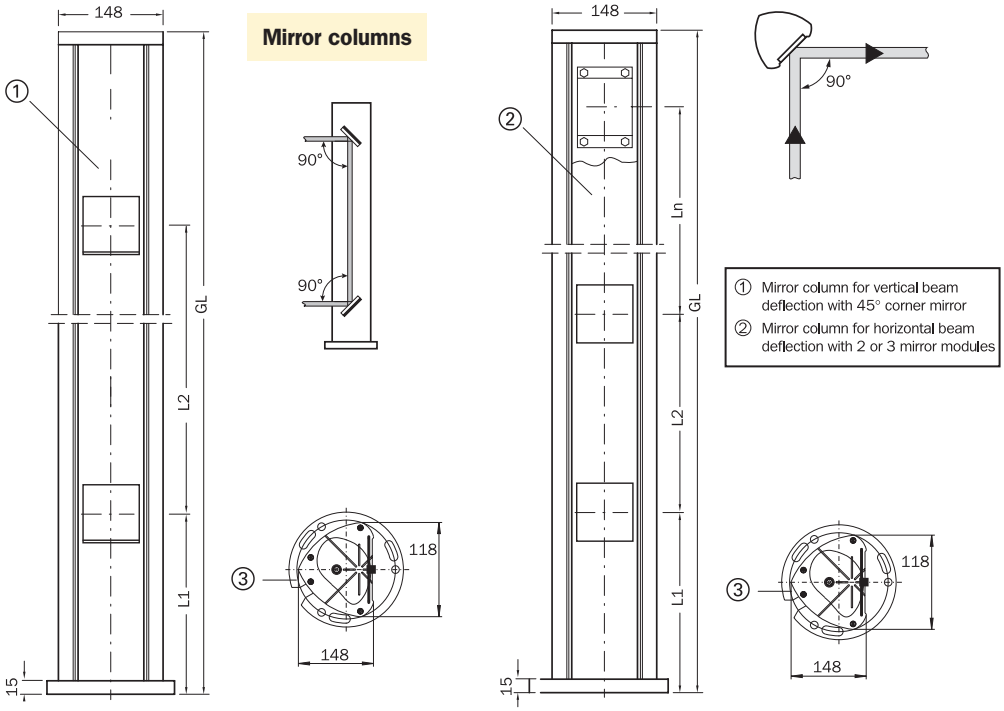


Support for lateral guide

Part number 2 019 506

Deviation mirrors/columns

Mirror columns

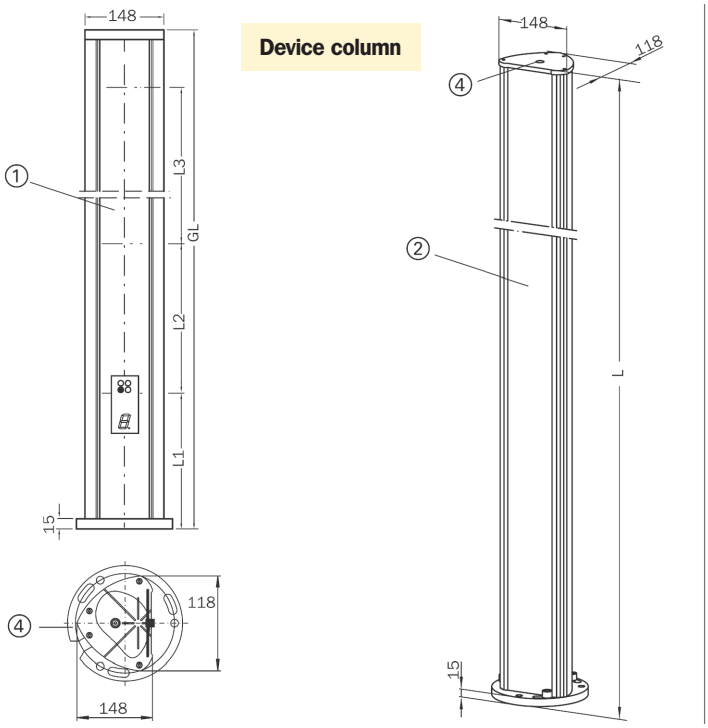


① Mirror column for vertical beam deflection with 45° corner mirror
② Mirror column for horizontal beam deflection with 2 or 3 mirror modules

M 2000

Part number	Number of	L1	L2	L3	L4	GL
1 015 041	2	400	500	--	--	1221
1 015 040	3	300	400	400	--	1221
1 019 115	4	300	300	300	300	1521
1 015 042	--	400	500	--	--	1221

Device column

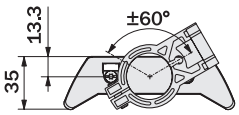


① Device column for M 2000 and M 2000 A/P with front cut-out panel
② Device column for C 2000, M 2000 and M 2000 A/P with front screen
④ Device column (top view)

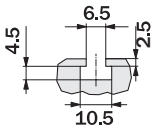
Part number	Number of beams	L1	L2	L3	GL
2 021 329	3	300	400	400	1221
2 021 328	2	400	500	--	1221

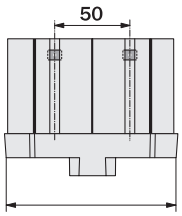
M 2000

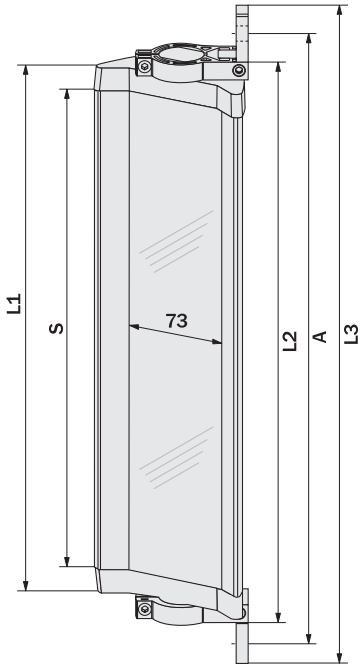
Part number	L
2 021 330	1221
2 021 331	1521
2 021 332	1721
2 021 330	1221
2 021 331	1521
2 021 332	1721



Installation with swivel ball mount

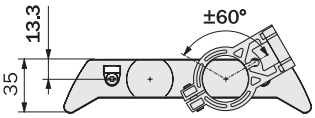




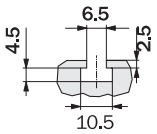


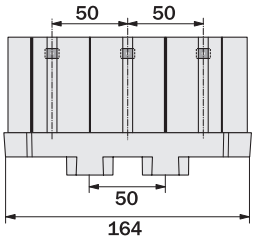
PNS 75

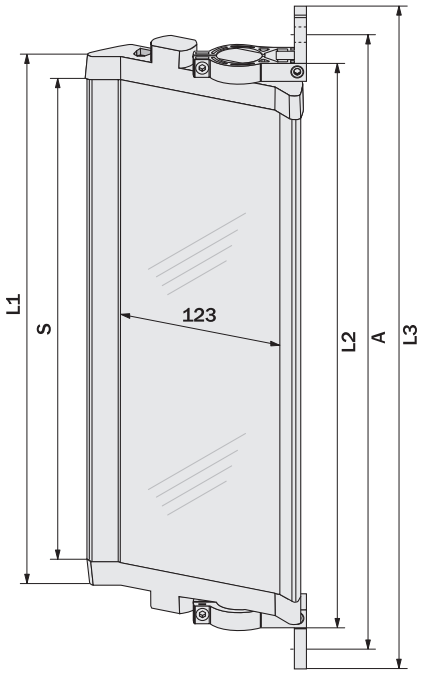
Mirror height (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure L3 (mm)	Measure A (mm)
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940



Installation with swivel ball mount







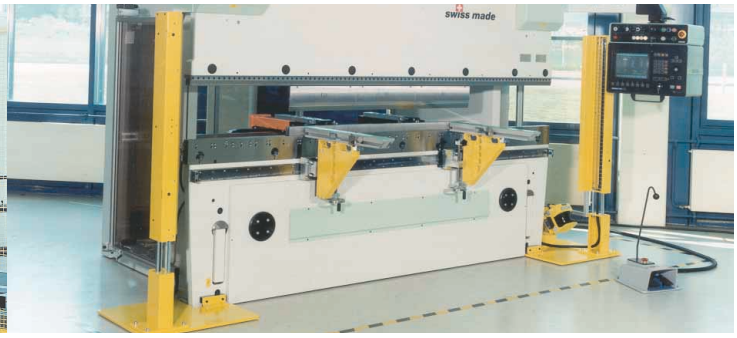
PNS 125

Mirror height (mm)	Measure L1 (mm)	Measure L2 (mm)	Measure L3 (mm)	Measure A (mm)
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Accessories for C 2000 IP 67/M 2000 IP 67

Model	Part number
Stainless steel fastening bracket kit	2 023 708
Stainless steel vibration-damping bracket kit	2 026 850
Support for vibration-damping brackets	2 026 849
Cable replacement accessory	4 034 690

Safety interfaces technology



Machine safeguarding is possible through the use of innovative components and safety systems. However, safety components, like optoelectronic barriers, emergency stops, safety interlocks and two hands controls are not enough to ensure the actual switching of power devices downstream from the circuit. SICK safety interfaces are used in order to prevent a machine or installation control circuit failure that would cause the loss of the safety function, resulting in potential hazard for the operator.

Basic module

These devices are used for monitoring emergencies, movable guards, two-hands controls and optoelectronic systems. The devices include instantaneous release contacts and delayed release contacts with time delays that may be set from 0.15 s to a 30 s. The base module of SICK safety devices may be used for safety applications up to Safety Category 4 as per EN 954-1.

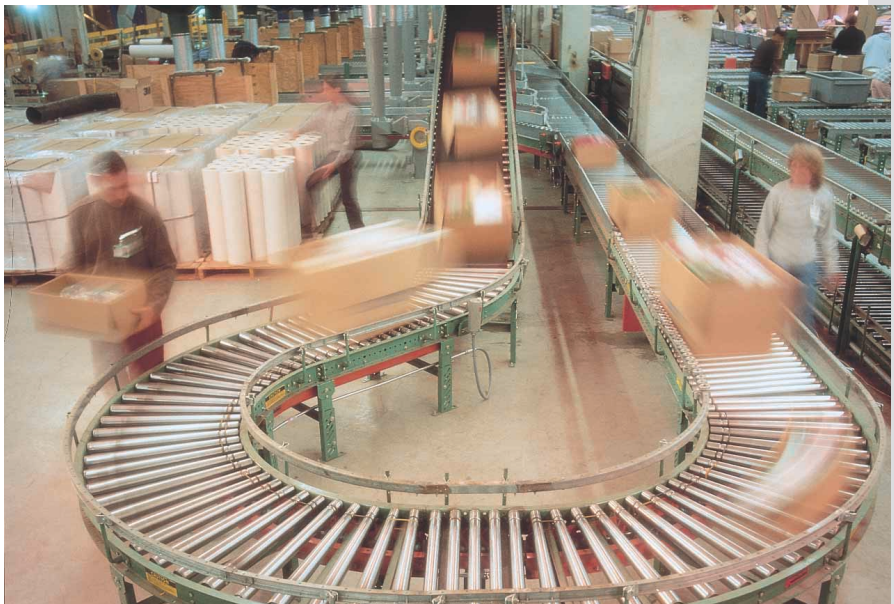
Depending on the external connection and on the cable layout of connected devices, it is possible to reach Safety Categories 2, 3 and 4.

Expansion control module

These devices are used in order to increase the number of safety and alert channels of the base models to which they should be connected.

A contact expansion module individually installed without a base model, does not ensure that any category above Safety Category 1 would be achieved.

A release contact of the base module is used to connect an expansion module. If the connection is correct, the control category of the expansion module is the same as the base module. The devices include instantaneous release contacts and delayed release contacts with fixed delays from 0.5 to a 3 s.







	UE 10-3 OS	UE 48-2 OS	UE 48-3 OS	UE 23-2 MF	UE 42-2 HD
Used With					
Safety Light Curtains / Sensors	with EDM[2]=ON in curtain	without EDM[2] or EDM=OFF in curtain	without EDM[2] or EDM=OFF in curtain		
Safety Area Scanners	with EDM[2]=ON in scanner	without EDM[2] or EDM=OFF in scanner	without EDM[2] or EDM=OFF in scanner		
Two Hand Controls					Type IIIC to EN574
Safety Interlocks / Moveable Guards		2 NC	2 NC	Switch 1 NC or Switch 2 NC	
Emergency Stops		2 NC	2 NC	E-Stop 1 NC or E-Stop 2 NC	
Safety Mats		yes	yes		
Enclosure Type	A	A	A	A	A
Terminal Type	EZwire™	EZwire™	EZwire™	Screw terminal	EZwire™
Electrical / Input Configuration					
Supply Voltage	24 V DC	24 V DC	24 V DC	see below	24 V DC
Input Contact Arrangement	2 NC	2 NC	2 NC	1 NC or 2 NC	2 NO and 2 NC
Simultaneous Time Monitoring	No	No	No	No	Yes
Output Configuration					
Contact Arrangement	3 Safety Circuits (NO) 1 Auxiliary Circuit (NC)	2 Safety Circuits (NO) 1 Auxiliary Circuit (NC)	3 Safety Circuits (NO) 0 Auxiliary Circuit (NC)	2 Safety Circuits (NO) 1 Auxiliary Circuit (NC)	2 Safety Circuits (NO) 1 Auxiliary Circuit (NC)
Nominal Switching Voltage	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC
Continuous Current per Contact[3]	6A	6A	6A	6A	6A
Delayed Outputs	None	None	None	None	None
Response Time	25 ms	25 ms	25 ms	80 ms (max)	40 ms (max)
Operational Data					
Ambient Temperature	-25…55°C	-25…55°C	-25…55°C	-25…55°C	-25…55°C
Enclosure	IP 20	IP 20	IP 20	IP 20	IP 20
Automatic or Manual Reset	Automatic or Manual	Automatic or Manual	Automatic or Manual	Automatic or Manual	Automatic
Stop Category (EN 60204-1)	0	0	0	0	0
Safety Category [1]	Category 1 to EN954-1 Category 2, 3, 4 to EN61496	Category 1 to EN954-1 Category 2, 3, 4 to EN61496	Category 1 to EN954-1 Category 2, 3, 4 to EN61496	Category 2	Category 4
Model Designation	UE10-3OS3D0	UE48-2OS3D3	UE48-3OS3D2	UE23-2MF2** ** = D3 for 24 V DC ** = A4 for 115 V AC ** = A3 for 230 V AC	UE42-2HD3D2
Approvals	UL CSA CE	UL CSA CE	UL CSA CE	UL CSA CE	UL CSA CE
Availability	Available Today	Available Today	Available Today	Available Today	Available Today
Part Number	6 024 918	6 024 916	6 025 097	UE23-2MF2** ** = D3= 6 026 146 ** = A4= 6 026 147 ** = A3 = 6 026 148	6 024 881

[1] When specified, the Safety Category indicates the highest level attainable based on the device used and the associated wiring. For example, a Safety Category 4 device must be used in conjunction with a UE Series Relay and be wired in accordance with Safety Category 4 in order to attain Safety Category 4 for the system.







UE 43-2 MF	UE 43-3 MF	UE 43-6 MF	UE 44-3 SL	UE 45-3 S1	UE 10-4 XT	UE 11-4 DX
			ON Delay	OFF Delay	Expansion Unit	Expansion Unit
				without EDM[2] or EDM=OFF in curtain		
Switch 1 NC or Switch 2 NC	Switch 2 NC	Switch 2 NC	Switch 2 NC Mechanical Locking	Switch 2 NC Electrical Locking		
E-Stop 1 NC or E-Stop 2 NC	E-Stop 2 NC	E-Stop 2 NC	E-Stop 2 NC	E-Stop 2 NC		
A	B	C	A	A	A	A
EZwire™	Screw Terminals	Screw Terminals	EZwire™	EZwire™	EZwire™	EZwire™
24 V AC/DC	See below	24 V DC	24 V DC	24 V DC	24 V AC/DC	24 V DC
1 NC or 2 NC	2 NC	2 NC	2 NC	2 NC	1 NO from UE Relay	1 NO from UE Relay
No	No	No	No	No	No	No
2 Safety Circuits (NO) 1 Auxiliary Circuit (NC)	3 Safety Circuits (NO) 1 Auxiliary Circuit (NC)	6 Safety Circuits (NO) 4 Auxiliary Circuits (NC)	3 Safety Circuits (NO) with 1 defined as On-Delay	3 Safety Circuits (NO) with 1 defined as Off-Delay	4 Safety Circuits (NO) 2 Auxiliary Circuits (NC)	4 Safety Circuits (NO) 2 Auxiliary Circuits (NC)
230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC/30 V DC
6A	6A	6A	6A	6A	6A	6A
None	None	None	0.15-3 s or 1.5-30 s	0.15-3 s or 1.5-30 s	None	0.5-3 s
40 ms (max)	40 ms (max)	40 ms (max)	40 ms (max)	40 ms (max)	40 ms (max)	40 ms (max)
-25…55°C	-25…55°C	-25…55°C	-25…55°C	-25…55°C	-25…55°C	-25…55°C
IP 20	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Automatic or Manual	Automatic or Manual	Automatic or Manual	Automatic or Manual	Automatic or Manual	Not Applicable	Not Applicable
0	0	0	0 or 1	0 or 1	0	1
Category 4	Category 4	Category 4	Category 4 or 3	Category 4 or 3	Same as the UE Series Unit it is connected to	Same as the UE Series Unit it is connected to
UE43-2MF3D2	UE43-3MF2** ** = D3 for 24 V DC ** = A2 for 120 V AC ** = A3 for 230 V AC	UE43-6MF2D3	UE44-3SL3D3** ** = 3 for 0.15…3 s ** = 30 for 1.5…30 s	UE45-3S13D3** ** = 3 for 0.15…3 s ** = 30 for 1.5…30 s	UE10-4XT3D2	UE11-4DX3D3** ** = 0.5 for 0.5 s ** = 1 for 1 s ** = 2 for 2 s ** = 3 for 3 s
Available Today	Available Today	Available Today	Available Today	Available Today	Available Today	Available Today
6 024 894	UE43-3MF2** ** = D3 = 6 024 987 ** = A2 = 6 024 900 ** = A3 = 6 024 901	6 024 902	UE44-3SL3D3** ** = 3 = 6 024 908 ** = 30 = 6 024 910	UE45-3S13D3** ** = 3 = 6 024 912 ** = 30 = 6 024 914	6 024 920	UE11-4DX3D3** ** = 0.5 = 6 024 925 ** = 1 = 6 024 926 ** = 2 = 6 024 927 ** = 3 = 6 024 928

[2] EDM = External Device Monitoring

[3] Continuous current based on resistive load

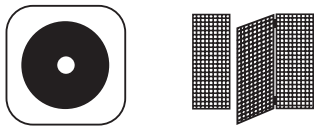
Safety relay for safety interlocks, movable guards, and emergency stops

UE 23-2 MF

Safety class
Class 2
Supply voltage
24 V DC, 115/120 V AC, 230 V AC
Output contacts
Safety 2 / Signal 1
Dimensions
96.5 x 22.5 x 114 mm
Function
■ Dual-channel wiring with transversal short circuit detection ■ Automatic/manual start ■ External device monitoring (EDM) ■ Version with connection clamps available

Applications

- Emergency stop control of movable guards shelters

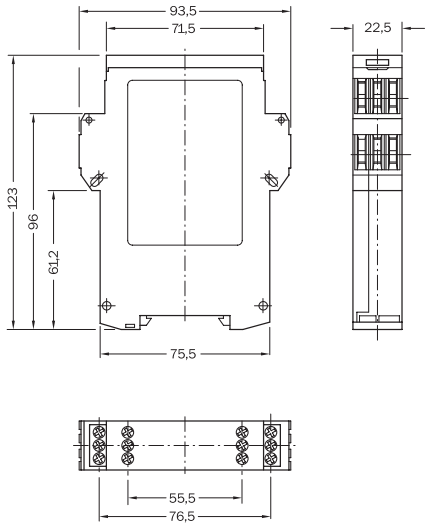


Features

- Safety Category 2* approved to EN 954-1
- Stop Category 0 approved to EN 60 204-1
- 2 instant NO safe contacts + 1 instant NC auxiliary contact
- Automatic or manual reset
- External device monitoring (EDM)
- 2 LED signals
- Inputs for safety devices with 1 or 2 NC contacts

* Cables for input and output signals should be routed outside the control panel, in compliance with the applicable safety category.

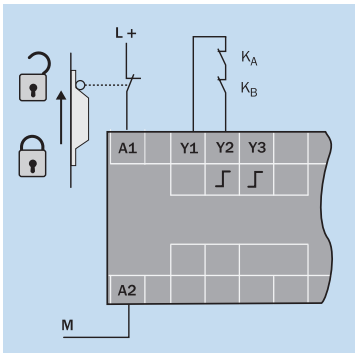
Dimensions



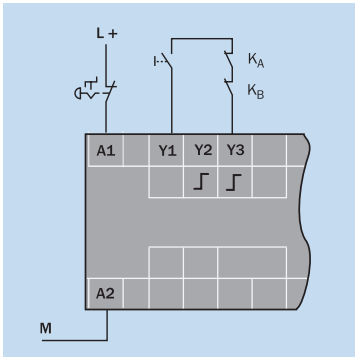
Functionality

UE 23-2 MF controllers are designed for monitoring single channel control devices. When the closed safety circuit is powered, the “SUPPLY” LED indicator light is on and the controller is ready. To activate the outputs, the feedback/reset circuit, built by serial connection of the reset button NO contact with the external device NC contacts, should be closed.

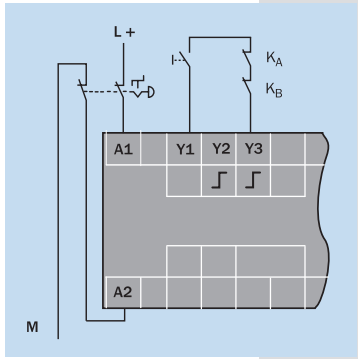
For manual resetting, a pushbutton must be connected to terminals Y1/Y3. For automatic resetting, Y1/Y2 must be linked.



Example of 1 connection channel of a protection shelter with automatic reset and external contact



Example of connection of an emergency stop to a channel with self-contained reset and external contacts

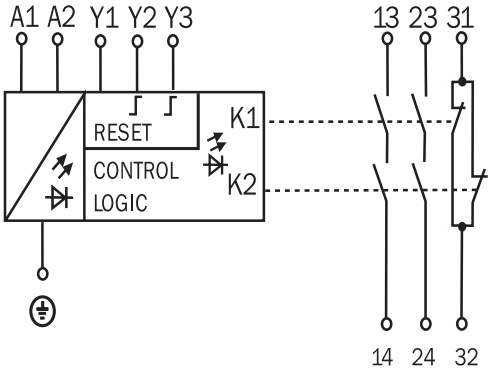


Example of connection of an emergency stop to two channels with self-contained reset and external contacts

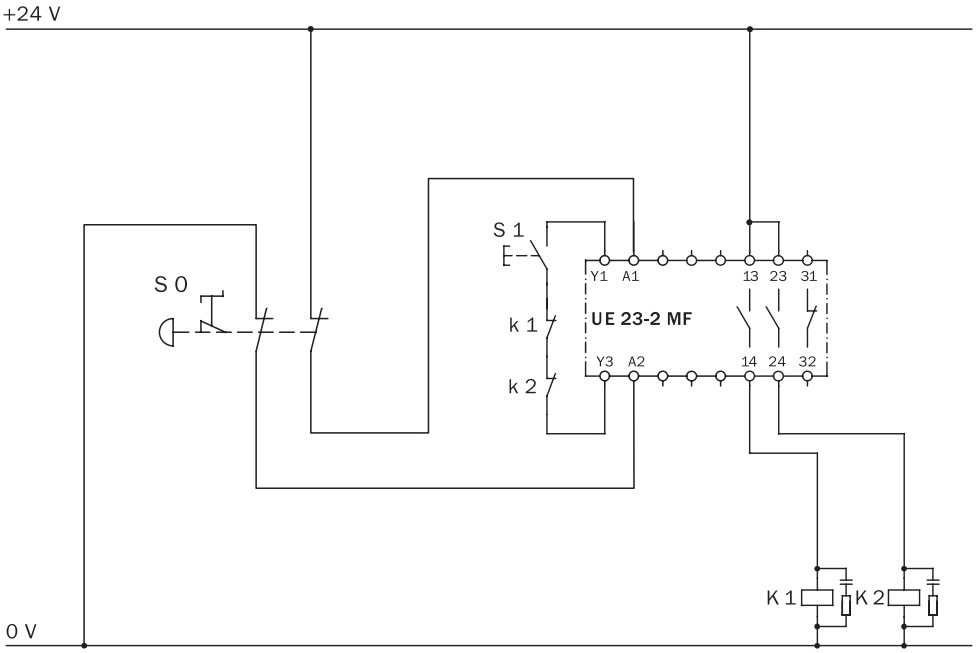
Technical specifications

General data description	min.	typ.	max.
Protection class 2 according to EN 50 178	between supply circuit/control circuit/output circuits and between the output circuits mutually		
Safety category EN 954-1			4
Supply voltage V_S (A1 - A2)			
UE 23-2 MF 2 D2	20.4 V DC	24 V DC	26.4 DC
UE 23-2 MF 2 A4	98 V AC	15/120 V AC	132 V AC
UE 23-2 MF 2 A3	196 V AC	230 V AC	253 V AC
Power consumption			
AC			2.7 V A
DC			1.6 W
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Nominal frequency in AC mode	50 Hz		60 Hz
Control voltage (Y1 - Y2 - Y3)			
Control voltage			40 V DC
Control current			200 mA
Fuse	PTC resistor		
Reset time			
Manual (Y3)			70 ms
Automatic (Y2)			600 ms
Galvanic separation (only on AC units)	yes		
Output circuits (13 - 14, 23 - 24, 31 - 32)			
Response time (K1/K2)		30 ms	80 ms
Relay contacts			
	2 normally open contacts (NO), safety relevant 1 normally closed contact (NC), not safety relevant		
Contact type	Positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of the contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			12 A
Category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (360 c/h) AC-15 Ue 230 V AC, I_e 3 A (3600 c/h) DC-13 Ue 24 V DC, I_e 4 A (360 c/h) DC-13 Ue 24 V DC, I_e 2.5 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{Imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2.0 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Interference emission according to	DIN EN 61 000-6-4		
Ambient operating temperature	-25° C		+ 55° C
Storage temperature	-25° C		+ 75° C
Cross sections of electrical conductors			
single strand wire (2 x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1 x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps	0.25 mm^2		
(2 x, identical cross section)	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1 x)	0.25 mm^2		2.5 mm^2
Weight	270 g		

Switching internal circuits



Connection drawing

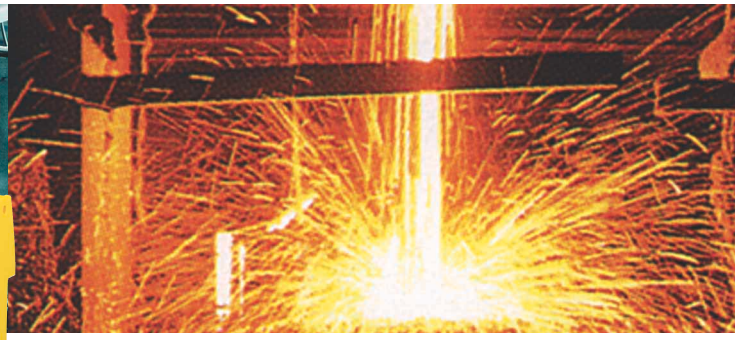


Selection table

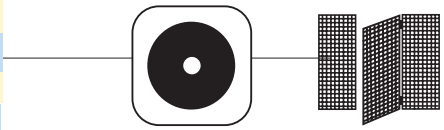
Model	Type	Part number
UE 23-2 MF 2 D3	24 V DC screw terminals	6 026 146
UE 23-2 MF 2 A4	115/120 V A C screw terminals	6 026 147
UE 23-2 MF 2 A3	230 V AC 24 V DC screw terminals	6 026 148

We recommend contacting Customer Service for product selection

Safety relay
Manual or automatic reset
UE 43-2 MF



Safety class
Class 4
Supply voltage
AC: 24 V DC: 24 V
Output contacts
Safety 2 / Auxiliary 1
Dimensions
87 x 22.5 x 122 mm
Function
■ Dual-channel wiring with short circuit detection ■ Supply voltage: 24 V AC/DC ■ Start automatic/manual ■ External device monitoring (EDM) ■ Version with connection clamps available



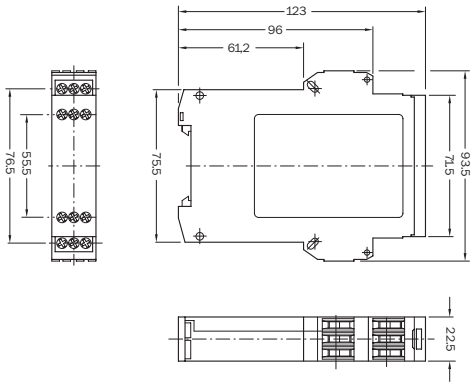
Features

- Safety Category 4 approved to EN 954-1
- Stop Category 0 approved to EN 60 204-1
- 2 instant NO safe contacts + 1 instant NC signal contacts
- Automatic or manual reset
- External device monitoring (EDM)
- 3 LED signals
- Inputs for safety devices with 1 or 2 NC contacts
- Monitors the integrity of connection of safety circuit

Applications

- Redundant circuits and auto control for emergency stops and safety switches
- Monitor movable guards

Dimensions



Functionality

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the opened state. If the connected sensor is not activated (i.e. the input circuits are closed), then the normally open contacts close immediately in Automatic Reset (LED “K1, K2” illuminate). In the case of Manual Reset, this only occurs after pressing and releasing the Reset button. Activation of the sensor (opening of one or both input circuits) affects the opening of the normally open outputs.

External device monitoring (EDM)

The UE 43-2 MF unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays by means of their normally closed contacts.

Reset

For Manual resetting, a pushbutton must be connected to terminals S33 - S34. Reset is monitored.

For Automatic resetting, S12 - S35 must be linked.

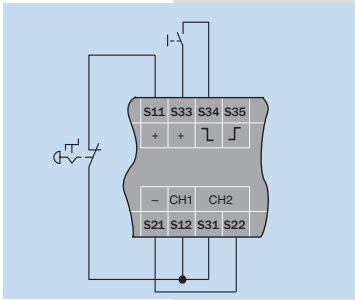
Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

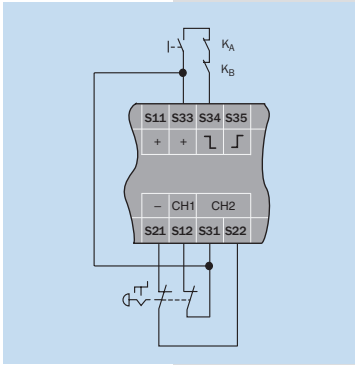
Monitoring of synchronization

If input 2 closes no later than 0.5 seconds after input 1, the output circuits close. If input 2 closes before input 1, the monitoring of synchronization will not take place, and the output circuits will close. This monitoring only takes place in Automatic Reset.

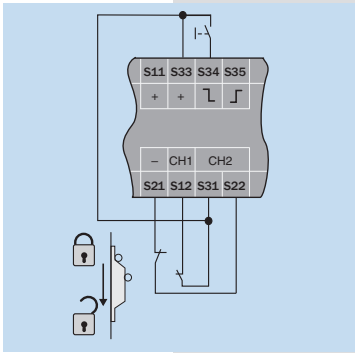
The UE 43-2 MF 2 units have screw type terminals.
The UE 43-2 MF 3 units have removable terminals.



Example of a connection of emergency stops to individual channel with manual reset



Example of a connection of emergency stops to dual channel with manual reset, EDM and control of integrity of connections

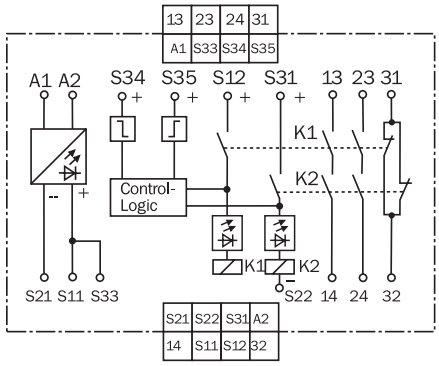


Example of a connection of limit stops of safety with manual reset and control of the connections

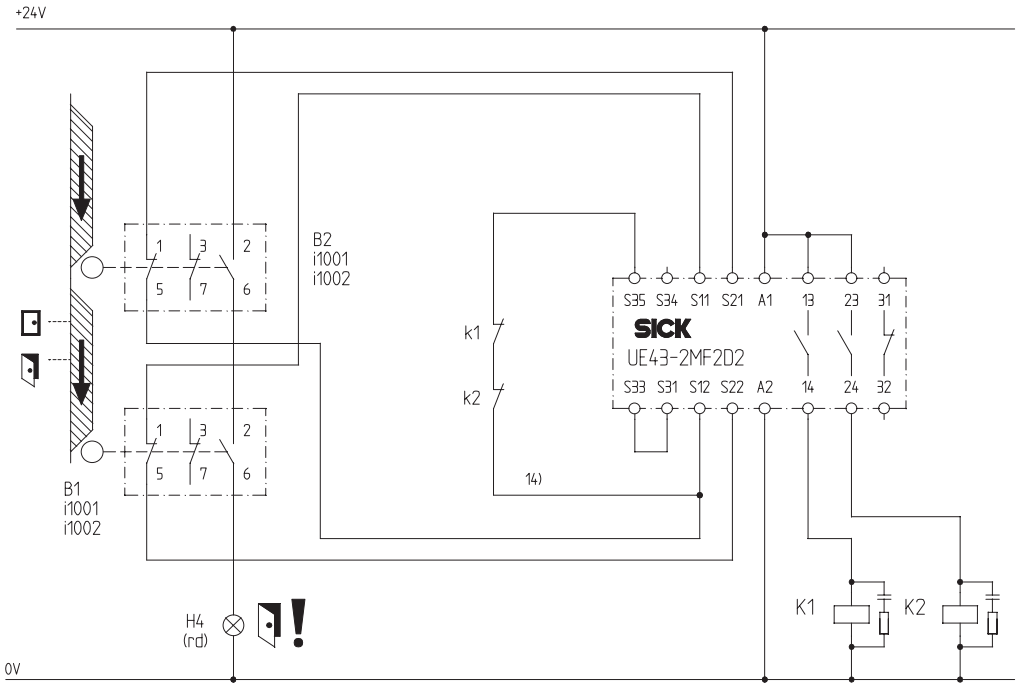
Technical specifications

General data description	min.	typ.	max
Supply voltage to A1/A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Safety category: EN 954-1			4
Stop category: EN 60 204	0		
Supply voltage V_S (A1/A2)	20.4 V	24 V	26.4 V AC/DC
Power consumption			
AC			4.6 V A
DC			2.1 W
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Nominal frequency in AC mode	50Hz		60Hz
Control voltage S33/S11 and S 21			
Control voltage	17.4 V DC	24 V DC	
Control current	40 mA		100 mA
Short circuit between S33/S11 and S21			2000 mA
Fuse	PTC resistor		
Reaction time by cross connection			3 sec
Activation time upon detection of cross connection			3 sec
Galvanic separation between A1/A2 and S21, S11, S33	No		
Input circuits (S12, S31, S22, S34, S35)			
Input current S12 and S31/S22		40 mA	100 mA
Input current S34/S35		5 mA	50 mA
Reset time			
Manual (S34)			40 ms
Automatic (S35)	200 ms		500 ms
Activation time of Reset button	50 ms		
Line resistance at the input circuit			35 Ohm
Synchronization time			500 ms
Output circuits (13-14, 23-24, 31-32)			
Response time (K1/K2)			25 ms
Minimum time outputs will stay off			40 ms
Relay contacts			
	2 normally open contacts (NO), safety relevant 1 normally closed contact (NC), not safety relevant		
Contact type	Positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			12 A
Application category to EN 60 947-5-1	AC-15 Ue230 V AC, I_e 4 A (3600 c/h) AC-15 Ue230 V AC, I_e 3 A (360 c/h) DC-13 Ue24V DC, I_e 4 A (360 c/h) DC-13 Ue24V DC, I_e 4 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	1 x10^5		
Operating data			
Surge voltage rating (V_{Imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2.0 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Interference emissions according to	DIN EN 61 000-6-4		
Ambient operating temperature	-25° C		+ 55° C
Storage temperature	-25° C		+ 75° C
Cross sections of electrical conductors			
single strand wire (2 x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1 x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps	0.25 mm^2		
(2 x, identical cross section)	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1 x)	0.25 mm^2		2.5 mm^2
Weight	0.2 kg		

Switching internal circuits



Connection drawing



Selection table

Model	Outputs		Connection (terminal type) Screw	Removable	Supply voltage 24 V AC/DC	24 V DC	24 V AC	115 V AC	120 V AC	230 V AC	Part number
UE 43-	2	MF	2		D2						6 024 893
UE 43-	2	MF		3	D2						6 024 894

We recommend contacting Customer Service for product selection

Safety relay
Manual or automatic reset
UE 43-3 MF

Safety class

Class 4

Supply voltage

AC: 24 V AC, 115 V AC, 120 V AC, 230 V AC; DC: 24 V DC

Output contacts

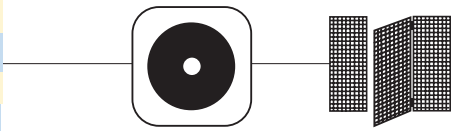
Safety 3 | Auxiliary 1

Dimensions

75 x 45 x 120.5 mm

Function

- Dual-channel wiring with short circuit detection
- Reset automatic/manual
- External Device Monitoring (EDM)



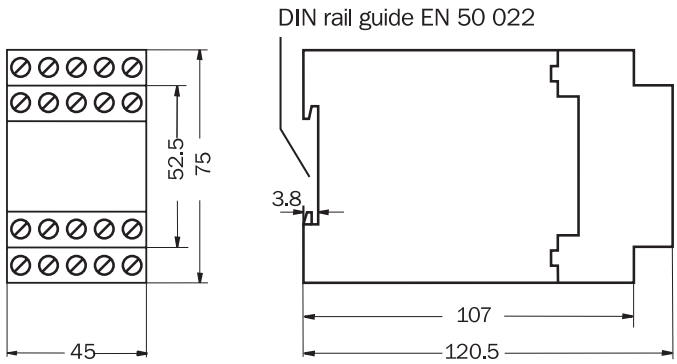
Features

- Safety Category 4 approved to EN 954-1
- Stop Category 0 approved to EN 60 204-1
- 3 NO safe circuits + 1 NC auxiliary circuit
- Automatic or manual reset
- External Device Monitoring (EDM)
- 3 LED signals
- Inputs for safety devices with 1 or 2 NC contacts
- Monitors the integrity of connection of safety circuit

Applications

- Redundant circuits and auto control for emergency stops and safety switches
- Monitor movable guards

Dimensions



Functionality

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the opened state. If the connected sensor is not activated (i.e. the input circuits are closed), then the normally open contacts close immediately in Automatic Reset (LED “K2” and “K3” illuminate). In the case of Manual Reset, this is only effected upon pressing and releasing the Reset button.

Activation of the sensor (opening of one or both input circuits) affects the opening of the normally open contacts (LED K2 and K3 off).

External device monitoring (EDM)

The UE 43-3 MF unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays by means of their normally closed contacts.

Reset

For Manual resetting, a pushbutton must be connected to terminals Y12 and Y13. Reset is monitored.

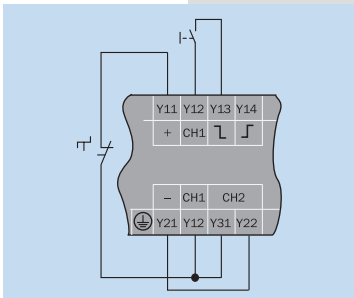
For Automatic resetting, Y 12 - Y 14 must be linked.

Cross circuit detection

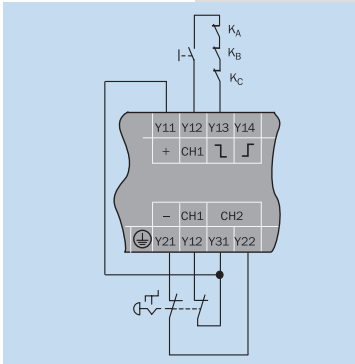
Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronization

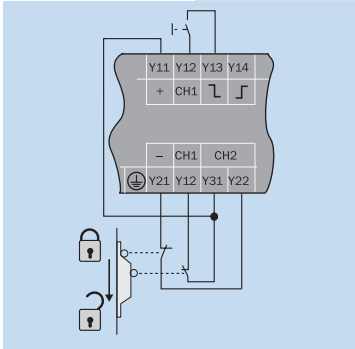
If input 2 closes no later than 0.5 seconds after input 1, the output circuits close. If input 2 closes before input 1, the monitoring of synchronization will not be effected, and the output circuits will close. This monitoring only takes place in Automatic Reset.



Example of a connection of emergency stops to individual channel with manual reset of safety relay.



Example of connection of emergency button to dual channel, manual reset and EDM.

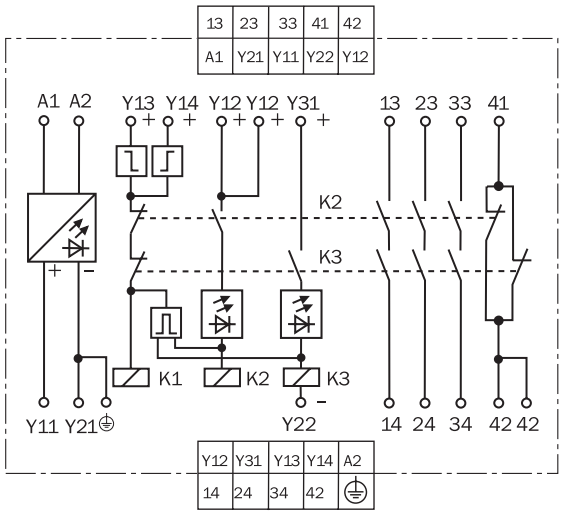


Example of connection between a safety limit stop to dual channel and manual reset.

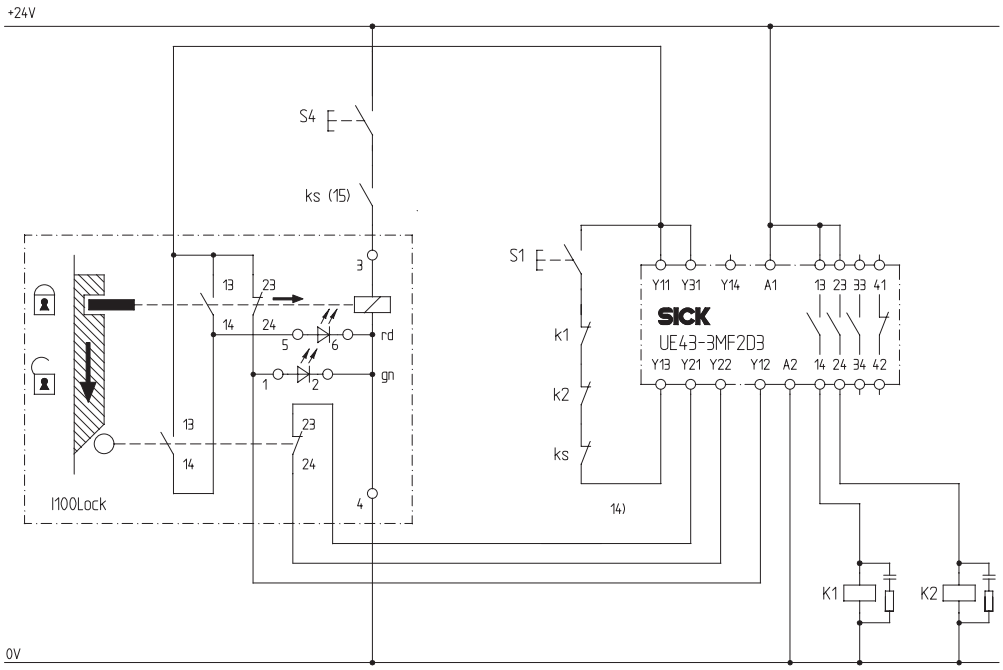
UE 43-3 MF

General data description	min.	typ.	max
Supply voltage to A1/A2 for DC units			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Voltage supply to A1/A2 on AC units	Use of earth conductor terminal		
Safety category: EN 954-1			4
Stop category: EN 60 204	0		
Supply voltage V_S (A1/A2)			
UE 43-3 MF 2 D3	20.4 V DC	24 V DC	26.4 V DC
UE 43-3 MF 2 A0	20.4 V AC	24 V AC	26.4 V AC
UE 43-3 MF 2 A1	97.75 V AC	115 V AC	126.5 V AC
UE 43-3 MF 2 A2	102.0 V AC	120 V AC	132.0 V AC
UE 43-3 MF 2 A3	195.5 V AC	230 V AC	253.0 V AC
Power consumption			
AC		2.5 W/3.2 V A	
DC		1.0 W	
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Nominal frequency in AC mode	50Hz		60Hz
Control voltage Y11 and Y21			
Control voltage		24 V DC	
Control current		40 mA	
Short circuit current between Y11 and A2			1000 mA
Fuse			
AC units	short circuit resistant transformer		
DC units	PTC resistor		
Reaction time by cross connection			3 sec
Galvanic separation between A1/A2 and Y11 - Y21 - PE	only on AC units		
Input circuits (Y12 and Y31 - Y 22)			
Input current Y12 and Y31			15 mA
Input current at Y 13 and Y 14 (reset circuit)			40 mA
Reset time			
Manual (Y13)		150 ms	250 ms
Automatic (Y14)		0.8 s	1.2 s
Synchronization time			500 ms
Line resistance at the input circuit			< 70 Ohm
Input time upon applying supply voltage	100 ms		
Output circuits (13-14, 23-24, 33-34, 41-42)			
Response time (K2/K3)			50 ms
Minimum time outputs will stay off			40 ms
Relay contacts			
	3 normally open contacts (NO), safety relevant 1 normally closed contact (NC), not safety relevant		
Contact type	Positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			18 A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 6 A (3600 c/h) AC-15 Ue 230 V AC, I_e 6 A (360 c/h) DC-13 Ue 24 V DC, I_e 3 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{Imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2.0 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	DIN EN 61 000-6-4		
Interference emission according to	DIN EN 61 000-6-4		
Ambient operating temperature	-25° C		+ 55° C
Storage temperature	-25° C		+ 75° C
Cross sections of electrical conductors			
single strand wire (2 x, identical cross section)	0.75 mm^2		2.5 mm^2
single strand wire (1 x)	0.75 mm^2		2.5 mm^2
fine stranded wire with terminal crimps	0.75 mm^2		
(2 x, identical cross section)	0.5 mm^2		1.5 mm^2
fine stranded wire with terminal crimps (1 x)	0.5 mm^2		1.5 mm^2
Weight	AC unit: 0.36 kg; DC unit: 0.30 kg		

Internal circuitry



Connection drawing

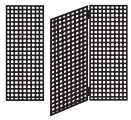


Selection table

Model	Output		Connection (terminal types) Screw	Removable	Supply voltage 24 V AC/DC	24 V DC	24 V AC	115 V AC	120 V AC	230 V AC	Part number
UE 43-	3	MF	2			D3					6 024 897
UE 43-	3	MF	2				A0				6 024 898
UE 43-	3	MF	2					A1			6 024 899
UE 43-	3	MF	2						A2		6 024 900
UE 43-	3	MF	2							A3	6 024 901

Safety relay
Manual or automatic reset
UE 43-6 MF

Safety class	
Class 4	
Supply voltage	
AC: 120 V AC, 230 V AC VC: 24 V DC	
Output contacts	
Safety 6	Auxiliary 4
Dimensions	
75 x 90 x 120.5 mm	
Function	
■ Dual-channel wiring with short circuit detection ■ Automatic or manual reset	



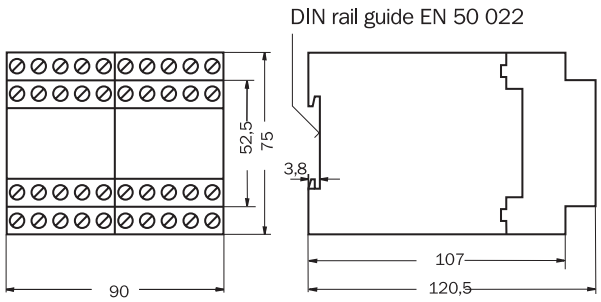
Features

- Safety Category 4 approved to EN954-1
- Stop Category 0 approved to EN 60 204-1
- Outputs: 6 normally open contacts, 4 normally closed contacts
- Automatic or manual reset
- External device monitoring (EDM)
- 6 LED Signal
- Inputs for safety devices with 1 or 2 NC contacts
- Monitors the integrity of connection of safety circuit

Applications

- Redundant circuits and auto control for emergency stops and safety switches
- Monitor movable guards

Dimensions



Functionality

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated, the LEDs CH 1 and CH 2 illuminate. In the case of Automatic resetting, the normally open contacts close immediately (LED K1 and K2 illuminate). With Manual resetting the normally open contacts (LED K1 and K2 off).

External device monitoring (EDM)

The UE 43-6 MF unit can take over the external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For Manual Reset, a pushbutton must be connected to the terminals S33 - S34 and a link connected between S12 and Y3 and between Y1 and S37. This Reset is monitored.

Automatic reset

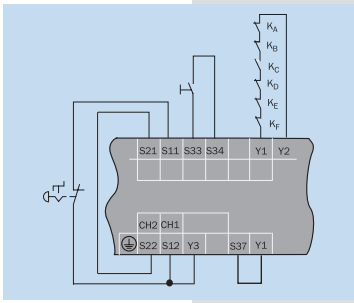
For Automatic Reset S12 - S34 and Y3 - S33 must be linked.

Cross circuit detection

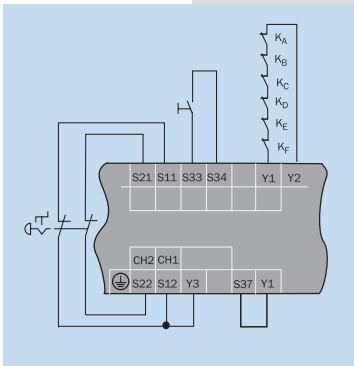
Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronization

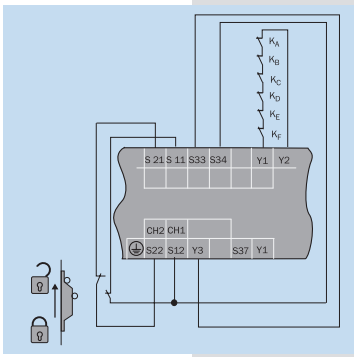
If input 2 closes no later than 0.5 seconds after input 1, the output circuits close. If input 2 closes before input 1, the monitoring of synchronization will not be effected, and the output circuits will close. this monitoring only takes place in Automatic Reset.



Connection to single channel with emergency stop and manual reset, EDM



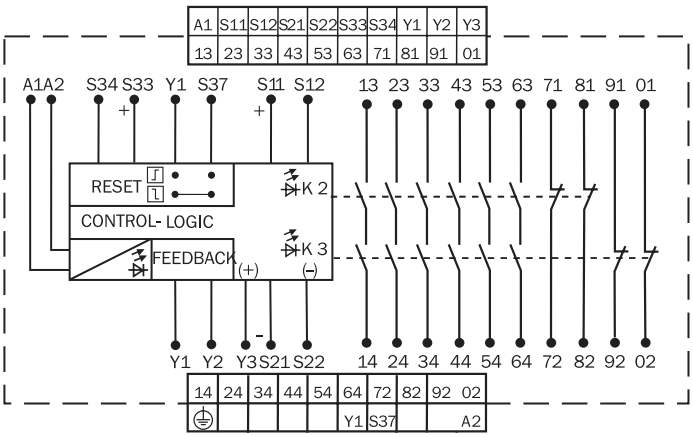
Connection to dual channel with emergency button, manual reset and EDM



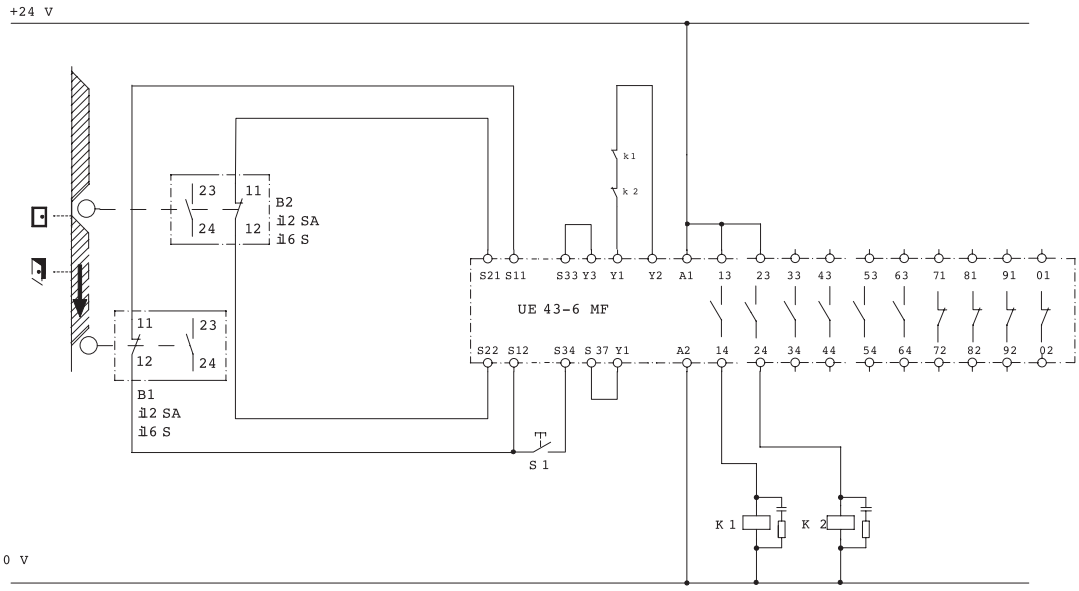
Connection to dual channel with safety interlocks with EDM and control of integrity of connections and automatic reset

General data description	min.	tip	max
Supply voltage to A1/A2 for DC units			
Electrical output circuit > 25 V AC / 60 V DC	PELV		
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV		
Voltage supply to A1/A2 for AC unit	Use earth conductor terminal		
Safety category EN 954-1			4
Stop category EN 60 204	0		
Supply voltage V_S (A1/A2)			
UE 43-6 MF 2 D 3	20.4V DC	24V DC	26.4 V DC
UE 43-6 MF 2 A 2	102 V AC	120 V AC	132 V AC
UE 43-6 MF 2 A 3	195.5 V AC	230 V AC	253 V AC
Power consumption			
AC		4.2 W/4.5 V A	
DC		2.4 W	
Residual ripple in DC mode (within the limits of V_S)			$2.4V_{PP}$
Nominal frequency in AC mode	50 Hz		60 Hz
Control voltage S11 and S21			
Control voltage		24 V DC	
Control current		40 mA	
Short circuit (between Y11 and A2)			1000 mA
Fuse			
AC units	short circuit resistant transformer		
DC units	PTC resistor		
Reaction time by cross connection (DC unit)			3 sec
Galvanic separation (between A 1-2 and Y 11 - Y21 - PE)	only on AC units		
Input circuits (S12 - S22 and Y3 - S22)			
Input current			40 mA
Reset time			
Manual			350 mA
Automatic			500 mA
Synchronization time			500 ms
Line resistance at the input circuit			85 Ohm
Switch-on time upon applying the supply voltage (AC units)	100 ms		
Output circuits (13 - 14, 23 - 24, 33 - 34, 43 - 44, 53 - 54, 63 - 64, 71 - 72, 81 - 82, 91 - 92, 01 - 02)			
Response time (K1 / K2)			60 ms
Relay contacts			
	6 normally open contacts (NO), safety relevant 4 normally closed contacts (NC), not safety relevant		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			24 A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 3 A (3600 c/h) DC-13 Ue 24 V DC, I_e 2 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1×10^7		
Electrical service life (dependent upon loading)	2×10^6		
Operating data			
Surge voltage rating			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminal	IP 20		
Radio interference	DIN EN 61 000-6-4		
Interference emission according to	EN 60 947-1 02/99		
Ambient operating temperature	–25° C		+55° C
Storage temperature	–25° C		+75° C
Cross sections of electrical conductors			
single strand wire (2 x, identical cross section)	0.75 mm^2		2.5 mm^2
single strand wire (1 x)	0.75 mm^2		2.5 mm^2
fine stranded wire with terminal crimps (2 x, identical cross section)	0.5 mm^2		1.5 mm^2
fine stranded wire with terminal crimps (1 x)	0.5 mm^2		1.5 mm^2
Weight	0.8 Kg		

Internal circuitry



Connection drawing

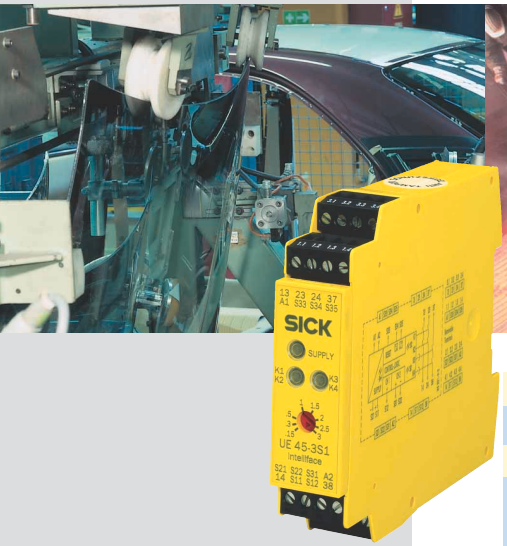


Selection table

Model	Output		Connection (terminal type) Screw	Removable	Supply voltage 24 V AC/DC	24 V DC	24 V AC	115 V AC	120 V AC	230 V AC	Part number
UE 43-	6	MF	2			D3					6 024 902
UE 43-	6	MF	2						A2		6 024 905
UE 43-	6	MF	2							A3	6 024 906

We recommend contacting Customer Service for product selection

Safety relay with additional off-delay UE 45-3 S1



Safety class	
Class 4	
Supply voltage	
24 V DC	
Output contacts	
Quick safe	Slow safe
2 NO	1 NO OFF
Dimensions	
96.5 x 22.5 x 114 mm	
Function	
■ Dual-channel wiring with short circuit detection	
■ Automatic or manual reset	
■ External device monitoring (EDM)	
■ Version with connection clamps available	
■ Adjustable from 0.15 … 3 sec or 0.15 … 30 sec	

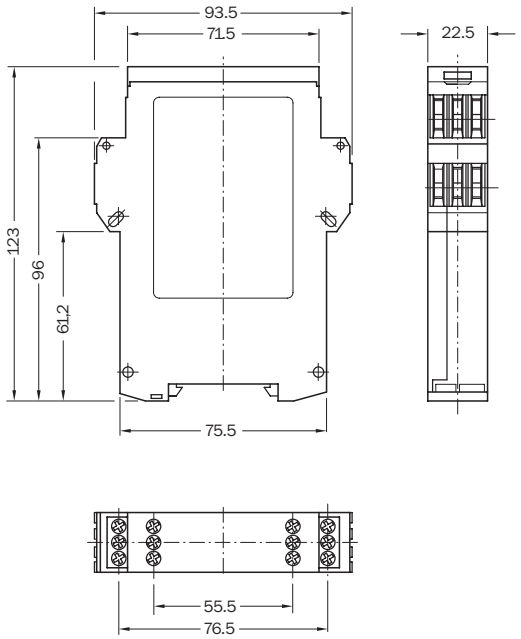
Applications

- Redundant circuits and auto control for emergency stops and safety switches
- Monitor movable guards

Features

- Safety Category 4/3 approved to EN 954-1
- Stop Category 0/1 approved to EN 60 204-1
- Outputs: 2 normally open contacts, 1 normally open contact with off-delay, adjustable from 0.15…3 sec or 0.15…30 sec
- Automatic or manual reset
- External device monitoring (EDM)
- 3 LED signals
- Inputs for safety devices with 1 or 2 NC contacts
- Monitors the integrity of connection of safety circuit and control (ts = 0.5 s)

Dimensions



Functionality

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts close immediately curing Automatic resetting, LED K1/K2 and K3/K4 illuminate. In the case of Manual resetting, this only occurs after pressing and releasing the Reset button.

The activation of the sensor (opening of one or both input circuits) affects the opening of both normally open contacts (13 - 14/23 - 24) immediately, and a time delayed closing of the third circuit (37 - 38), with LED K1/K2 immediately going off and K3/K4 going off later.

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For Manual resetting, a pushbutton must be connected to terminals S33 - S34. This Reset is monitored.

Automatic reset

For Automatic resetting S33 - S35 must be linked.

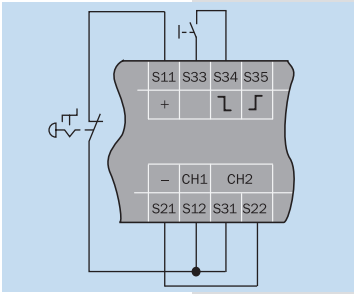
Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

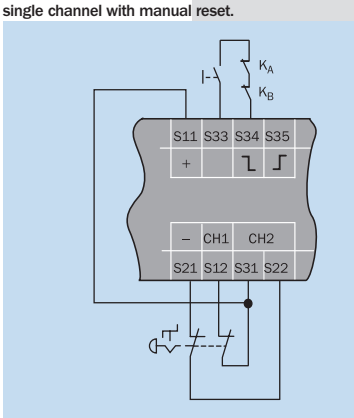
Monitoring of synchronization

If input 2 closes no later than 0.5 sec after input 1, the output circuits close. If input 2 closes before input 1, the monitoring of synchronization will not be effected, and the output circuits will close. This monitoring only takes place in Automatic Reset.

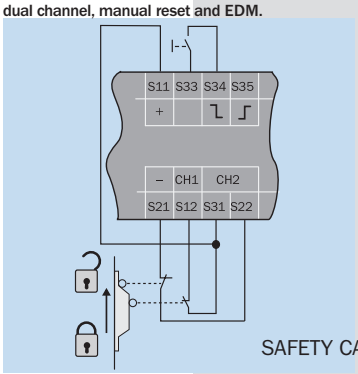
The UE 45-3 S1 2 unit has screw terminals.
The UE 45-3 S1 3 unit has removable terminals.



Example of a connection of emergency button to single channel with manual reset.



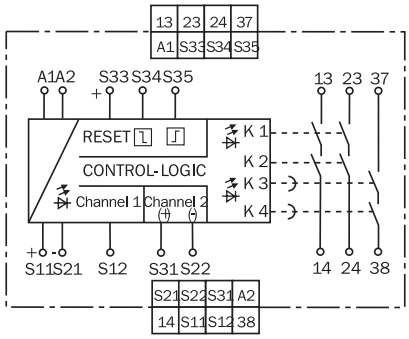
Example of connection of emergency button to dual channel, manual reset and EDM.



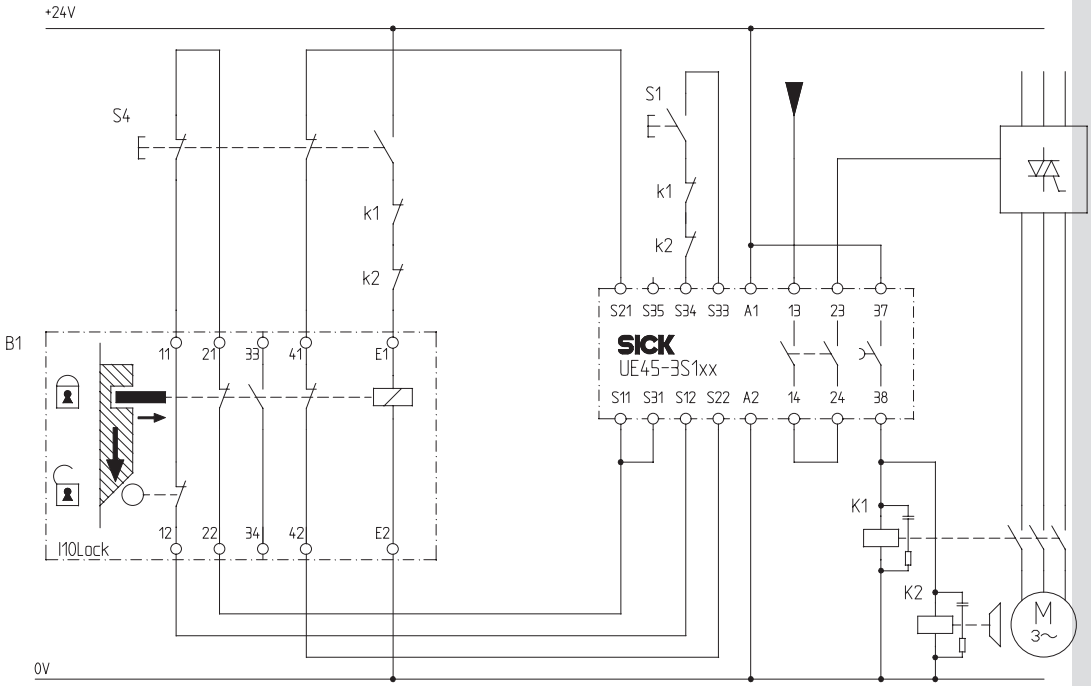
Example of connection between a safety limit stop to dual channel, manual reset and EDM.

General data description	min.	typ.	max.
Supply voltage to A1/A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Safety category: EN 954-1			4
Supply voltage V_S	20.4 V DC	24 V DC	26.4 V DC
Power consumption		2.6 W	
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Control voltage S11- S33 and S21			
Control voltage		24 V DC	
Control current		60 mA	
Electrical short circuit between S11 and A2			2200 mA
Fuse	PTC resistor		
Reaction time by cross connection			2 sec
Galvanic separation between A1/A2 and S11/S21	no		
Input circuits (S12 and S31)			
Input current at S12 and S31		25 mA	100 mA
Input current at S34/S35 (reset circuit)		40 mA	50 mA
Reset time			
Manual (S34)			30 ms
Automatic (S35)			600 ms
Synchronization time			500 ms
Activation time for Reset button	200 ms		
Line resistance at the input circuit			< 85 Ohm
Output circuits (13 - 14, 23 - 24, 37 - 38)			
Response time (K1/K2)			25 ms
Off-delay time (K3/K4)			
UE 45-3 S1 x D3 3	0.15 sec		3 sec
UE 45-3 S1 x D3 30	1.5 sec		30 sec
Relay contacts			
	2 normally open contacts (NO), sfty. category 4 1 normally open contact (NO), off-delayed, sfty. category 3		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10mA		6 A
Total current across all contacts			12A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (3600 c/h) DC-13 Ue 24 V DC, I_e 5 A (360 c/h) DC-13 Ue 24 V DC, I_e 3 A (3600c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	5 x 10^6		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit EN 50 178			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	EN 60 947-1 02/99		
Interference emission according to	EN 60 947-1 02/99		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 Kg		

Internal circuitry



Connection drawing



Selection table

Model	Output		Connection (terminal type) Screw	Removable	Supply voltage 24 V DC	Delay in sec.	Part number
UE 45-	3	S1	2		D3	3	6 024 911
UE 45-	3	S1		3	D3	3	6 024 912
UE 45-	3	S1	2		D3	30	6 024 913
UE 45-	3	S1		3	D3	30	6 024 914

We recommend contacting Customer Service for product selection

Safety relay with additional on-delay UE 44-3 SL

Safety class	
Class 4	
Supply voltage	
24 V DC	
Output contacts	
Quick safe 2	Slow Safe 1
Dimensions	
96.5 x 22.5 x 114 mm	
Function	
■ Dual-channel wiring with transversal short circuit detection	
■ Automatic/manual restart	
■ External device monitoring (EDM)	
■ Version with connection clamps available	
■ Adjustable from 0.15 … 3 sec or 0.15 … 30 s	

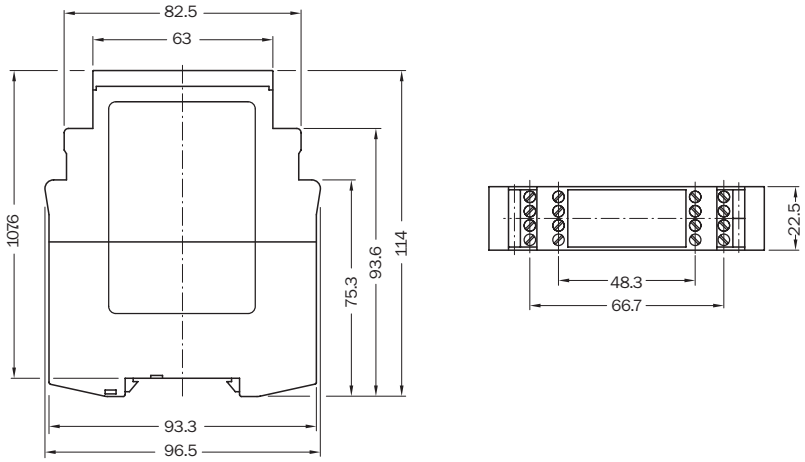
Applications

- Redundant circuits and auto control for emergency stops and safety switches
- Monitor movable guards
- Solenoid operated safety interlocks with time delay

Features

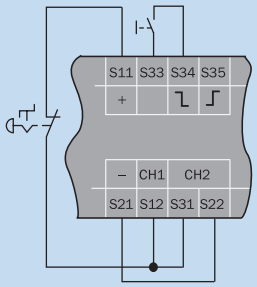
- Safety category 4 approved to EN 954-1
- Stop category 0 approved to EN 60 204-1
- 2 normally open contacts, 1 normally open contact with on-delay
- Adjustable from 0.15 … 3 sec or 0.15 … 30 sec
- Automatic or manual reset
- External device monitoring (EDM)
- 3 LED signals
- Inputs for safety devices with 1 or 2 NC contacts
- Monitors the integrity of connection of safety circuit and control (ts = 0.5 s)

Dimensions



Functionality

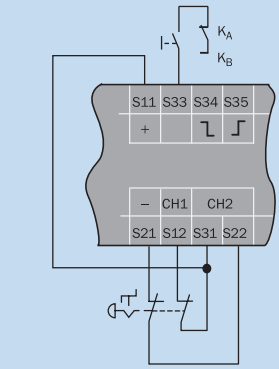
After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts (13 - 14 / 23 - 24) remain open. After completion of the on-delay set on the relay, the delay circuit (37 - 38) closes, and the LED K3/K4 illuminates. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts (13 - 14/23 - 24) close immediately during Automatic Reset, the LED K1/K2 illuminates, and the delay circuit (37 - 38) opens (LED K3/K4 off). In the case of Manual Reset, this only occurs after pressing and releasing the Reset button.



The activation of the sensor (opening of one or both input circuits) affects the opening of both normally open contacts (13 - 14/23 - 24), with LEDs K1/K2 being off, and a time delayed closing of the third circuit (37 - 38), with LED K3/K4 illuminating.

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.



Manual reset

For Manual resetting, a pushbutton is to be connected between 24 V DC supply and terminal S34. This Reset is monitored. For applications with mechanical locking safety switches, only channel 2 must be closed during Manual Reset.

Automatic reset

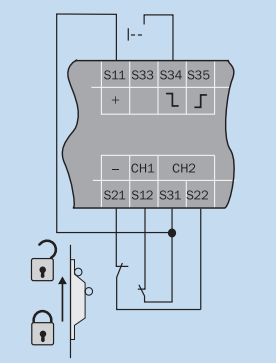
For Automatic resetting S12 - S35 must be linked. For applications with mechanical locking safety switches, only channel 1 must be closed during Automatic Reset.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronization

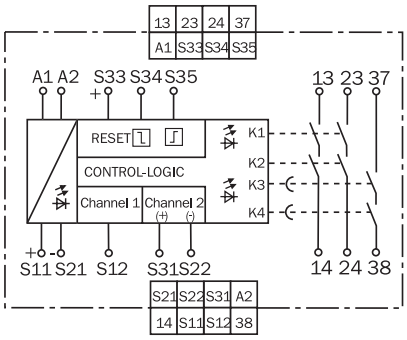
If input 2 closes no later than 0.5 sec after input 1, the output circuits close. If input 2 closes before input 1, the monitoring of synchronization will not be effected, and the output circuits will close. This monitoring only takes place in Automatic Reset.



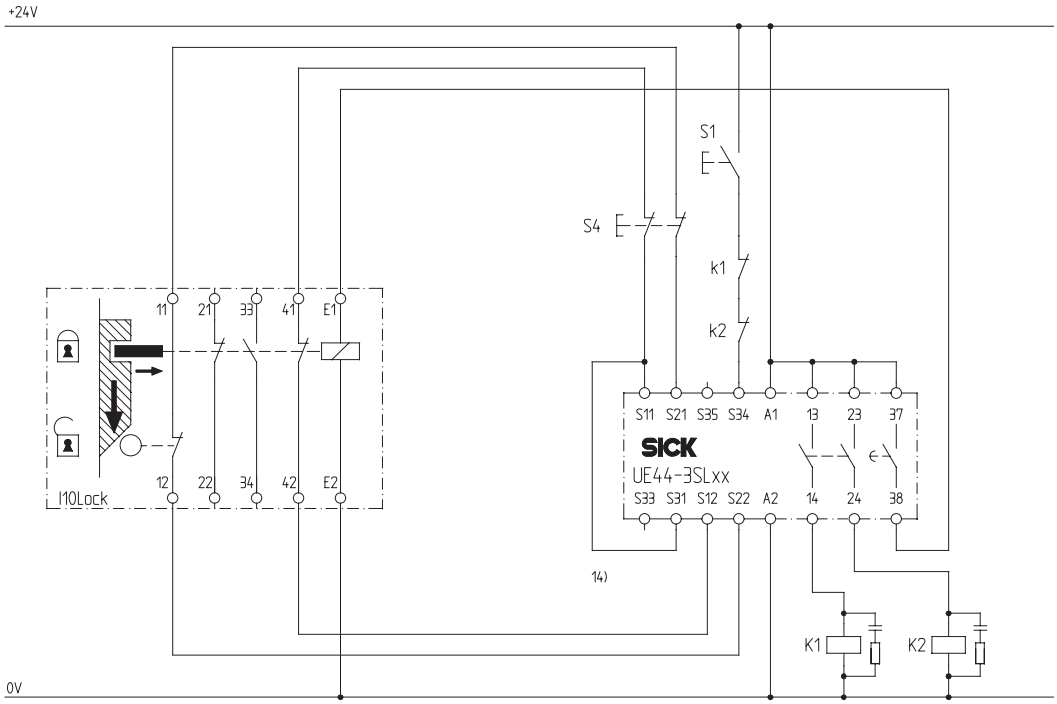
The UE 44-3 SL 2 unit has screw type terminals.
The UE 44-3 SL 3 unit has removable terminals.

General data description	min.	typ.	max.
Supply voltage to A1/A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Safety category: EN 954-1			4
Supply voltage V_S	20.4 V DC	24 V DC	26.4 V DC
Power consumption		1.8 W	
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Control voltage S11- S33 and S21			
Control voltage		22 V DC	
Control current		60 mA	
Electrical short circuit between S11 and A2			2200 mA
Fuse	PTC resistor		
Reaction time by cross connection			2 sec
Galvanic separation between A1/A2 and S11/S21	no		
Input circuits (S12 and S31)			
Input current at S12 and S31		25 mA	100 mA
Input current at S34/S35 (reset circuit)		40 mA	50 mA
Reset time			
Manual (S34)			30 ms
Automatic (S35)			750 ms
Synchronization time			500 ms
Activation time for Reset button	250 ms		
Line resistance at the input circuit			< 85 Ohm
Output circuits (13 - 14, 23 - 24, 37 - 38)			
Response time (K1/K2)			25 ms
Off-delay time (K3/K4)			
UE 44-3 SL x D3 3	0.15 sec		3 sec
UE 44-3 SL x D3 30	1.5 sec		30 sec
Relay contacts	2 normally open contacts (NO), sfty. category 4 1 normally open contact (NO), on-delayed, sfty. category 3		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10mA		6 A
Total current across all contacts			12A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (3600 c/h) DC-13 Ue 24 V DC, I_e 5 A (360 c/h) DC-13 Ue 24 V DC, I_e 3 A (3600c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	5 x 10^6		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit EN 50 178			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	EN 60 947-1 02/99		
Interference emission according to	EN 60 947-1 02/99		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 Kg		

Internal circuitry



Connection drawing

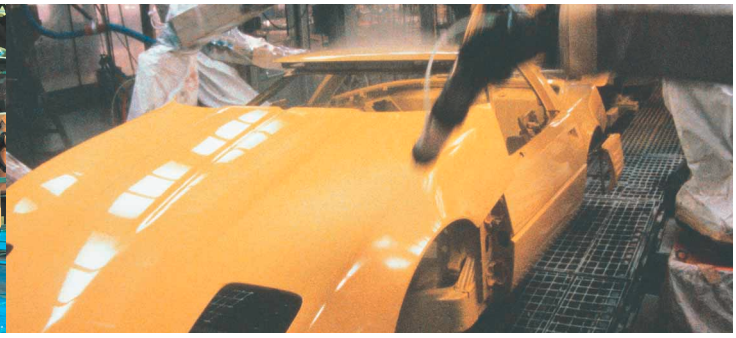


Selection table

Model	Output		Connection (terminal type) Screw	Connection (terminal type) Removable	Supply voltage 24 V DC	Delay in sec.	Part number
UE 44-	3	SL	2		D3	3	6 024 907
UE 44-	3	SL		3	D3	3	6 024 908
UE 44-	3	SL	2		D3	30	6 024 909
UE 44-	3	SL		3	D3	30	6 024 910

We recommend contacting Customer Service for product selection

Safety relay
For two-hand operation
UE 42-2 HD



Safety class

Class 4

Supply voltage

24 V DC/V AC

Output contacts

Safety 2 | Auxiliary 1

Dimensions

96.5 x 22.5 x 114 mm

Function

- Dual-channel wiring with transversal short circuit detection
- Automatic start
- External device monitoring (EDM)
- Version with connection clamps available

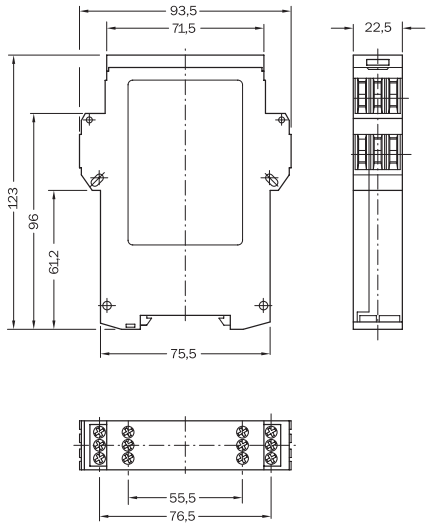
Features

- Safety Category 4 approved to EN 954-1
- Two-hand controls with Type III C requirements to EN 574 and to EN 954-1, Category 4
- Outputs: 2 normally open contacts, 1 normally closed contact
- Automatic reset
- External device monitoring (EDM)
- 3 LED signals
- Dual-channel control
- Monitors the integrity of connection of safety circuit and control (ts = 0.5 s)

Applications

- Redundant circuits and auto control
- Protect from hazards caused by movable parts on a machine
- Monitoring of two-hand control circuits

Dimensions



Functionality

The UE 42-2 HD unit corresponds to EN 574 Type III C. A prerequisite for the release of the outputs is that the two inputs (e.g. two-hand pushbuttons) are actuated within 0.5 sec.

After applying the supply voltage to the terminals A1 - A2, the LED SUPPLY illuminates to indicate that electrical power is present. Pressing the two-hand pushbuttons S1 and S2 at the same time closes the two normally open contacts. Releasing even one of the buttons will cause the circuits to adopt the open circuit status.

A renewed attempt to initiate starting is only possible if both Start buttons are set to their nominal start position (for two-hand pushbuttons units: if both have been released) and the normally closed contact is closed.

External device monitoring (EDM)

The UE 42-2 HD can take over the function of external device monitoring. The normally closed contacts of the external relays are switching in series, connected to the terminals Y1 - Y2.

Automatic start

The UE 42-2 HD has an Automatic start facility.

Monitoring of simultaneous activation

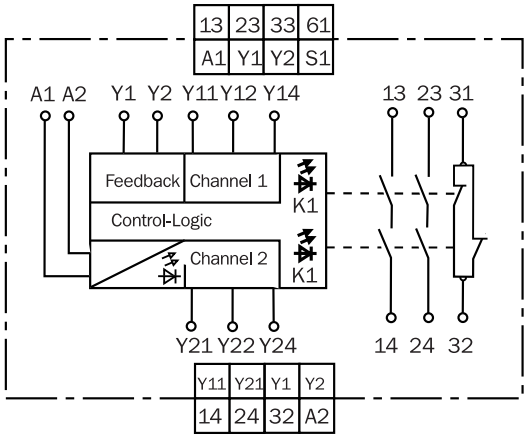
Pressing the Start buttons at the same time is monitored. When both Start buttons are activated within 0.5 sec, normally open contacts close and the normally closed contact opens.

The UE 42-2 HD 2 unit has screw type terminals.
The UE 42-2 HD 3 unit has removable terminals.

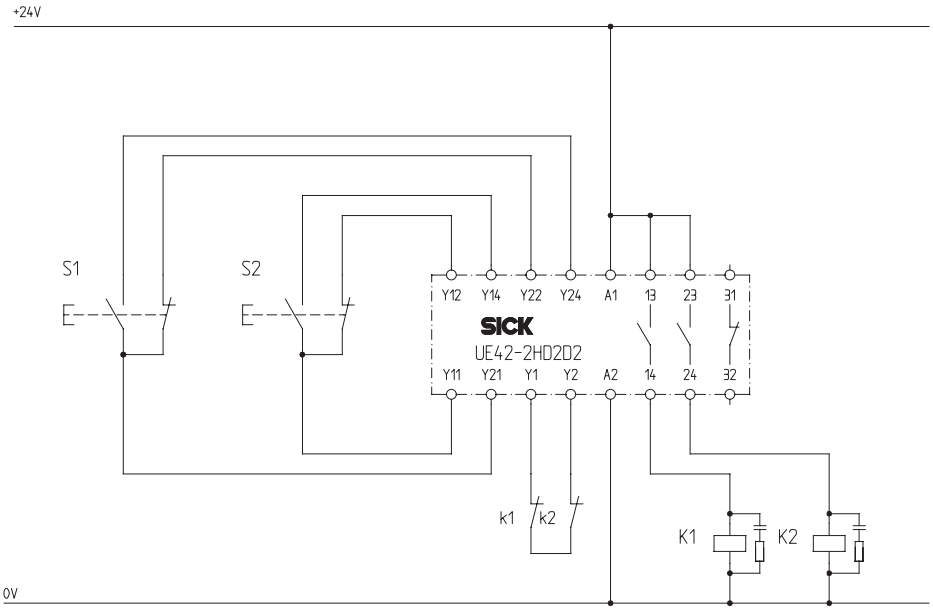
Technical specifications

General data description	min.	typ.	max.
Supply voltage to A1/A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Safety category: EN 954-1			4
Supply voltage V_S (A1/A2)	20.4 V AC/DC	24 V DC	26.4 V DC
Power consumption			
AC			2.7 V A
DC			1.5 W
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Nominal frequency in AC mode	50 Hz		60 Hz
Control voltage (Y11- Y21)			
Control voltage		24 V DC	
Control current		60 mA	
Short circuit between Y11 and A2			1000 mA
Fuse	PTC resistor		
Galvanic separation between A1/A2 and Y11/Y21	no		
Input circuits (Y12 - Y14 and Y22 - Y23)			
Input current		60 mA	
Reset time			40 ms
Activation time tolerance between the two Start buttons			500 ms
Minimum switch-off time	250 ms		
Line resistance at the input circuit			< 70 Ohm
Switch-on time (upon applying the supply voltage)	250 ms		
Output circuits (13 - 14, 23 - 24, 31 - 32)			
Response time (K1/K2)			50 ms
Relay contacts			
	2 normally open contacts (NO), safety relevant 1 normally open contact (NO), not safety relevant		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10mA		6 A
Total current across all contacts			12A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (360 c/h) AC-15 Ue 230 V AC, I_e 3 A (3600 c/h) DC-13 Ue 24 V DC, I_e 4 A (360 c/h) DC-13 Ue 24 V DC, I_e 2.5 A (3600c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	EN 60 947-1 02/99		
Interference emission according to	EN 60 947-1 02/99		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 Kg		

Internal circuitry



Connection drawing

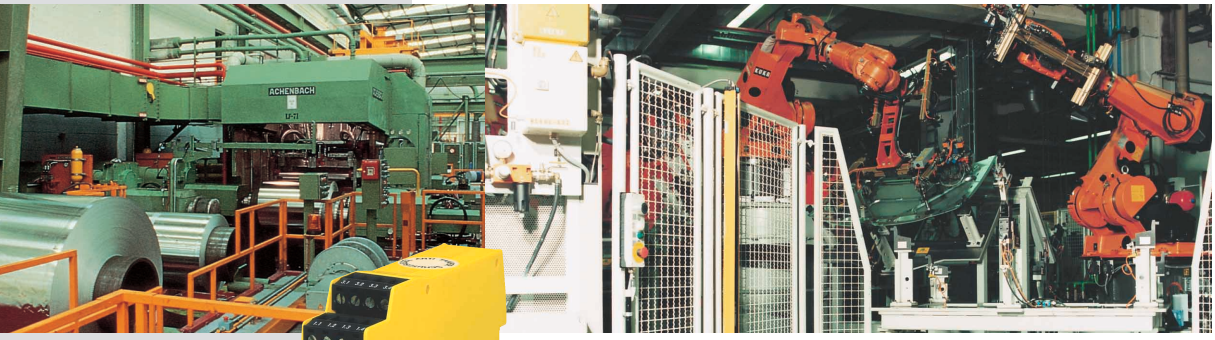


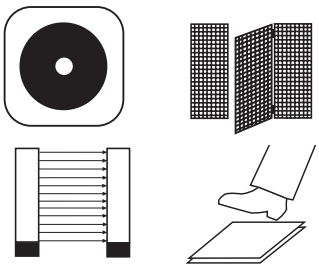
Selection table

Model	Output		Connection (terminal type) Direct wire	Removable	Supply voltage 24 V AC/DC	Part number
UE 42-	2	HD	2		D2	6 024 878
UE 42-	2	HD		3	D2	6 024 881

We recommend contacting Customer Service for product selection

Safety relay
Automatic or manual reset
UE 48-2 OS





Safety class	
Class 4	
Supply voltage	
24 V DC/AC	
Output contacts	
Safety 2	Auxiliary 1
Dimensions	
87 x 22.5 x 122 mm	

Function

- Dual-channel wiring with short circuit detection
- Supply voltage 24 V AC/DC
- Automatic/manual start
- External device monitoring (EDM)
- Version with connection clamps available

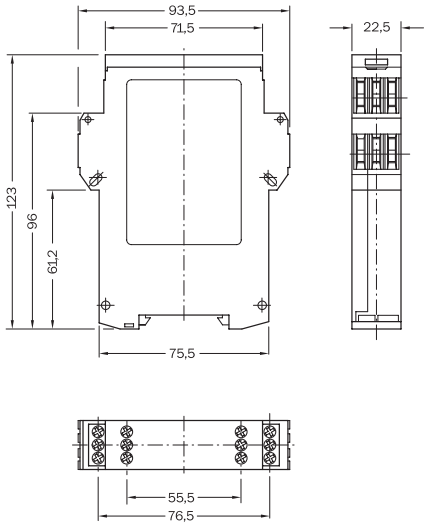
Features

- Safety Category 4 approved to EN 954-1
- Stop Category 0 approved to EN 60 204-1
- 2 normally open (NO) contacts, 1 normally closed (NC) contact
- Automatic/manual reset
- External device monitoring (EDM)
- 3 LED signals
- Monitors the integrity of connection of safety circuit and control (ts = 0.5 s)
- Suitable for applications with safety optoelectronic barriers with tested static outputs

Applications

- Safety optoelectronic barriers (ESPE) with monitored static outputs (OSSD), like FGS, C 4000, MSL, PLS, LSI, S 3000, C/M 2000, C 4000
- Emergency stops according to EN 418 (single and dual channel)
- Safety switches for movable guard control (single and dual channel)
- Safety mats in compliance with DIN EN 1760, with 4 wire technology

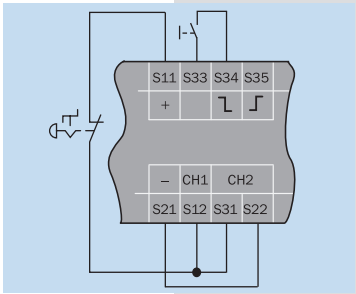
Dimensions



Functionality

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated or the protective field of the connected electrosensitive protective equipment (ESPE) is not broken (i.e. the input circuits are closed), then the normally open contacts close immediately in Automatic Reset, LED K1 and K2 illuminate. In the case of Manual resetting, this only occurs after pressing and releasing the Reset button.

The activation of the sensor or infringement into the protective field of the non-contact safety device (open state of one of the two input circuits) effects the opening of the normally open contacts (LED K1 and K2 off).



Example of connection of emergency stop button to single channel with manual reset

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

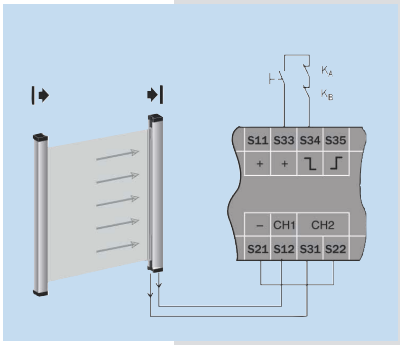
For manual resetting, a pushbutton must be connected to terminals S33 - S34. This Reset is monitored.

Automatic reset

For ESPE's: S33 - S35 must be linked for applications with potential free contacts on the input circuit S12 - S35 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

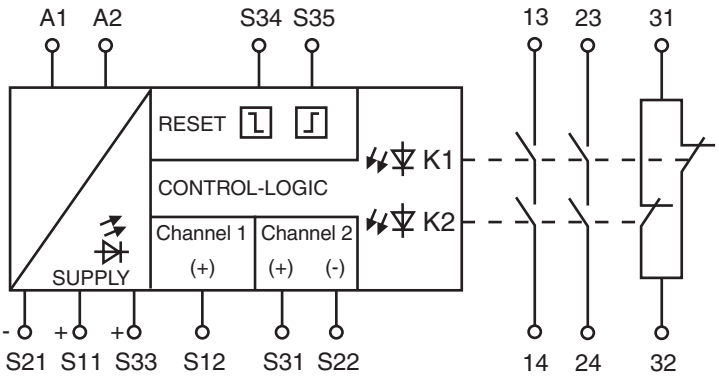


Example of connection between a safety curtain with manual reset and EDM

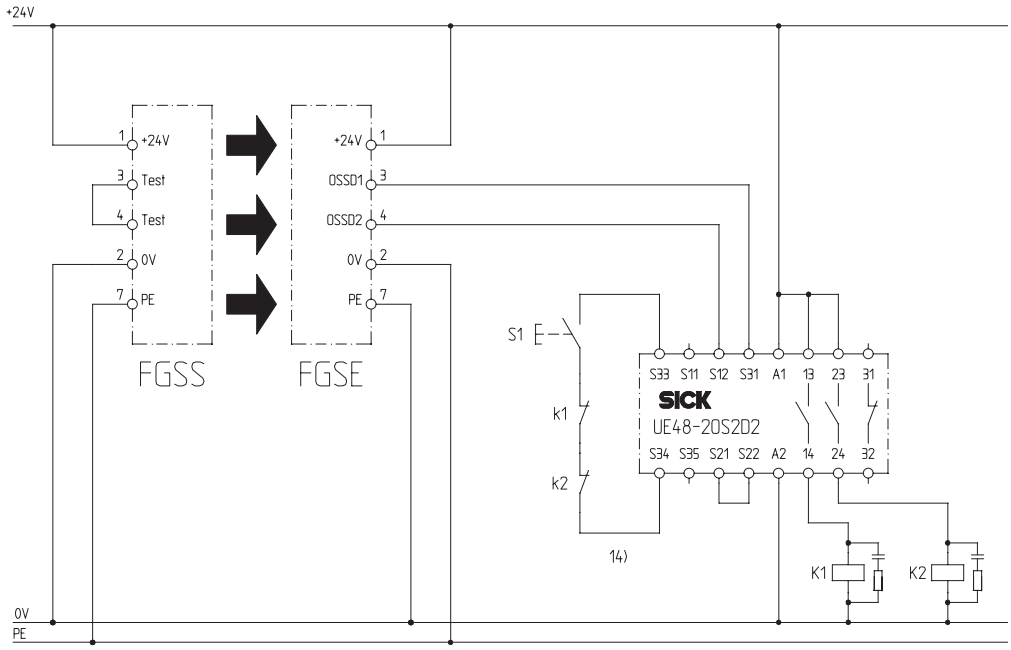
The UE 48-2 OS 2 unit has screw type terminals.
The UE 48-2 OS 3 unit has removable terminals.

General data description	min.	typ.	max.
Supply voltage to A1/A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Safety category: EN 954-1			4
Stop category: EN 60 204	0		
Supply voltage V_S (A1/A2)	20.4 V AC/DC	24 V AC/DC	26.4 V AC/DC
Power consumption			
AC mode			4.6 V A
DC mode			2.1 W
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Nominal frequency in AC mode	50 Hz		60 Hz
Control voltage S33/S11 and S21			
Control voltage	17.4 V DC	22 V DC	
Control current	40 mA		100 mA
Electrical short circuit between S33/S11 and S21			300 mA
Fuse	Electronic fuse		
Reaction time by cross connection			50 ms
Switch-on time after cross connection detection			50 ms
Galvanic separation between A1/A2 and S21, S11, S33	no		
Input circuits (S12, S31, S22, S34, S35)			
Input voltage (S12 and S31)			
HIGH	17.4 V DC		26.4 V DC
LOW	-3 V DC		+5 V DC
Input current at S12 and S31/S22		40 mA	100 mA
Input current at S34/S35		5 mA	50 mA
Reset time			
Manual (S22/S34)			40 ms
Automatic (ESPE: S33/S35; potential free: S12/S35)			80 ms
Activation time for Reset button	50 ms		
Minimum switch-off time/Minimum switch-on time	7 ms		
Permitted test pulse time/Test frequency			1000 µs/10 s^{-1}
Line resistance at the input circuit			35 Ohm
Synchronization time	70 ms		
Output circuits (13 - 14, 23 - 24, 31 - 32/33 - 34)			
Response time (K1/K2)			25 ms
Minimum switch-off time	70 ms		130 ms
Relay contacts			
	2 normally open contacts (NO), safety relevant 1 normally open contact (NO), not safety relevant		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10mA		6 A
Total current across all contacts			12A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (360 c/h) AC-15 Ue 230 V AC, I_e 3 A (3600 c/h) DC-13 Ue 24 V DC, I_e 4 A (360 c/h) DC-13 Ue 24 V DC, I_e 2.5 A (3600c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	DIN EN 61 000-6-4		
Screening against interference	DIN EN 61 000-6-2		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 Kg		

Internal circuitry



Connection drawing



Selection table

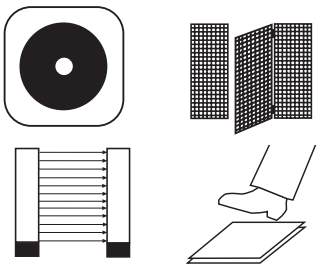
Model	Output		Connection (terminal type) Screw	Connection (terminal type) Removable	Supply voltage 24 V DC	Part number
UE 48-	2	0S	2		D2	6 024 915
UE 48-	2	0S		3	D2	6 024 916

We recommend contacting Customer Service for product selection

Safety relay
Automatic or manual reset
UE 48-3 OS

Safety class
Class 4
Supply voltage
24 V DC/AC
Output contacts
Safety 3
Dimensions
87 x 22.5 x 122 mm
Function

- Dual-channel wiring with transversal short circuit detection
- Supply voltage 24 V AC/DC
- Automatic/manual start
- External device monitoring (EDM)
- Version with connection clamps available



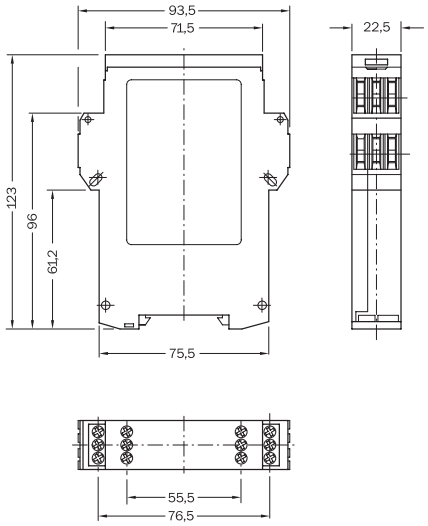
Features

- Safety Category 4 approved to EN 954-1
- Stop Category 0 approved to EN 60 204-1
- 3 normally open (NO) contacts
- Automatic/manual reset
- External device monitoring (EDM)
- 3 LED signals
- Monitors the integrity of connection of safety circuit and control (ts = 0.5 s)
- Suitable for applications with safety optoelectronic barriers with tested static outputs

Applications

- Safety optoelectonric barriers (ESPE) with monitored static outputs (OSSD), like FGS, C 4000, MSL, PLS, LSI, S 3000, C/M 2000, C 4000
- Emergency stops according to EN 418 (single and dual channel)
- Safety switches for movable guard control (single and dual channel)
- Safety mats in compliance with DIN EN 1760, with 4-wire technology

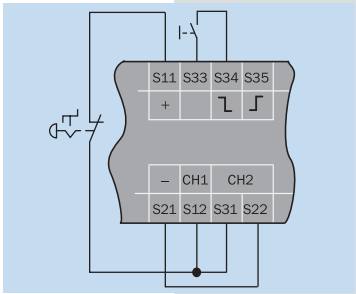
Dimensions



Functionality

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated or the protective field of the connected electrosensitive protective equipment (ESPE) is not broken (i.e. the input circuits are closed), then the normally open contacts close immediately in Automatic Reset, LED K1 and K2 illuminate. In the case of Manual resetting, this only occurs after pressing and releasing the Reset button.

The activation of the sensor or incursion into the protective field of the non-contact safety device (open state of one of the two input circuits) affects the opening of the normally open contacts (LED K1 and K2 off).



Example of connection of emergency stop button to single channel with manual reset

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

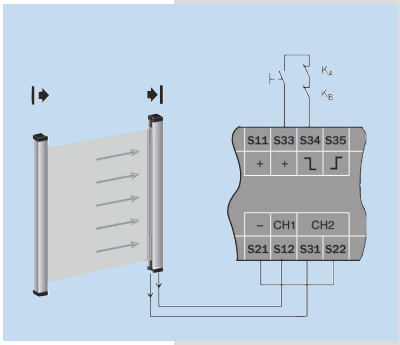
For manual resetting, a pushbutton must be connected to terminals S33 - S34. This Reset is monitored.

Automatic reset

For ESPE's: S33 - S35 must be linked for applications with potential free contacts on the input circuit S12 - S35 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

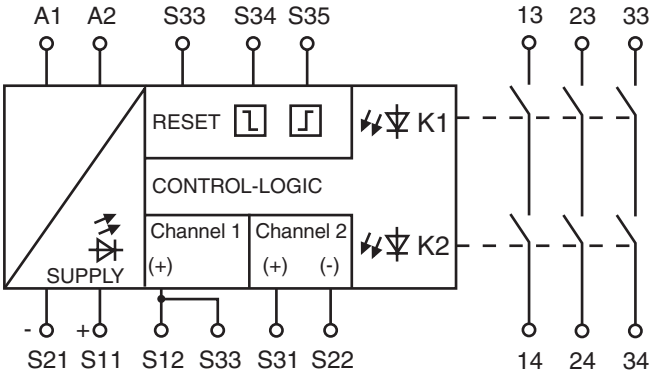


Example of connection between a safety curtain with manual reset and EDM

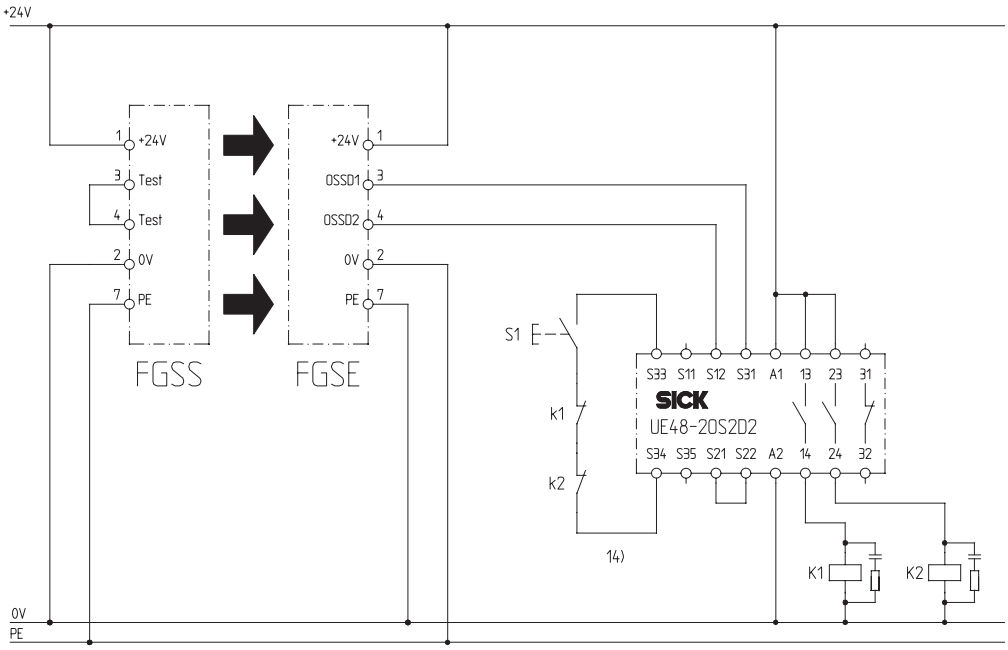
The UE 48-3 OS 2 unit has screw type terminals.
The UE 48-3 OS 3 unit has removable terminals.

General data description	min.	typ.	max.
Supply voltage to A1/A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Safety category: EN 954-1			4
Stop category: EN 60 204	0		
Supply voltage V_S (A1/A2)	20.4 V AC/DC	24 V AC/DC	26.4 V AC/DC
Power consumption			
AC mode			4.6 V A
DC mode			2.1 W
Residual ripple in DC mode (within the limits of V_S)			2.4 V_{PP}
Nominal frequency in AC mode	50 Hz		60 Hz
Control voltage S33/S11 and S21			
Control voltage	17.4 V DC	22 V DC	
Control current	40 mA		100 mA
Electrical short circuit between S33/S11 and S21			300 mA
Fuse	Electronic fuse		
Reaction time by cross connection			50 ms
Switch-on time after cross connection detection			50 ms
Galvanic separation between A1/A2 and S21, S11, S33	no		
Input circuits (S12, S31, S22, S34, S35)			
Input voltage (S12 and S31)			
HIGH	17.4 V DC		26.4 V DC
LOW	-3 V DC		+5 V DC
Input current at S12 and S31/S22		40 mA	100 mA
Input current at S34/S35		5 mA	50 mA
Reset time			
Manual (S22/S34)			40 ms
Automatic (ESPE: S33/S35; potential free: S12/S35)			80 ms
Activation time for Reset button	50 ms		
Minimum switch-off time/Minimum switch-on time	7 ms		
Permitted test pulse time/Test frequency			1000 µs/10 s^{-1}
Line resistance at the input circuit			35 Ohm
Synchronization time	70 ms		
Output circuits (13 - 14, 23 - 24, 31 - 32/33 - 34)			
Response time (K1/K2)			25 ms
Minimum switch-off time	70 ms		130 ms
Relay contacts			
	3 normally open contacts (NO), safety relevant		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10mA		6 A
Total current across all contacts			12A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (360 c/h) AC-15 Ue 230 V AC, I_e 3 A (3600 c/h) DC-13 Ue 24 V DC, I_e 4 A (360 c/h) DC-13 Ue 24 V DC, I_e 2.5 A (3600c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	DIN EN 61 000-6-4		
Interference emission according to	DIN EN 61 000-6-2		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 Kg		

Internal circuitry



Connection drawing



Selection table

Model	Output		Connection (terminal type) Screw	Connection (terminal type) Removable	Supply voltage 24 V DC	Part number
UE 48-	3	OS	2		D2	6 025 089
UE 48-	3	OS		3	D2	6 025 097

We recommend contacting Customer Service for product selection

Safety relay for optoelectronic protective equipment

UE 10-3 OS

Safety class
Depending on the connected device
Output contacts
Safety 3 — Auxiliary 1
Dimensions
96.5 x 22.5 x 114 mm

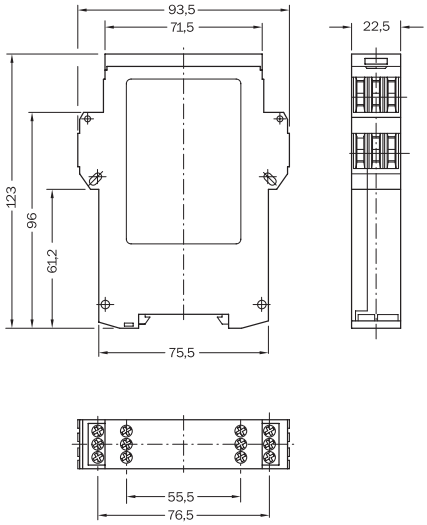
Applications

- Safety optoelectonric barriers (ESPE) with monitored static outputs (OSSD), like C 4000, MSL, LSI, S 3000, C/M 2000, C 4000, LE 20
- EDM and/or Reset functions integrated in the connected optoelectronic device

Features

- Safety Category is approved to the level of the connected optoelectronic device
- Stop Category 0 approved to EN 60 204-1
- 3 normally open contacts (NO), 1 normally closed contact (NC)
- 2 LED signal
- Suitable for applications with safety optoelectronic barriers with tested outputs

Dimensions



Functionality

If the semiconductor outputs of the installed safety device (e.g. C 4000, S 3000) are energized, then the safety output contacts will close.

When at least one of the semiconductor outputs of the safety device becomes de-energized, then the output contacts revert back to open circuit status.

If Restart Inhibit is needed, then this is achieved in the safety device, for example C 4000 or S 3000.

External device monitoring (EDM)

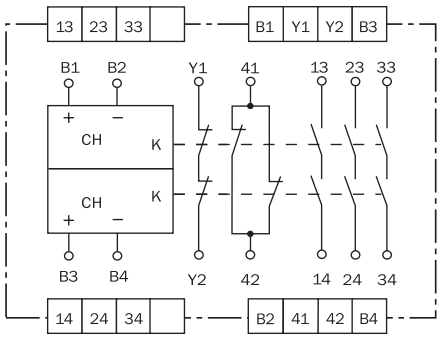
Safety Category 3 or 4 requires monitoring of contactors. This is provided by the connected protective device, for example in the C 4000 or S 3000. The normally closed contact (Y1 - Y2) in the UE 10-3 OS unit is, however, a part of this contactor monitoring system.

The UE 10-3 OS 2 unit has screw type terminals.
The UE 10-3 OS 3 unit has removable terminals.

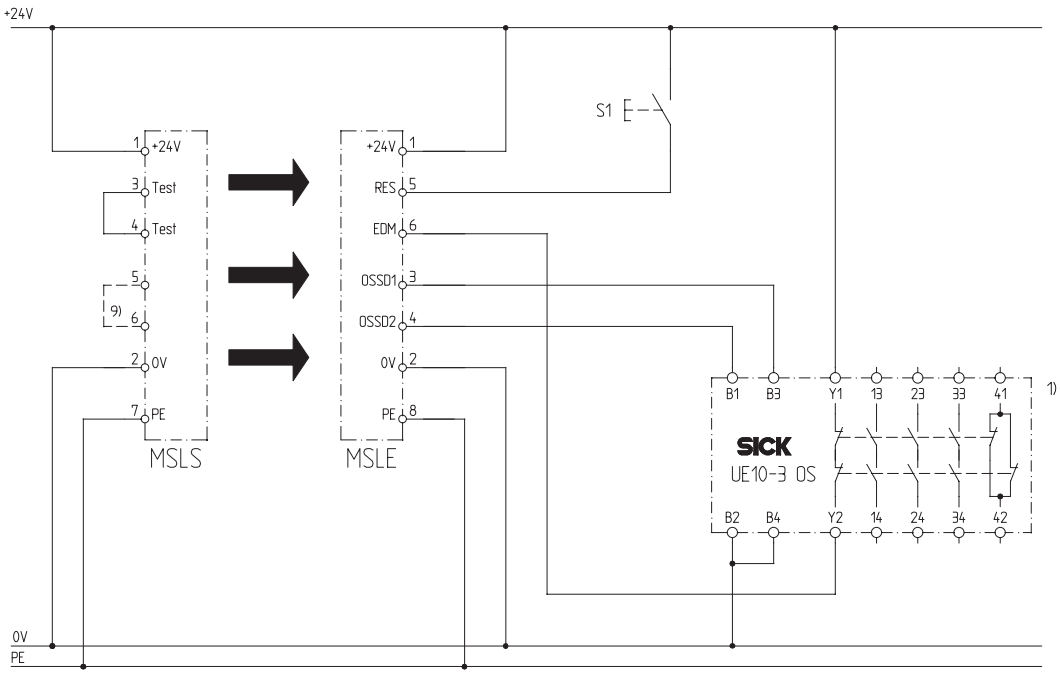
Technical specifications

General data description	min.	typ.	max.
Supply voltage to B1 - B2, B3 - B4			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Inputs B1…B4			
Activation time			40 ms
Switch-on voltage	15 V	24 V	30 V
Switch-on current			500 mA
Output circuits (13 - 14, 23 - 24, 33 - 34, 41 - 42, Y1 - Y2)			
Response time (K1/K2)			20 ms
Relay contacts			
	3 normally open contacts (NO), safety relevant		
	1 normally closed contact (NC), not safety relevant		
	1 normally closed contact (NC), contactor monitoring		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			12 A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 4 A (360 c/h) AC-15 Ue 230 V AC, I_e 3 A (3600 c/h) DC-13 Ue 24 V DC, I_e 4 A (360 c/h) DC-13 Ue 24 V DC, I_e 2.5 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1×10^7		
Electrical service life (dependent on the load)	2×10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	DIN EN 61 000-6-4		
Interference emission according to	DIN EN 61 000-6-2		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 kg		

Internal circuitry



Connection drawing



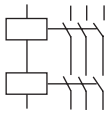
Selection table

Model	Output		Connection (terminal type) Screw	Removable	Without actual supply voltage	Part number
UE 10-	3	OS	2		DO	6 024 917
UE 10-	3	OS		3	DO	6 024 918

We recommend contacting Customer Service for product selection

Expansion module
UE 10-4 XT

Safety class	
Based on that of the main relay	
Supply voltage	
24 V DC/AC	
Output contacts	
Safety	Auxiliary
4	2
Dimensions	
96.5 x 22.5 x 114 mm	



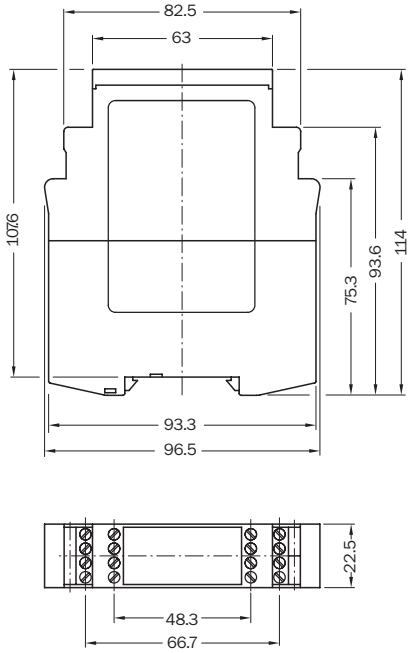
Features

- Instantaneous expansion module
- Stop and safety category equal to the one of the connected base controller
- 4 normally open contacts (NO), 2 normally closed contacts (NC)

Applications

- Additional outputs for load activation

Dimensions



Functionality

The supply voltage of the expansion module is linked to an output contact of a main unit.

Upon applying the supply voltage to terminals A1 and A2, relays K1 and K2 are energized (the LEDs for both relays illuminate): The 4 output contacts close, the 2 normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

When the output contacts of the standard unit opens (e.g. by activation of the Emergency Stop), the relays K1 and K2 de-energize: The normally open contacts open, and the two normally closed contacts close.

External device monitoring (EDM)

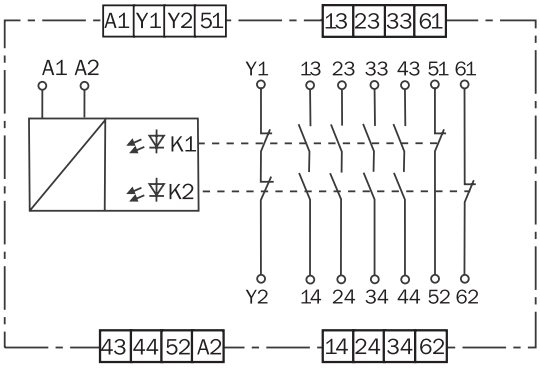
If external device monitoring is implemented in the connected main unit, then the normally closed contacts (Y1 - Y2) prevent the resetting of the main unit, when K1 and/or K2 do not de-energize.

Unit 10-4 XT 2 has screw type terminals.
Unit 10-4 XT 3 has removable terminals.

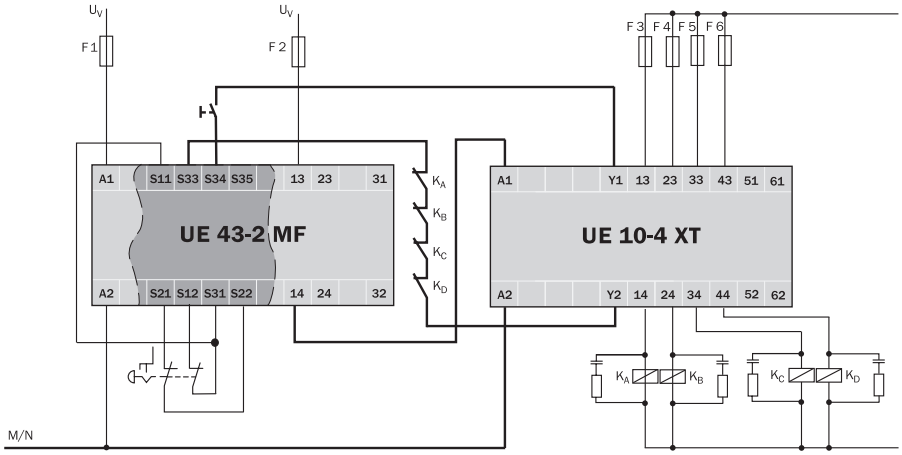
Technical specifications

General data description	min.	typ.	max.
Supply voltage to A1 - A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Supply voltage V_v (A1 - A2)			
UE 10-4 XT	20.4 V AC/DC	24 V AC/DC	26.4 V AC/DC
Power consumption			
AC			2.7 V A
DC			1.5 W/2.0 W
Residual ripple in DC mode (within the limits of V_v)			2.4 V_{PP}
Nominal frequency in AC mode	50 Hz		60 Hz
Activation time (after applying the supply voltage)	25 ms		
Output circuits (13 - 14, 23 - 24, 33 - 34, 43 - 44, 51 - 52, 61 - 62, Y1 - Y2)			
Response time (K1/K2)			40 ms
Relay contacts			
	4 normally open contacts (NO), safety relevant 2 normally closed contact (NC), not safety relevant 1 normally closed contact (NC), contactor monitoring		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			12 A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 6 A (3600 c/h) DC-13 Ue 24 V DC, I_e 6 A (360 c/h) DC-13 Ue 24 V DC, I_e 3 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	EN 60 947-1 02/09		
Interference emission according to	EN 60 947-1 02/09		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm^2		0.75 mm^2
single strand wire (1x)	0.14 mm^2		2.5 mm^2
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm^2		0.5 mm^2
fine stranded wire with terminal crimps (1x)	0.25 mm^2		2.5 mm^2
Weight	0.2 kg		

Internal circuitry



Connection drawing



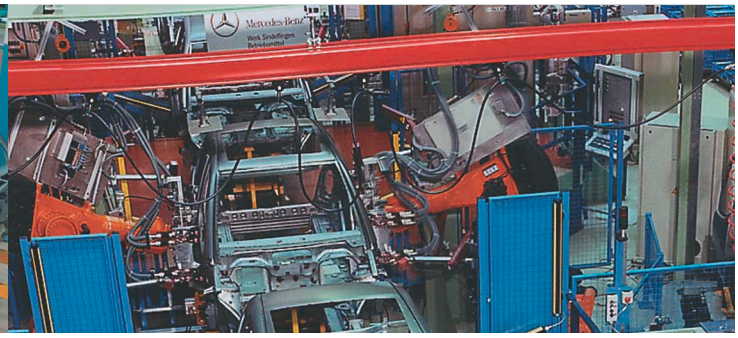
Example of connection of emergency button to dual channel from base unit UE 43-2 MF with output expansion module UE 10-4 XT, manual reset and EDM

Selection table

Model	Output		Connection (terminal type) Screw	Removable	Supply voltage 24 V AC/DC	Part number
UE 10-	4	XT	2		D2	6 024 919
UE 10-	4	XT		3	D2	6 024 920

We recommend contacting Customer Service for product selection

Expansion module
UE 11-4 DX



Safety class

Based on that of the main relay

Supply voltage

24 V DC

Output contacts

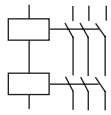
Safety Delay OFF 4 | Auxiliary Delay OFF 2

Dimensions

96.5 x 22.5 x 114 mm

Function

- Pre-set contacts delay of 0.5 ÷ 3 s
- Version with connection clamps available



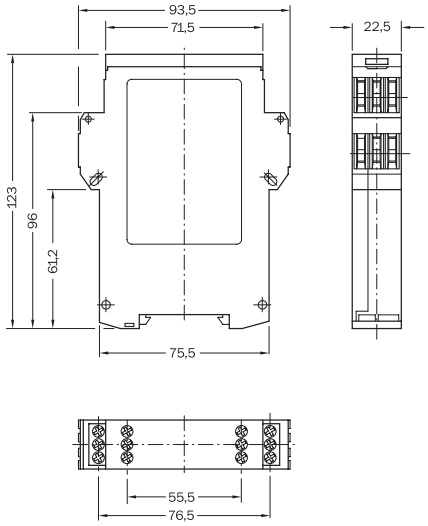
Features

- Off delay expansion modules for emergency stops and movable guards control
- Stop and safety category equal to the one of the connected base controller
- 4 normally open contacts (NO), 2 normally closed contacts (NC), auxiliary delay OFF

Applications

- Additional outputs for load activation
- Expansion of the activation output capacity

Dimensions



Functionality

The function of the 11-4 DC corresponds to that of the UE 10-4 XT, but the unit also has fixed switch off-delay times of 0.5 sec, 1 sec, 2 sec and 3 sec, depending on the model. They are achieved by means of capacitors, so that even in the event of power supply failure the off-delay runs its full duration in each instance. The delay cannot be prematurely cancelled. After the delay periods have expired the relays K1 and K2 return to their neutral rest position.

With the combination of UE 11-4 DX and a main unit, Stop Category 1 (EN 418) can be realized.

External device monitoring (EDM)

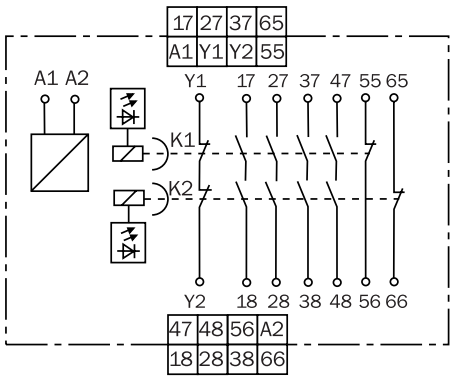
If external device monitoring is implemented in the connected main unit, then the normally closed contacts (Y1 - Y2) prevent the resetting of the main unit, when K1 and/or K2 do not de-energize.

Unit 11-4 DX 2 has screw type terminals.
Unit 11-4 DX 3 has removable terminals.

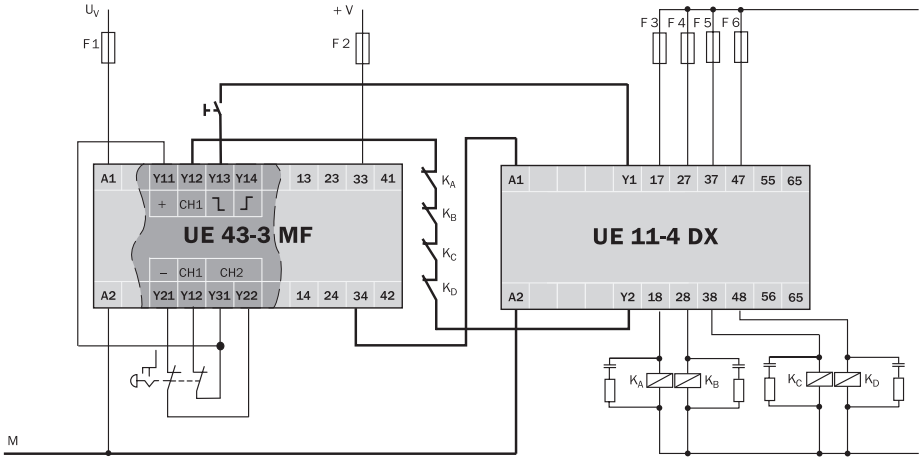
Technical specifications

General data description	min.	typ.	max.
Supply voltage to A1 - A2			
Electrical output circuit > 25 V AC/60 V DC	PELV		
Electrical output circuit < 25 V AC/60 V DC	PELV or SELV		
Supply voltage V_v (A1 - A2)			
UE 11-4 DX	20.4 V DC	24 V DC	26.4 V DC
Power consumption			
DC			1.5 W/2.0 W
Residual ripple in DC mode (within the limits of V_v)			2.4 V_{PP}
Nominal frequency in AC mode	50 Hz		60 Hz
Activation time (after applying the supply voltage)	25 ms		
Output circuits (17 - 18, 27 - 28, 37 - 38, 47 - 48, 55 - 56, 65 - 66, Y1 - Y2) off-delayed			
Switch-off delay time of UE 11-4 DX (depending on type)	0.5, 1, 2 or 3 sec		
Influence of the supply voltage			0.5 (%/% ΔU_N)
Influence of ambient temperature			0.4 (%/K)
Mean value of error (% + ±10 ms)			±20
Dispersion (% + ±10 ms)			±2
Relay contacts			
	4 normally open contacts (NO), safety relevant 2 normally closed contact (NC), not safety relevant 1 normally closed contact (NC), contactor monitoring		
Contact type	positively guided		
Contact material	Silver alloy; gold-plated		
Load capacity of contacts			
Switching voltage	10 V AC/DC		230 V AC/30 V DC
Switching current	10 mA		6 A
Total current across all contacts			12 A
Application category to EN 60 947-5-1	AC-15 Ue 230 V AC, I_e 6 A (3600 c_y/h) DC-13 Ue 24 V DC, I_e 6 A (360 c/h) DC-13 Ue 24 V DC, I_e 3 A (3600 c/h)		
Permitted switching frequency			3600 c/h
Mechanical service life (switching cycles)	1 x 10^7		
Electrical service life (dependent upon loading)	2 x 10^6		
Operating data			
Surge voltage rating (V_{imp})			4 kV
Excess voltage category			III
Contamination rating of the unit (EN 50 178)			
External			3
Internal			2
Voltage rating			300 V AC
Test voltage V_{eff} (50 Hz) EN 60 439-1			2 kV
Protection type			
Housing	IP 40		
Terminals	IP 20		
Radio interference	DIN EN 61 000-6-4		
Interference emission according to	DIN EN 61 000-6-2		
Ambient operating temperature	-25°C		+55°C
Storage temperature	-25°C		+75°C
Cross sections of electrical conductors			
single strand wire (2x, identical cross section)	0.14 mm²		0.75 mm²
single strand wire (1x)	0.14 mm²		2.5 mm²
fine stranded wire with terminal crimps			
(2x, identical cross section	0.25 mm²		0.5 mm²
fine stranded wire with terminal crimps (1x)	0.25 mm²		2.5 mm²
Weight	0.2 kg		

Internal circuitry



Connection drawing



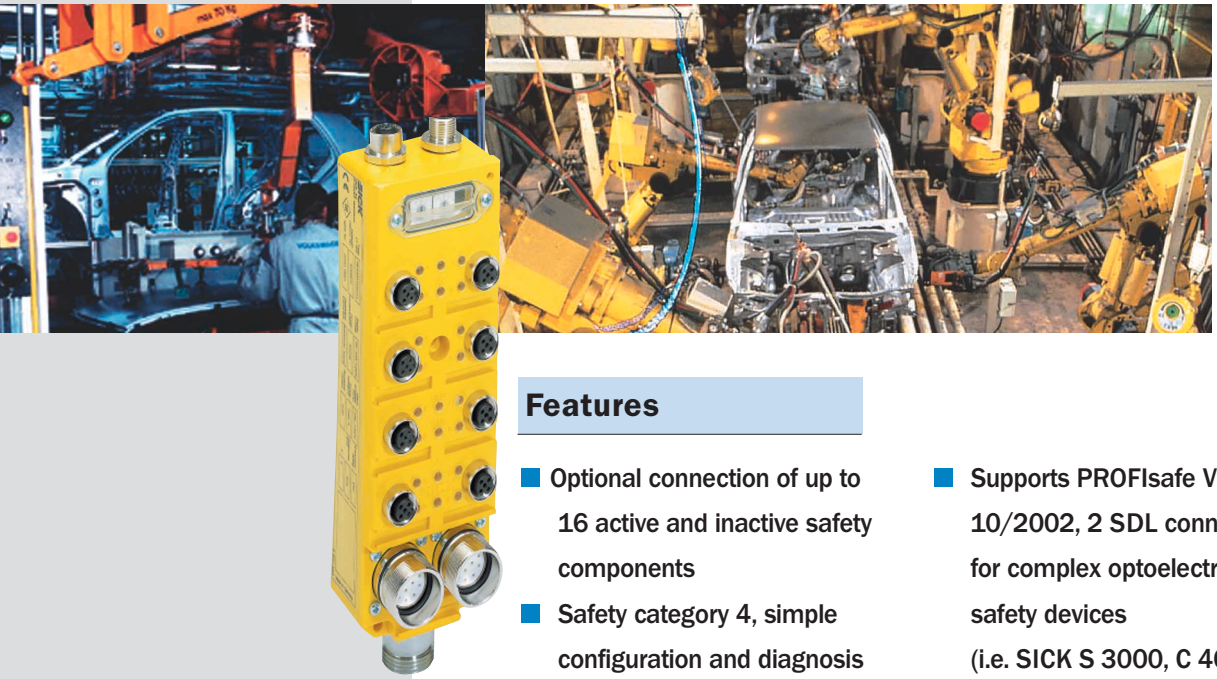
Example of connection of emergency button to dual channel from base unit
UE 43-3 MF with output expansion module UE 11-4 DX, manual reset and EDM

Selection table

Model	Output		Connection (terminal type) Screw	Connection (terminal type) Removable	Supply voltage 24 V DC	Delay in sec	Part number
UE 11-	4	DX	2		D3	0.5	6 024 921
UE 11-	4	DX	2		D3	1	6 024 922
UE 11-	4	DX	2		D3	2	6 024 923
UE 11-	4	DX	2		D3	3	6 024 924
UE 11-	4	DX		3	D3	0.5	6 024 925
UE 11-	4	DX		3	D3	1	6 024 926
UE 11-	4	DX		3	D3	2	6 024 927
UE 11-	4	DX		3	D3	3	6 024 928

We recommend contacting Customer Service for product selection

Bus node
UE 4100



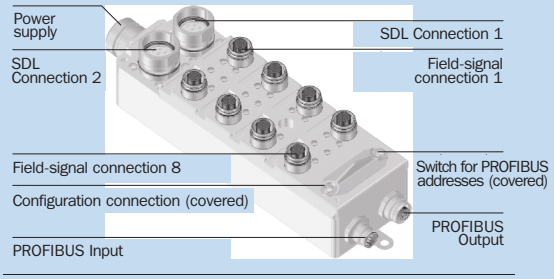
Features

- Optional connection of up to 16 active and inactive safety components
- Safety category 4, simple configuration and diagnosis using CDS software
- Configuration of system offline without FPLC, supports the PROFIBUS DP-V1 (Master Class 1 and Master Class 2)
- Supports PROFIsafe V1.20 10/2002, 2 SDL connectors for complex optoelectronic safety devices (i.e. SICK S 3000, C 4000)

Description of Function

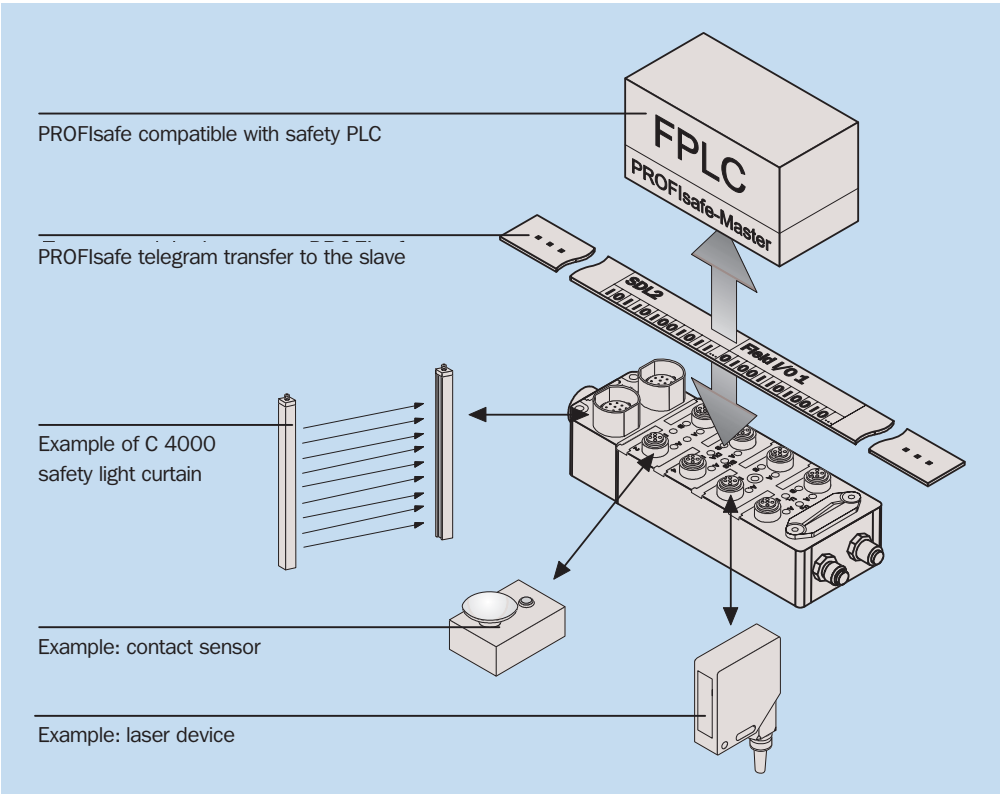
PROFIsafe

PROFIsafe is an extension of the PROFIBUS DP protocol, with safety technology. The PROFIsafe protocol Master/Slave communication is protected from transmission errors and potential modifications. The UE 4100 bus node is a PROFIsafe device in accordance to the requirements of “PROFIsafe – Safety technology profile” V1.20 10/2002; this is true because the UE 4100 always waits for PROFIsafe Master and does not establish communications with PROFIBUS DP Masters.

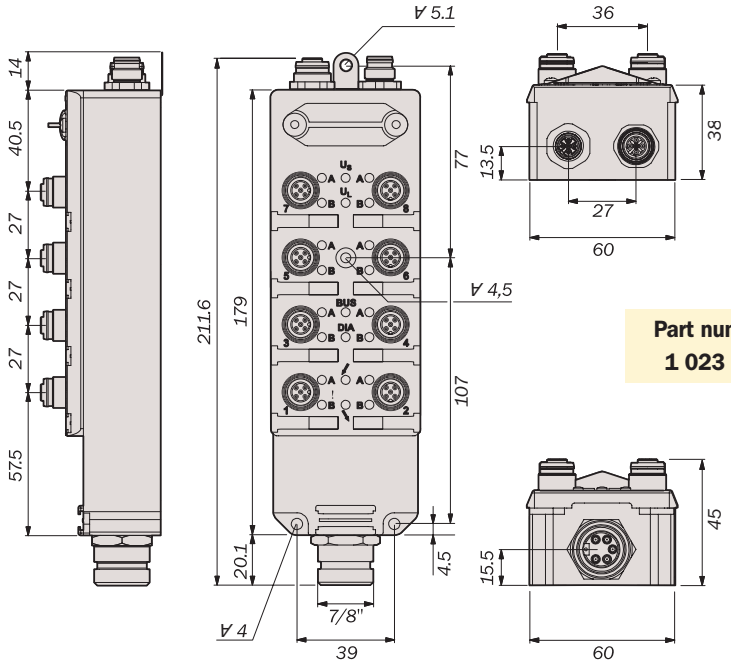


Operation

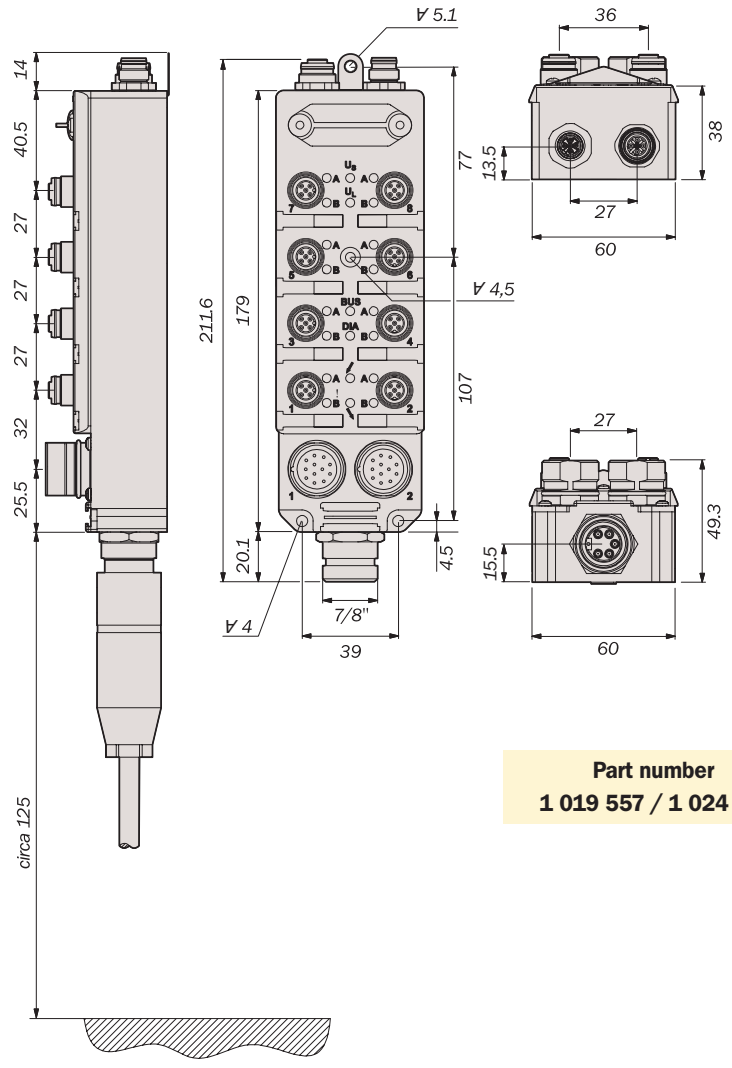
The UE 4100 bus node is a PROFIsafe Slave. Signals from UE 4100 are transmitted to the PROFIsafe Master through a PROFIsafe telegram. The Master copies the PROFIsafe telegram data in the safety PLC. The safety PLC evaluates the data received and places the calculated output values inside the output process image. The PROFIsafe Master transfers the output data to the bus nodes using a PROFIsafe telegram. The UE 4100 transforms the safety PLC incoming telegram into an electrical signal that can be processed by connected components.



Drawings



Part number
1 023 176



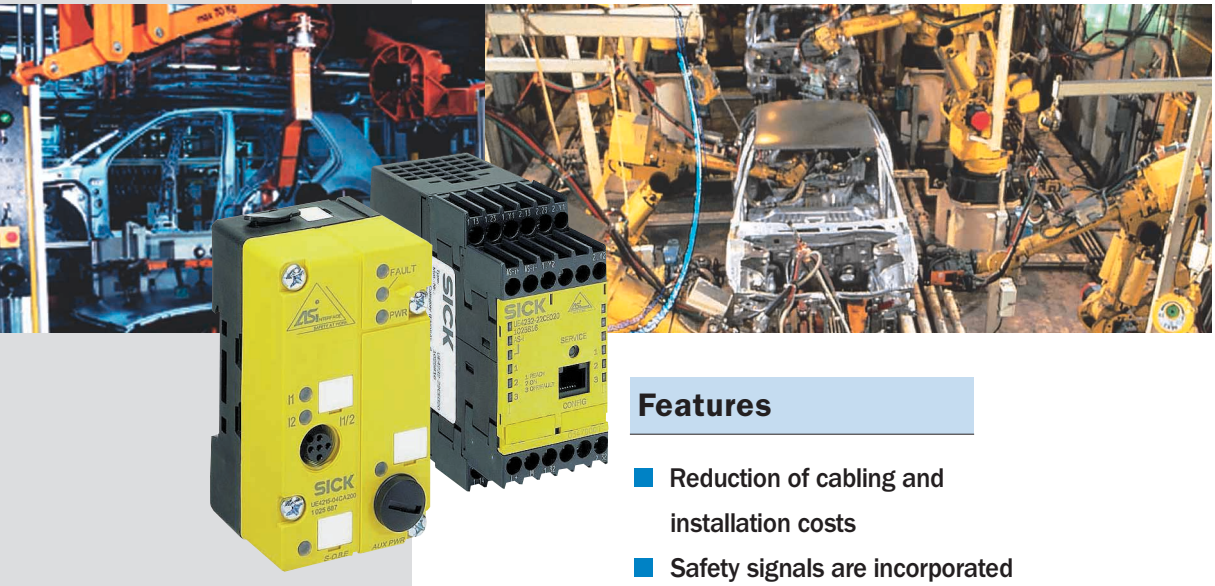
Part number
1 019 557 / 1 024 057

Technical specifications

	UE 4100		
Protection class (IEC 61 140:1997):		III	
Protection class		IP 67	
Safety category		4 (EN 954), SIL 3 (IEC 61508)	
Field-signal inputs	**min.**	**typ.**	**max.**
Input voltage, High	11 V	24 V	28.8 V
Input current, High	6 mA	12 mA	15 mA
Input voltage, Low	-28.8 V	0 V	8 V
Input current, Low	-1 mA	0 mA	3 mA
Input delay (configurable)	0 ms		90 ms
Field-signal outputs	**min.**	**typ.**	**max.**
Output voltage High (without load)	Uv		
Switching Current	0 mA		700 mA
Minimum current for fault monitoring on field-signal	4 mA	10 mA	16 mA
Connectors 7 and 8			
Peak current in the case of a short-circuit			2.4 A
Internal resistance			0.5 ohm
SDL connection	**min.**	**typ.**	**max.**
Supply voltage current			1.4 A
Internal resistance			0.3 ohm
Inputs OSSD			
Input voltage, High	13 V	24 V	28.8 V
Input current, High	1.8 mA	6 mA	8 mA
Input voltage, Low	-17 V		12 V
Input current, Low	-6 mA		1.6 mA
Test pulse data			
Test pulse rate			500 1/s
Test pulse width			700 µs
Discrepancy time	3 ms		6 ms
PROFIBUS connection			
Baud rate	9.6 Kbit/s		12 Mbit/s
Address range	3		125
Recovery detection			
UE 4120	070F hex		
UE 4150/UE 4155	071A hex		
Supply voltage Uv at device	19.2 V	24 V	28.8 V
Residual ripple			5 Vss
Power consumption through power supply connection			9 A
Power consumption			3.8 W
Power up delay		2-10 s	
Operating temperature	0°C		50°C
Storage temperature	-25°C		70°C
Air humidity	15%		95%
Rigidity	10 g, 10-300 Hz according to IEC 60068-2-6		
Shock resistance	25 g, 6 ms according to IEC 60068-2-29		

NOTE: Minimum current for fault monitoring on field-signal connections

AS-interface Safety-at-Work
UE 4200



Features

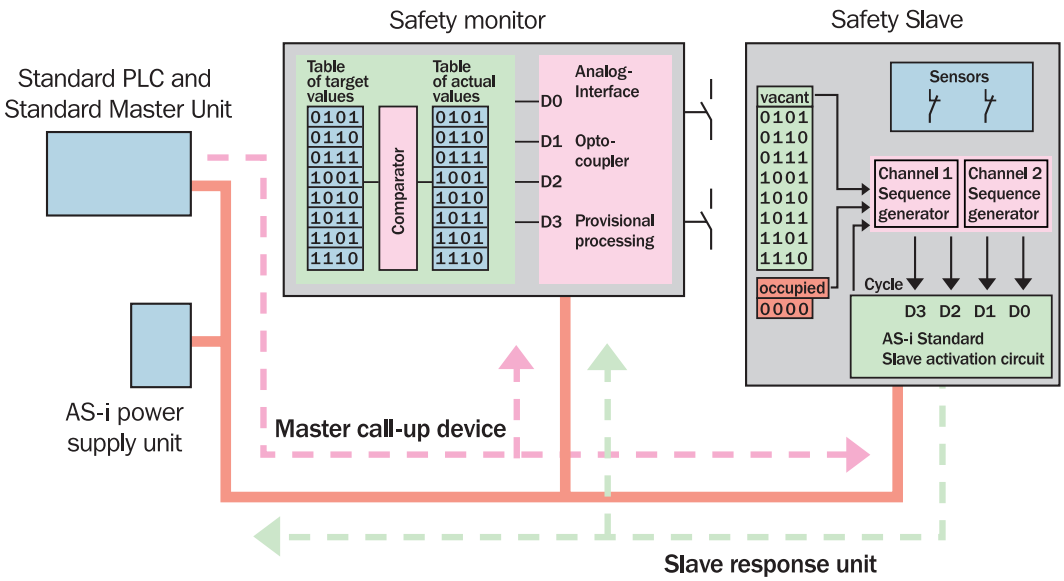
- Reduction of cabling and installation costs
- Safety signals are incorporated into the system diagnostics
- Safety and non-safety on one bus
- Approved to Category 4 per EN 984-1
- TÜV and BIA certified

Description of Function

The “Safety-at-Work” AS-interface system was developed as an enhancement to the existing AS-interface. The designation – “Safety-at-Work” AS-interface – thereby conveys the notion of secure transmission when incorporating safety devices into an AS-interface network. The components for "Safety-at-Work" are compatible with all other AS-interface components, so that existing AS-interface applications can be expanded in a simple manner by safety-related functions.

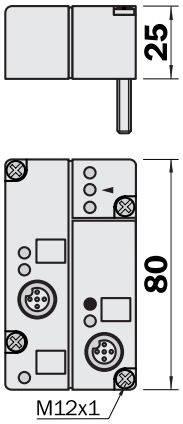
Safety Monitor

All binary switched safety-related components, such as “Emergency Off” switches, safety door switches, safety light curtains or safety laser scanners are hooked up to the “Safety-at-Work” AS-interface. This connection of safety-related components is effected by way of a secure AS-interface module, which is monitored by an AS-interface safety monitor. Similar to a switching unit in conventional technology, the transmitted data on individual safety-associated components is gathered together by this safety monitor by means of the AS-interface and is processed relevant to safety requirements. The safety monitor has one or two conventional safety-associated output circuits.

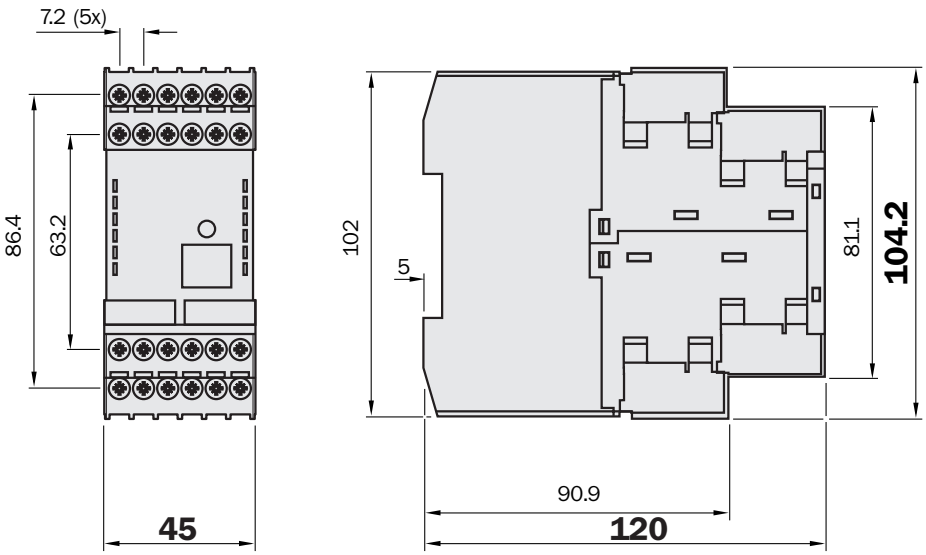


Drawings

UE 4212/UE 4215
Part numbers
1 025 814/1 025 687



UE 4231/UE4232
Part numbers
1 025 814/1 025 687



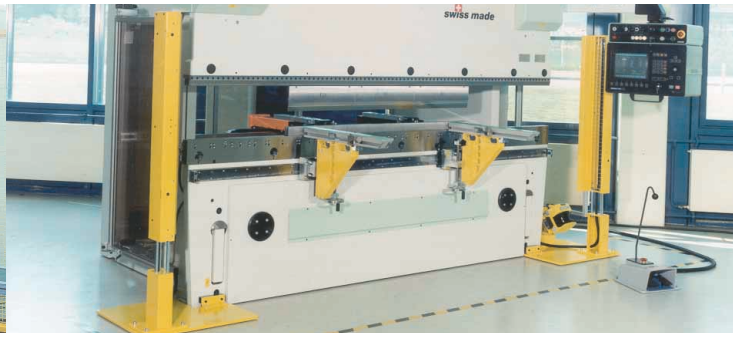
Technical specifications

	UE 4212	UE 4215	UE 4231	UE4232
Safety inputs	1	1		
Configuration interface			RS 232	RS 232
Supply voltage V_s [1]	26.5…31.6 V DC	26.5…31.6 V DC	24 V DC ± 15%	24 V DC ± 15%
Current consumption total	60 mA	60 mA	150 mA	200 mA
Switch-on delay			< 10 s	< 10 s
Safety data				
Safety Category (EN 954)	4	4	4	4
Response time		22 ms	< 40 ms	< 40 ms
AS-i data				
Voltage area			18.5…31.6 V	18.5…31.6 V
Current consumption			< 45 mA	< 45 mA
Inputs				
Input circuit	PNP/NPN	PNP		
Current loading [2]		200 mA		
Short-circuit detection	Y	Y		
Short-circuit protected	Y	Y		
Switching level HIGH signal 1		> 10 V		
Input current HIGH/LOW		> 5 mA/< 1.5 mA		
External supply				
External supply voltage [3]		24 V DC via ribbon cable		
Current load per module		1.2 A		
AS-i interface		Polarity reversal protection		
AS-i profile	S-7.B.0	S-0.B.E	Monitor 7.F	Monitor 7.F
AS-i interface specification			0.3 ohm	
Expanded address space possible				
Safety switch outputs			Volt-free, NO	Volt-free, NO
Release circuits			1 output pair	2 output pair
Maximum contact loading			*	**
Continual residual current			3 A per output circuit	3 A per output circuit
Product standard/EMC	EN 50295	EN 50295		
Enclosure rating to EN 60 529	IP 65	IP 65	IP 20	IP 20
Ambient temperature T_A (Operating)	-25…70°C	-25…65°C	-20…60°C	-20…60°C
Display				
LED yellow	Input signals	Inputs signals		
LED green	Display AS-i voltage	Display AS-i voltage		
LED red	Fault	Fault		
Addressing	Via IR interface	Via IR interface		
Housing material	PBTP (Pocan)	PBTP (Pocan)		
Weight	100 g	85 g	350 g	450 g
Connection to AS-i interface	Via contact pins [4]	Via contact pins [4]		
Connection to safety sensors	***	****		
Fixing			Snap-on fixing for mounting rail in accordance with EN 50 022	

[1] In accordance with AS-i specification
[2] For all inputs total
[3] Via AS-i interface ribbon cable to PELV
[4] On FK or FKE lower parts or FK-A or FKE-A lower parts

* 1 A DC 13 for DC 24 V
** 3 A AC 15 for DC 230 V
*** Safety sensors fitted with contacts
**** Electro-sensitive protection equipment with self-monitoring semi-conductor

Using Safety interlocks



A variety of risks may be associated with machines and work equipment during their life cycle - ANSI B11.TR3 includes many risks potentially associated with several types of machinery on the market and the requirements that need to be met. Those risks may result in immediate injury or damages that can be very serious; therefore, it is imperative to carefully evaluate the extent of the risk relative to expected or reasonably predictable applications.

Standardized methods for risk assessment (like those defined in ANSI B11.TR3 Risk assessment) and for defining appropriate safety measures; in any event, at the time of risk assessment, the Machinery Directive requires the manufacturer to apply the “safety integration principle in design.”

According to the principle, the following criteria should be met, in the order listed:

- Working to eliminate or reduce the risks in the best manner possible
- To adopt timely supplementary measures of protection towards the risks that are impossible to eliminate
- Users should be informed of the residual risks due to incomplete effectiveness of current safety measures, indicating if operators require special qualifications and if it is necessary to preset an individual safety device.

Safety interlocks

Interlocking devices with safety functions (with or without solenoid locking) are considered safeguarding devices, in accordance with current regulation, and are used in equipment and installations where personnel, machinery and environmental hazard conditions may occur. Such devices are capable of interrupting the safety circuit for the duration of hazardous conditions, for example, by opening a guard.

Typical configuration of interlocking devices (associated with guards)

Interlocking device without solenoid locking.

These devices allow the guard to be open at any time. As soon as the guard is no longer in the closed position, the interlocking device generates a stop command. This configuration is possible when the dangerous movement stop time is less than the time a person needs to reach the hazard area.

Interlocking device with solenoid locking

The guard is kept closed by a solenoid locking device.

There are two device types:

A those with guards that can be released at any time by the operator (unconditional release), where the time needed for releasing the guard is more than the time needed to stop the hazard;

B those with guards that can be released only under specific conditions assuring that the hazard is no longer present (conditional release). In such cases, the guard can be released only if one of the following conditions is met:

B_1 a set time period has elapsed since the onset of the stop command.

B_2 it has been acknowledged that the hazard is no longer present (e.g., speed is equal to zero)

As per UNI EN 1088 rule, the blocking device can be either a separate unit or may be integrated in the interlocking device.

Technological configuration of interlocking devices

Mechanical interlock devices:

- With cam operated sensors
- With key operated sensors

Non-contact interlock devices:

- With magnetic switches
- With electric proximity switches

Key systems

- Trapped key systems
- Transfer key systems

Plug and socket systems

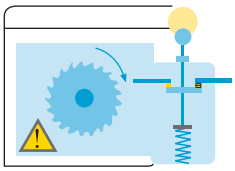
Mechanical interlock between guard and movable parts

Positive opening

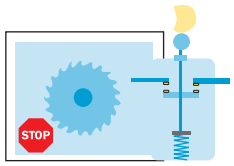
EN 292-2, section 3.5, explains that if a moving mechanical component inevitably moves another component along with it, either direct contact or via rigid elements, the second component is positively driven (positive mode) by the first component. Whenever a mechanical component is moving, while allowing another component to move freely (e.g., due to a spring), the connection between the two components it is in negative mode.

The open port within a safety interlock indicates the presence of a positive transmission force between the actuator and the switching mechanism. The actuating mechanism should be designed for the contact device to reliably open and remain open while activated, even in the case of a mechanical failure (e.g., spring failure or contact weld).

Positive manner



Machine working; door closed

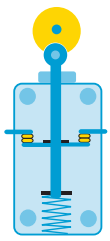


Machine stopped; door open

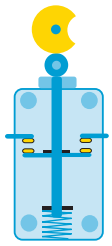
⚠ Dangerous failures: the machine continues to operate

Fail-safe position limit stop
Fail-safe requirement: forced conduction

Contact closes from elastic force

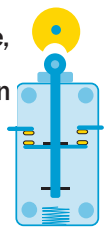


Contact is forced open

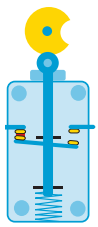


Forced conduction failure results

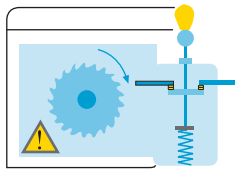
In case of spring failure, the contact remains open



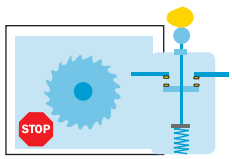
Contact is forced open after welding



Negative manner



Machine working; door closed

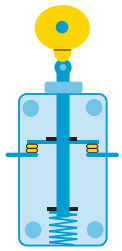


Machine stopped; door open

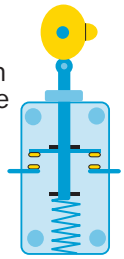
⚠ Dangerous failures: the machine continues to operate

Position limit stop without forced conduction

Contact closes at activation

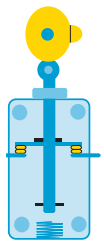


Contact opens from elastic force

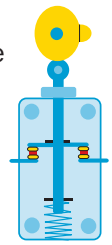


Failure possible

In case of spring failure, the contact remains closed

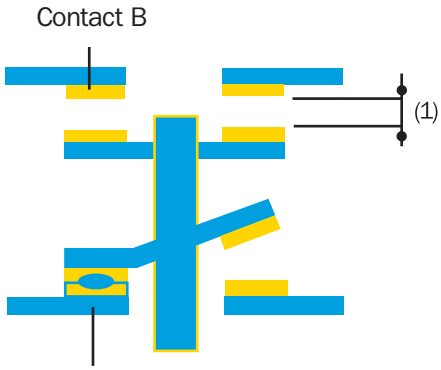


In case of welding the contact remains closed



Depending on how the positive mode (fail-safe) is achieved, it is possible to exclude dangerous internal failures (e.g., contact sticking faults or spring failures) in order to assure that the contacts will open and the hazardous motion will be stopped in under any conditions. Regular and preventive maintenance is important to effectively avoid external failures (like worn cam switch and/or misaligned cam).

Use of switches in safety applications



(1) Adequate distance to allow shock resistance

Positive Guided

When welding an opening contact, closing contacts will no longer be able to close while the coil is energizing. When welding a closing contact, opening contacts will no longer have to close while the coil is de-energizing.

In case of failure, contact A remains closed and contact B remains open.

Redundancy

Redundancy consists in the use of more than one device or system, in order to guarantee the availability of another device to provide safety functions in case of any component failure. If the first failure is not detected, the second one could result in the loss of the safety function. Implementing self-monitoring may compensate a safety function loss.

Self-monitoring

Self-monitoring consists on the operational auto-verification of all devices involved in the machine cycle. Consequently, the subsequent cycle could or could not be allowed.

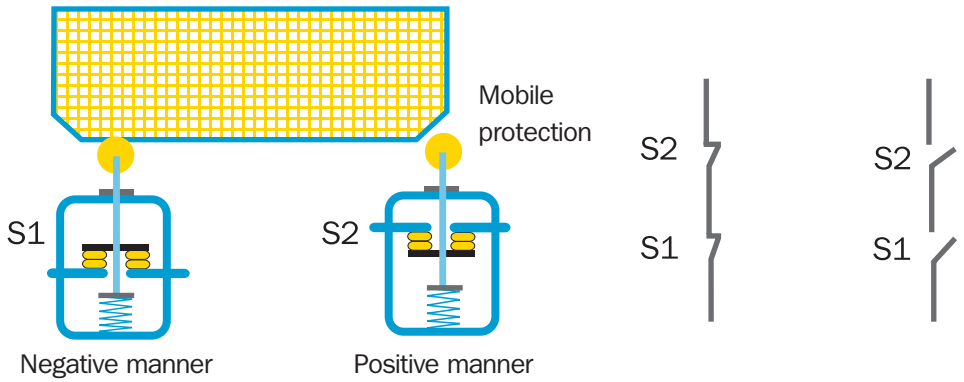
Diversification

Duplicate safety systems increases with diversification. The most common causes of improper operation and failure of electrical devices can be minimized if each product relies on multiple control circuits and on diverse devices and components. Following are some examples of diversified applications.

Emergency exit provided for safety components that use a combination of contacts NC and NO.

Circuits that use components that defer between them for typology.

Redundant combinations of electric and electromechanic circuits.



Machine working

Closed protection: Machine working

Open protection: Machine stopped

The diversification allows a superior degree of safety with respect to that guaranteed from the only positive method.

Manipulation

Interlocking devices should be designed so that they cannot be easily defeated (either by intentional tampering or by common objects, like screws, metal sheet sections, keys, coins, tools, etc.), and should come with installation and maintenance instructions. Devices requiring more than one step for assembly are not included in the definition of easily available object. Intrusions, like components dismantling, detaching safety interlocks from guards, using a dual actuator or the U bolt on the contacts, are not included in the recorded cases of easy defeating. Such actions are always considered part of high negligence events, with related consequences in case of accidents. Measures should be taken during the design phase to avoid potential tampering by installing: safety interlocks within the hazard area or behind the guard, locking devices (locks) when the guard is to be kept in open position, or fixed barriers or shields to preclude the introduction of loose actuators not connected to movable guards, etc.

Definitions and terminology

Safety interlocks are divided into two different categories:

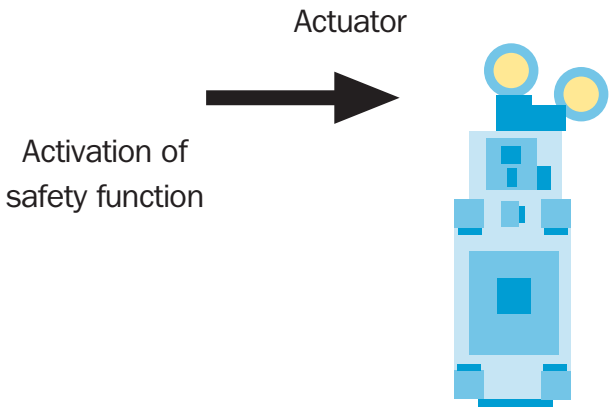
Safety Interlock Type 1 :

Safety interlock in which the communication element and the actuator are united

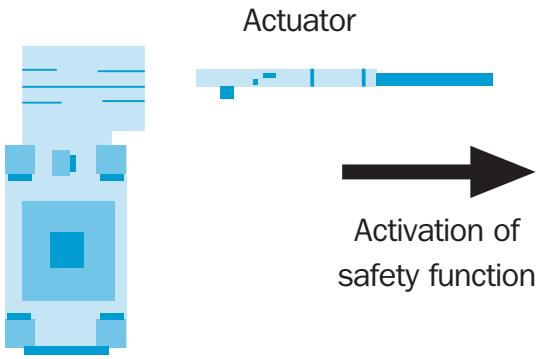
Safety Interlock Type 2:

Safety interlock in which the communication element and the actuator are not united, but are combined or separated during the accomplishment

Category 1:



Category 2:



Regulations– Standard

Standard	Description
	Definition of safety system
OSHA 1910.212	Control reliability
ANSI B 11..19	Run of the individual component
ANSI/RIA R 15.06-1999	Robot safety standard

Color code according to IEC 757

	Old abbreviation	New abbreviation
Black	sw	bk
Brown	br	BN
Red	rt	RD
Orange	or	OG
Yellow	ge	YE
Green	gn	gn
Blue	bl	BU
Violet	vi	VT
Grey	gr	GY
White	ws	WH
Pink	rs	PK
Gold	-	GD
Turquoise	tk	TQ
Silver	-	SR
Green-yellow	gnge	GNYE

Plastic interlocks with separate actuator

	i 10	i 12 S
Contact elements	1 NC/1 NO 2 NC	1 NC 1 NC/1 NO 2 NC/1 NO
Switching principle	slow acting	slow acting
Current, max. [A] at 230 V AC	4	2
Contact material	silver alloy	silver alloy
Environment		
Mechanical lifecycles, min.	10^6	10^6
Ambient temperature [°C]	-20…80	-20…80
Housing material	glass-reinforced plastic	glass-reinforced plastic
Protection class	IP 67	IP 67
Display LED		
Actuating direction		
Connection		
Cable entry	1 x M20	1 x M16
Connector		
Actuating element		
Straight	✓	✓
Straight, flexible	✓	✓
Angled	✓	✓
Angled, flexible	✓	✓
Radius actuator	✓	✓
Flexible		
Smaller door radius	90 mm	90 mm
Approvals	CSA, UL, BG	TÜV, cULus
Details	pg. 268	pg. 264

i 16 S	i 17 S
1 NC/NO  2 NC 	2 NC/1 NO 
slow acting	slow acting
2	2
silver alloy	silver alloy
10^6	10^6
-20…80	-20…80
glass-reinforced plastic	glass-reinforced plastic
IP 67	IP 67
	
3 x M20	3 x M20
✓	✓
✓	
✓	✓
	✓
60 mm	60 mm
TÜV, cULus	TÜV, cULus
pg. 272	pg. 276

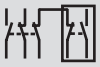
Metal interlocks with separate actuator

	i 100 S	i 110 S
Contact elements	3 NC/1 NO 	3 NC/1 NO  2 NC/2 NO 
Switching principle	slow acting	slow acting
Current, max. [A] at 230 V AC	6	2
Contact material	silver alloy, gold-plated	silver alloy
Environment		
Mechanical lifecycles, min.	2 x 10^6	10^6
Ambient temperature [°C]	-25…80	-20…80
Housing material	die-cast light alloy, anodized	die-cast light alloy
Protection class	IP 67	IP 67
Display LED		
Actuating direction		
Connection		
Cable entry	1 x M20	1 x M20
Connector	1 x SR11	
Actuating element		
Straight	✓	✓
Straight, flexible		
Angled		
Angled, flexible		
Radius actuator	✓	
Flexible	✓	✓
Smaller door radius	400 mm	60 mm
Approvals	CSA, UL, BG	TÜV, cULus
Details	pg. 284	pg. 280

i 1001	i 1002
2 NC/1NO	2 NC/1NO
slow acting	slow acting
10	10
silver alloy	silver alloy
10^6	10^6
-5…40	-5…40
powder-coated, die-cast stainless steel	die-cast stainless aluminum
IP 67	IP 67
✓	
1 x PG 13.5	1 x PG 13.5
with lever	✓
	✓
CSA, BG	CSA, BG
pg. 290	pg. 296

Plastic and metal interlocks with solenoid locking

	i 10 Lock	i 14 Lock
Contact elements	2 NC/1 NO (+ 1 NC) 	2 NC/1 NO  3 NC 
Switching principle	slow acting	slow acting
Current, max. [A] at 230 V AC	6	2
Contact material	silver alloy, gold-plated	silver alloy
Environment		
Mechanical lifecycles, min.	10^6	10^6
Ambient temperature [°C]	-20…80	-20…60
Housing material	glass-reinforced plastic	glass-reinforced plastic
Protection class	IP 67	IP 65
Display LED		
Actuating direction		
Locking device		
Locking method	mechanical/electrical	mechanical
Supply voltage (V)	24/110/230	24/110/230
Power consumption (W)	8	7
Connected load (continuous) [%]	100	100
Retaining force (N)	1200	1200
Connection		
Cable entry	3 x M20	1 x M20
Connector	1 x SR11	
Actuating element		
Straight	✓	✓
Straight, flexible	✓	
Angled	✓	
Angled, flexible	✓	
Radius actuator	✓	
Flexible		
Smaller door radius	90 mm	160 mm
Approvals	SA, UL, BG	TÜV, cULus
Details	pg. 304	pg. 302

			
i 200 Lock	**i 100 Lock**	**i 1001 Lock**	
4 NC/1 NO  3 NC/2 NO 	2 NC/2 NO 	4 NC/2 NO 	
slow acting	slow acting	slow acting	
2	6	10	
silver alloy	silver alloy, gold-plated	silver alloy	
10^6	$2x10^6$	10^6	
-25…80	-25…80	-5…40	
glass-reinforced plastic	anodized die-cast light alloy	zinc alloy and stainless steel	
IP 65	IP 67	IP 67	
	✓	✓	
			
mechanical	mechanical/electrical	mechanical	
24/110/230	24/110/230	24/110/230	
7	7		
100	100	100	
2000	1200		
3 x M20	1 x M20	1 x PG 13.5	
	1 x SR11		
✓	✓	with lever	
	✓		
✓			
80 mm	165 mm		
TÜV, cULus	CSA, UL, BG	CSA, BG	
pg. 312	pg. 316	pg. 324	

Metal interlocks with solenoid locking

	i 1002 Lock
Contact elements	4 NC/2 NO 
Switching principle	slow acting
Current, max. [A] at 230 V AC	10
Contact material	silver alloy
Environment	
Mechanical lifecycles, min.	10^6
Ambient temperature [°C]	-5…40
Housing material	Powder-coated, die-cast, stainless steel
Protection class	IP 67
Display LED	✓
Actuating direction	
Locking device	
Locking method	mechanical
Supply voltage (V)	24/110/230
Power consumption (W)	
Connected load (continuous) [%]	100
Retaining force [N]	
Connection	
Cable entry	1 x PG 13.5
Connector	
Actuating element	
Straight	✓
Straight, flexible	
Angled	
Angled, flexible	
Radius actuator	
Flexible	
Small door radius	
Approvals	CSA, BG
Details	pg. 330

Magnetic safety switches with contacts

Sensor & elem. actuator	RE 300	RE 4000
Safety category acc. EN 954-1	3	4
Contacts		
Contact elements	1 NC/1 NO 	1 NC/1 NO 
Housing	Polycarbonate/ABS	Polycarbonate/ABS
Operating mode	Reed	Reed
Supply voltage (V)	24	24
Environment		
Ambient temperature [°C]	-10…55	-10…55
Housing material	Polycarbonate/ABS	Polycarbonate/ABS
Protection class	IP 67	IP 67
Actuating direction		
Connection		
Connector		
Evaluation unit		
Safety category sec. EN 954-1	3	4
Contacts		
Maximum number of sensors	1	6
Output to semiconductor		
Outputs	2 NO/1 NC 	3 NO/1 NC/1 NO RIT 
Supply voltage (V)	24/110/230	24/110/230
Current, max. (A)	4	4
Environment		
Ambient temperature [°C]	-10…55	-10…55
Housing material	Polycarbonate/ABS	Polycarbonate/ABS
Protection class	IP 20	IP 20
Approvals	TÜV, cULus	TÜV, cULus
Details	pg. 336	pg. 340

Safety sensors and transponders with contacts

Sensor & elem. actuator	T 4000	T 4000 Compact
Safety category acc. EN 954-1	3	3
Contacts		
Contact elements	2 NO	2 OSSD's
Housing material	polycarbonate	polycarbonate
Operating mode	Transponder	Transponder
Supply voltage (V)		
Environment		
Ambient temperature [°C]	-25…70	0…55
Housing material	glass-reinforced plastic	glass-reinforced plastic
Protection class	IP 67	IP 67
Actuating direction		
Connection		
Connector	M8	M12
Cable connected	✓	
Evaluation unit		
Safety category sec. EN 954-1	3	3
Contacts		
Maximum number of sensors	1	1
Output to semiconductor		2 NPN
Outputs	2 NO (+NPN) 	
Supply voltage (V)	24	24
Current max. (A)	4	0.4
Environment		
Ambient temperature [°C]	0…55	0…55
Housing material	glass-reinforced plastic	glass-reinforced plastic
Protection class	IP 20	IP 67
Approvals	BG, cULus	BG, cULus
Details	pg. 344	pg. 350

Plastic position switches

	i 10 R	i 10 P
Contact elements	2 NC/1 NO 	2 NC/1 NO 
Switching principle	slow acting	slow acting
Current, max. [A] at 230 V AC	3	3
Contact material	silver alloy	silver alloy
Environment		
Mechanical lifecycles, min.	10 x 10^6	10 x 10^6
Ambient temperature [°C]	-25…80	-25…80
Housing material	glass-reinforced plastic	glass-reinforced plastic
Protection class	IP 66	IP 66
Actuating direction		
Connection		
Cable entry	1 x M20	1 x M20
Connector		
Actuating element		
Form	roller	plunger
Approvals	TÜV, cULus	TÜV, cULus
Details	pg. 240	pg. 242

Plastic position switches

	i 10 H
Contact elements	1 NC/1 NO  2 NC/1 NO 
Switching principle	slow acting
Current, max. [A] at 230 V AC	2
Contact material	silver alloy
Environment	
Mechanical lifecycles, min.	10^6
Ambient temperature [°C]	-20…80
Housing material	glass-reinforced plastic
Protection class	IP 67
Actuating direction	
Connection	
Cable entry	1 x M20
Connector	
Actuating element	
Form	hinge
Approvals	TÜV, cULus
Details	pg. 244

Metal position switches

	i 110 H	i 100 R
Contact elements	2 NC/1 NO 	3 NC/1 NO 
Switching principle	slow acting	slow acting
Current, max. [A] at 230 V AC	2	6
Contact material	silver alloy	silver alloy, gold-plated
Environment		
Mechanical lifecycles, min.	10^6	30×10^6
Ambient temperature [°C]	-20…80	-20…80
Housing material	Die-cast zinc	Die-cast light alloy, anodized
Protection class	IP 66	IP 67
Actuating direction		
Connection		
Cable entry	1 x M20	1 x M20
Connector		1 x SR11
Actuating element		
Form	hinge	roller lever
Approvals	TÜV, cULus	CSA, UL, BG
Details	pg. 260	pg. 252

Metal position switches

	i 100 P
Contact elements	3 NC/1 NO 
Switching principle	slow acting
Current, max. [A] at 230 V AC	6
Contact material	silver alloy
Environment	
Mechanical lifecycles, min.	30 x 10^6
Ambient temperature [°C]	-20…80
Housing material	Die-cast light alloy, anodized
Protection class	IP 67
Actuating direction	
Connection	
Cable entry	1 x M20
Connector	1 x SR11
Actuating element	
Form	roller plunger
Approvals	CSA, UL, BG
Details	pg. 256

i 110 R	i 110 P
1 NC/1NO 2 NC/2NO 3 NC/1 NO	1 NC/1NO 2 NC/2NO 3 NC/1 NO
fast/slow acting	fast/slow acting
3	3
silver alloy	silver alloy
10 x 10^6	10 x 10^6
-25…80	-25…80
Die-cast zinc	Die-cast zinc
IP 66	IP 66
1 x M20	1 x M20
roller lever	roller plunger
TÜV, cULus	TÜV, cULus
pg. 248	pg. 250

Safety operation units

	E 100	i 110 RP
Contact elements	2 NC/2 NO	3 NC/1 NO 2 NC/2 NO
Switching principle	slow acting	slow acting
Current, max. [A] at 230 V AC	4	2
Contact material	silver alloy, gold-plated	silver alloy
Environment		
Mechanical lifecycles, min.		10^6
Ambient temperature [°C]	-5…60	-25…80
Housing material	plastic	Die-cast light alloy
Protection class	IP 67	IP 66
Actuating direction	↕	↔
Connection		
Cable entry		1 x M20
Connector		
Connected cable	5 m, 10 m	
Maximum length of cable		30 m, 100 m
Accessories		
Rope set		5, 10, 20, 30 m
Rope clamps		✓
Rope guide		✓
Tensioner		✓
Length of rope		30 m, 100 m
Approvals	BG, CNA	TÜV, cULus
Details	pg. 360	pg. 356

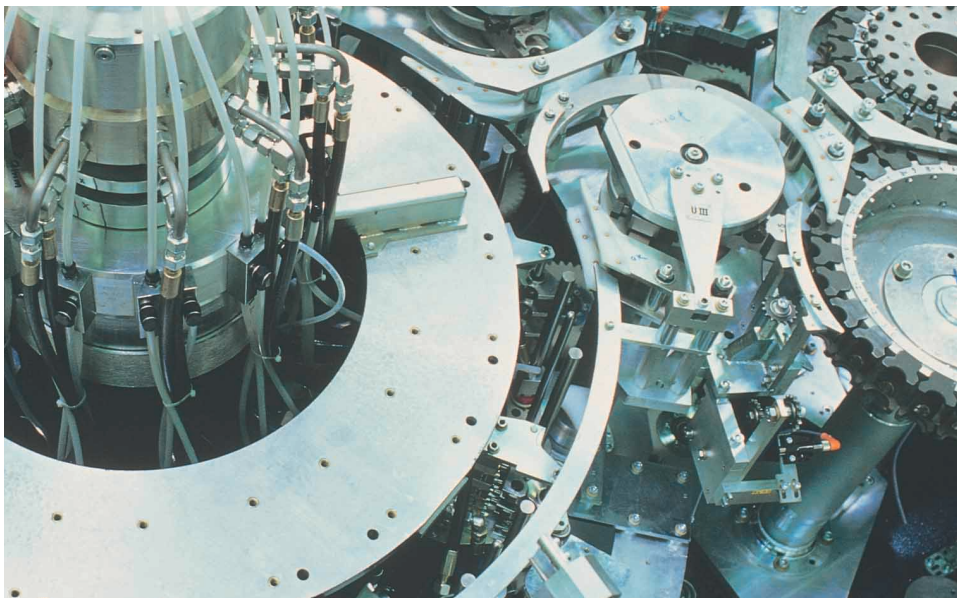
Safety interlocks
i10 R

The i10 R series position switches are designed to ensure reliability and safety in applications where movable guards and movable parts control machinery and equipment.

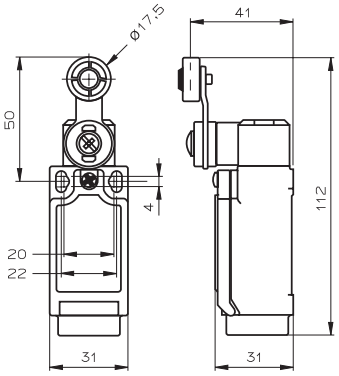
Due to the availability of models with slow action 2 NC + 1 NO and an optional rotation of the actuating head (4 x 90°), the flexibility of this safety interlock series makes it ideal for several applications.

The special adjustment ring nut for fastening the wheel shaft allows the linkage to be positioned at any angle (on 360°) with respect to the enclosure axis.

The fiberglass reinforced thermoplastic housing and the high protection rating (IP 66), make the i10 R series suitable for a wide range of light-duty applications.



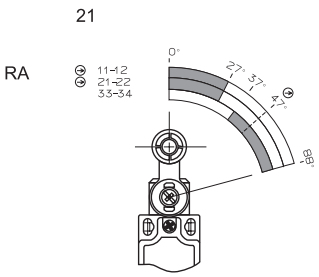
Drawings



Technical specifications

	i10 R
Housing material	Glass-reinforced plastic
Environmental protection to IEC 60529	IP 66
Mechanical lifecycles (min.)	10 x 10^6 cycles of order
Approach speed (max.)	250 mm/s
Approach speed (min.)	50 mm/min
Ambient temperature	-25…80° C
Type of connection	1 x M20
Switching principle	To slow release
Number of contacts (NO/NC)	2/1
Maximum surge voltage U_{imp}	2500 V
Rated insulation voltage U_i	250 V
Utilization category to IEC 60947-5-1	CA 15 CA: 3 A (230 V) CC 13 CC: 0.27 A (230 V)
Switching voltage (min)	5 V CC
Switching current (min) at 5 V CC	5 mA
Short-circuit protection	F 15/15 A

Switching elements



□ contacts open

■ contacts closed

Product selection table

Model	Part number
i 10 RA213	6 025 085

We recommend contacting Customer Service for product selection

Safety interlocks
i10 P

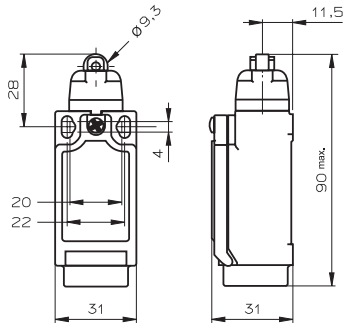
The i10 P series position switches are designed to ensure reliability and safety in applications where movable guards and movable parts control machinery and equipment.

The i10 P series is available with slow action (2 NC + 1 NO) and an optional rotation of the actuating head (4 x 90°).

The special adjustment ring nut for fastening the wheel shaft allows the linkage to be positioned at any angle (on 360°) with respect to the enclosure axis.

Due to the fiberglass reinforced thermoplastic housing and to the high protection (IP 66) rating, the i10 P series is suitable for a wide range of light-duty applications.

Drawings

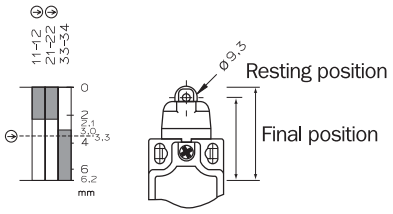


Technical specifications

	i 10 P
Housing material	Glass-reinforced plastic
Protection type conforming to IEC 60529	IP 66
Mechanical service life	10 x 10^6 cycles of order
Approach speed (max.)	250 mm/s
Approach speed (min.)	50 mm/min
Ambient temperature	-25…80° C
Type of connection	1 x M20
Switching principle	To slow release
Number of contacts (NO/NC)	2/1
Maximum surge voltage U_{imp}	2500 V
Rated insulation voltage U_i	250 V
Utilization category to IEC 60947-5-1	CA 15 CA: 3 A (230 V) CC 13 CC: 0.27 A (230 V)
Switching voltage (min)	5 V CC
Switching current (min) at 5 V CC	5 mA
Short-circuit protection	F 15/15 A

Switching elements

PA



□ contacts open

■ contacts closed

Product selection table

Model	Part number
i10 PA213	6 025 088

We recommend contacting Customer Service for product selection

Safety interlocks
i10 H

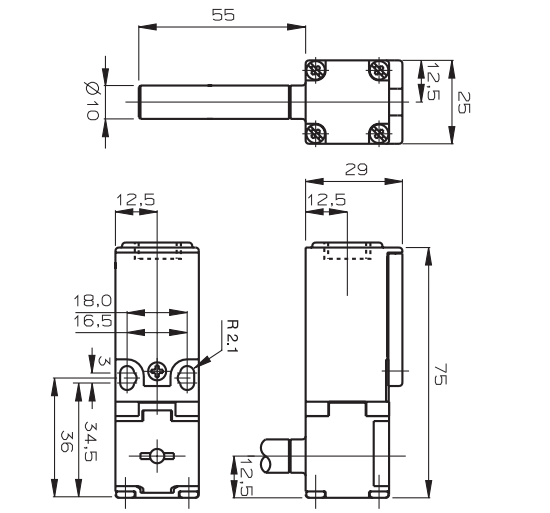
i10 H safety interlocks for hinges are designed for direct installation on movable safety guards' hinges or pins. The switching point may be set using a simple adjustment ring nut located on the rear side of the head. The i10 H series is available in two versions: with a miniature enclosure measuring 75 x 25 x 29 mm or the option in accordance with EN 50047.

Because of the availability of filled actuating shafts (80 mm or 160 mm long), users have the option not to install additional pins for connecting the hinge to the guard. The series i10 H safety interlocks are available in the following versions:

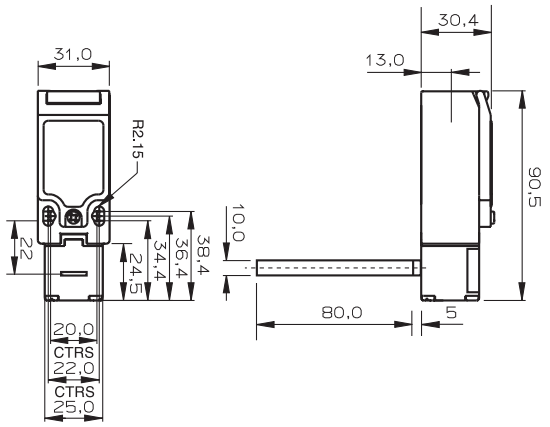
1 NC + 1 NO (i10-HA)

2 NC + 1 NO (i10-HB)

Drawings



Dimensional drawing i10-HA

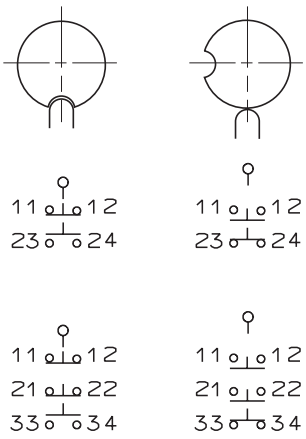


Dimensional drawing i10-HB

Technical specifications

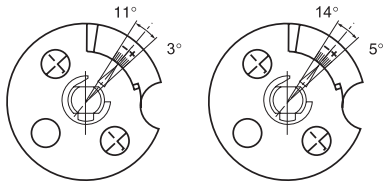
	i10 H
Housing material	Glass-reinforced plastic
Environmental protection to IEC 60529	IP 67
Mechanical lifecycles (min.)	10^6 switching operations
Minimal contact interruption force	20 cNm (i10-HA), 35 cNm (i10-HB)
Switching angle	3…11° (i10-HA), 5…14° (i10-HB)
Frequency of use	1 cycle/s
Positively driven NC/NO contact	1/1 (i10-HA), 2/1 (i10-HB)
Rated insulation voltage	Vi = 250 V≅
Utilization category to IEC 60947-5-1	
i10 HA	A 15/AC: 1.5 A(240 V), 3 A (120 V)
	DC 13/AC: 0.55 A (240 V), 1.1 A (125 V)
i10 HB	AC 15/AC: 3 A (240 V), 6 A (120 V)
	DC 13 /DC: 1.1 A (240 V), 2.2 A (125 V)
Supply voltage (min)	5 V
Switching current (min) at 5 V DC	5 mA
Weight	0.08 Kg (I 10-HA), 0.1 Kg (I 10-HB)
Certifications	CE, cULus, TÜV nord.

Switching elements



Regulation hinge

version i10-HA	version i 10-HB



Installation notes

Hinged interlocks are splined to the door pins. These interlocks should not be used as mechanical stoppers.

Sending the angle of communication

The switching angle may be configured between 3…11° (i10 HA) or 5…14° (i10 HB). After testing, the hinge safety interlock and the cam switches should be securely linked to ensure connection integrity.

Product selection table

Model	Contact	Connector	Part number
i10 HA - 113	1 NC + 1 NO	M 16	6 025 050
i10 HB - 213	2 NC + 1 NO	M 16	6 025 053

We recommend contacting Customer Service for product selection

Safety interlocks
i110 R

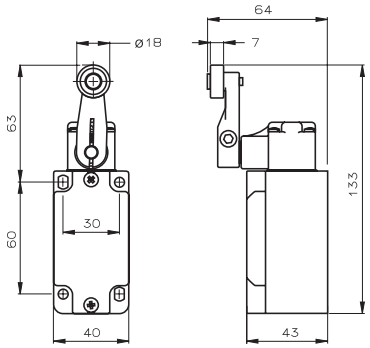
The i110 R series safety position switches are designed to ensure reliability and safety in applications where movable guards and movable parts control machinery and equipment.

Thanks to the availability of versions with 3 NC + 1 NO, slow action 2 NC + 2 NO, or rapid action 1 NC + 1 NO, and to the optional rotation of the actuating head (4 x 90°), the flexibility of this safety interlock series meets the requirements of several applications.

The special adjustment ring nut for fastening the wheel shaft allows the linkage to be positioned at any angle (over 360°) with respect to the enclosure axis.

The galvanized die-cast metal housing and the high protection rating (IP 66) makes the i110 R series suitable for a wide range of heavy-duty applications.

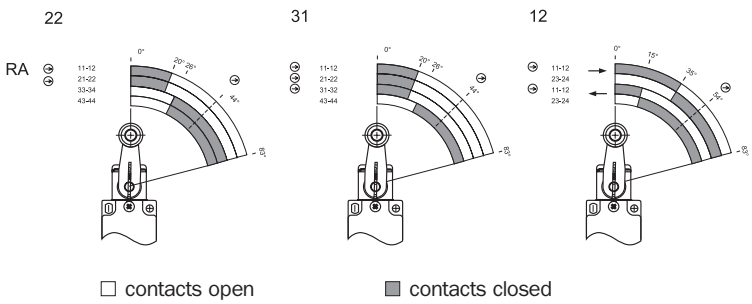
Drawings



Technical specifications

	i 110 R
Housing material	Die-cast zinc
Environmental protection to IEC 60529	IP 66
Mechanical service life (min.)	10 x 10^6 switching cycles
Approach speed (max.)	250 mm/s
Approach speed (min.)	50 mm/min.
Ambient temperature	-25…80° C
Type of connection	1 x M20
Switching principle	Slow release: (RA31/RA22) Quick release: (RA12)
Number of contacts (NO/NC)	Slow release: 3/1 (RA31), 2/2 (RA22) Quick release: 1/1 (RA12)
Maximum surge voltage U_{imp}	2500 V
Rated insulation voltage test U_i	250 V
Utilization category to IEC 60947-5-1	CA 15 CA: 3 A (230 V) CC 13: CC: 0.27 A (230 V)
Switching voltage (min)	CC 5 V
Switching current (min) at 5 V CC	5 mA
Short-circuit protection	F 15/15 A

Switching elements



☐ contacts open ■ contacts closed

Product selection table

Model	Contact	Connection	Part number
i110 RA 313	3 NC + 1 NO	M 20	6 025 107
i110 RA 223	2 NC + 2 NO	M 20	6 025 108
i110 RA 123	1 NC + 1 NO	M 20	6 025 109

We recommend contacting Customer Service for product selection

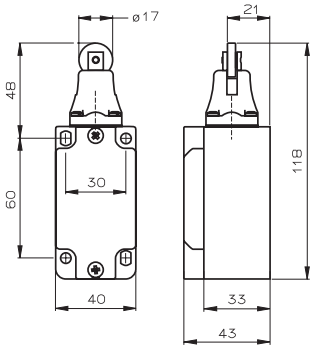
Safety interlocks
i110 P

The i110 P series safety position switches are designed to ensure reliability and safety in applications where movable guards and movable parts control machinery and equipment.

Versions are available with 3 NC + 1 NO, slow action 2 NC + 2 NO, or rapid action 1 NC + 1 NO, and with an optional rotation of the actuating head (4 x 90°).

The galvanized die-cast metal housing and the high degree of IP 66 protection, make the i110 P series suitable for a wide range of heavy-duty applications.

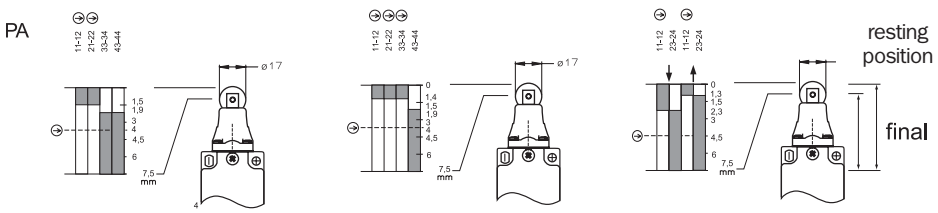
Drawings



Technical specifications

	i 110 P
Housing material	die-cast zinc
Environmental protection to IEC 60529	IP 66
Duration of mechanical service	10 x 10^6 switching cycles
Approach speed (max.)	250 mm/s
Approach speed (min.	50 mm/min.
Ambient temperature	-25…80° C
Type of connection	1 x M20
Switching principle	Slow release: (PA31/PA22) Quick release: (PA12)
Number of contacts (NO/NC)	Slow release: 3/1 (PA31), 2/2 (PA22) Quick release: 1/1 (PA12)
Impulsive voltage max. Uimp	2500 V
Maximum surge voltage U_i	250 V
Utilization category to IEC 60947-5-1	CA 15 AC: 3 A (230 V) CC 13 DC: 0.27 A (230 V)
Switching voltage (min)	CC 5 V
Switching current (min) at 5 V CC	5 mA
Short-circuit protection	F 15/15 A

Switching elements



Product selection table

Model	Contact	Connection	Part number
i 110 PA 313	3 NC + 1 NO	M 20	6 025 104
i 110 PA 223	2 NC + 2 NO	M 20	6 025 105
i 110 PA 123	1 NC + 1 NO	M 20	6 025 106

We recommend contacting Customer Service for product selection

Safety interlocks
i100 R

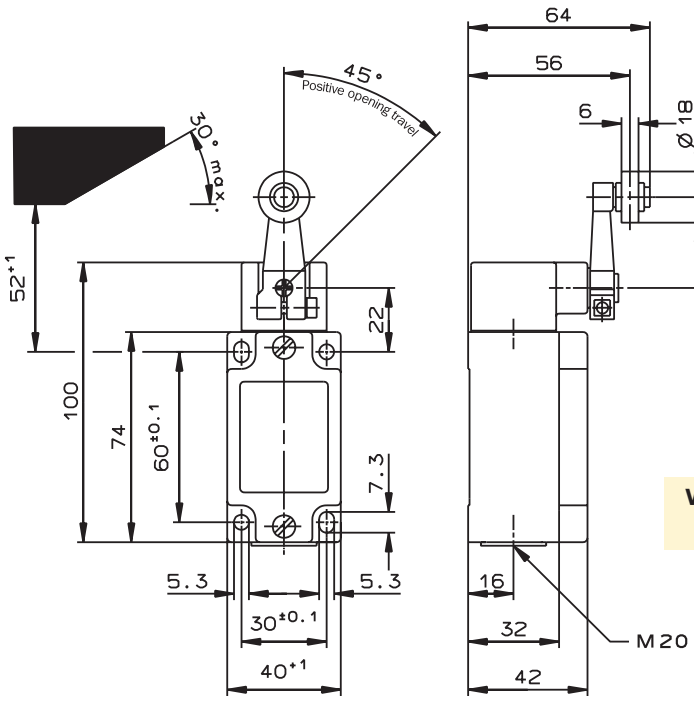
The i100 R series position switches are designed to ensure reliability and safety in applications where movable guards and movable parts control machinery and equipment.

Available models have slow trigger 3 NC + 1 NO and optional rotation of the actuating head (4 x 90°): as a result, this safety interlock series is flexible enough to meet the requirements of several applications.

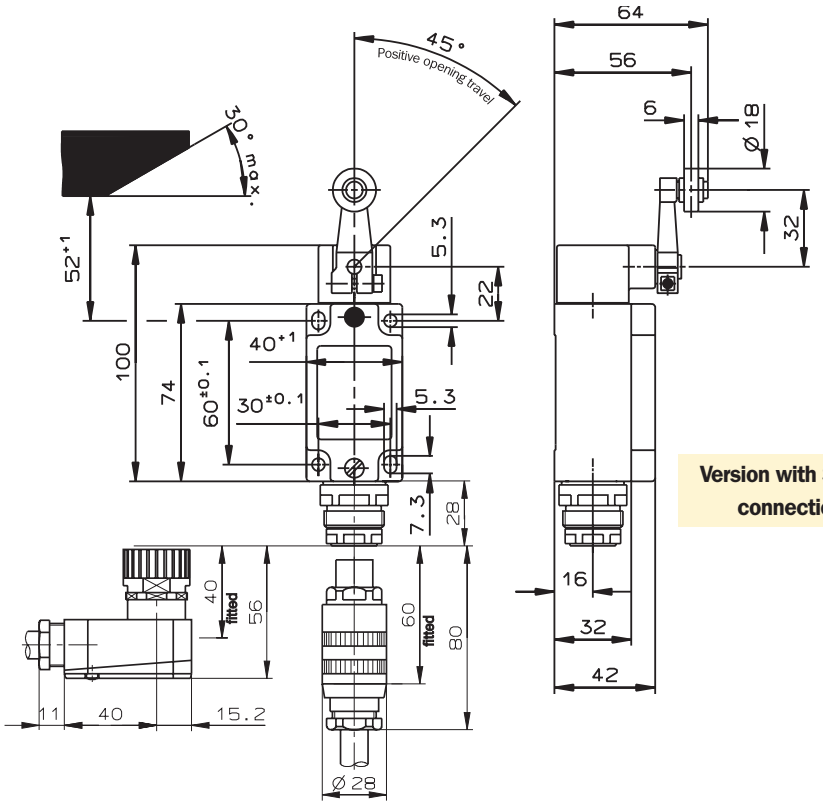
The adjustment ring nut for fastening the wheel shaft allows the linkage to be positioned at 90° steps (over 360°) with respect to the enclosure axis.

The aluminum housing and high protection rating (IP 67), make the i110 R series ideal for heavy-duty applications. Various models are available with either a metric electrical connection or a connection through SR 11 connector.

Drawings

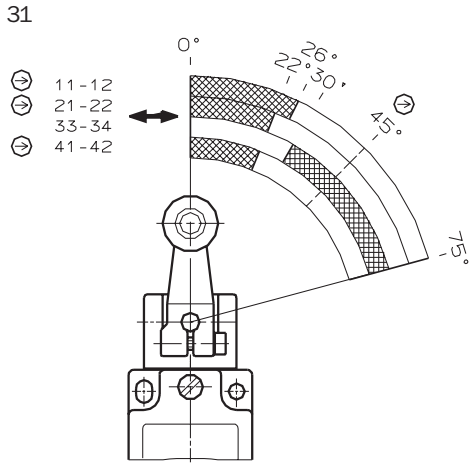


Version with metric connection



Version with SR 11 connection

Actuator travel



Installation notes

The vertical lever distance shown in the dimensional drawing should be taken into account for a correct use of the device.

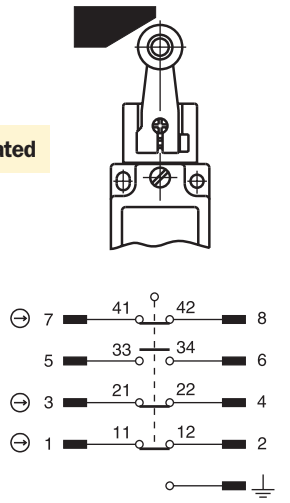
The radial lever should be installed in the interlock, as in compliance with VDI 2854, using rivets, welding or other methods suited to prevent possible detachment.

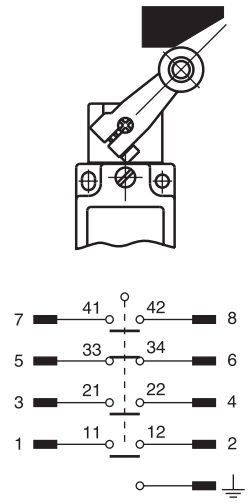
Technical specifications

	i100 R
Housing material	silver alloy, gold-plated
Environmental protection to IEC 529	IP 67
Mounting position	optional
Mechanical service life	30 X 10^6 switching cycles
Ambient temperature	-25…80° C
Actuator	steel roller lever
Approach speed (max.)[1]	60 m/min
Approach speed (min.)	0.1 m/min
Pretravel to switching point	see Actuator Travel diagram (above)
Roller isolation distance	45°
Actuating force	10 N
Switching element	31
Contact element	3 NC ⊖ + 1 NO
Switching principle	slow action
Closing time	< 4 ms
Bounce time	< 3 ms
Rated insulation voltage	250 V⎓, 50 V⎓ (version with connector)
Utilization category IEC 60 947-5-1	AC-15 Ue 230 V Ie 6 A/DC-13 Ue 24 V Ie 6 A AC 15 Ue 50 V Ie 6 A/DC-13 Ue 24 V Ie 6 A
Switching voltage (minimum)	12 V
Switching current (minimum)	10 mA
Switching current to 24 V	10 mA
Connection type	screw terminal M 20, SR 11
Cable cross-section	2 X 1.5 mm
Short-circuit protection	slow 10 A, fast 20 A
Weight	approx. 0.3 Kg
Certifications	CE, CSA, UL, BG

Switching elements

Not activated





Activated at 45°

Product selection table

Model	Roller lever	Communication element		Connector		Part number
		NC	NO	M20	SR 11	
i 100 -	R	3	1	3		6 022 588
i 100 -	R				2	6 012 131

We recommend contacting Customer Service for product selection

Accessories: connectors and cable glands

Connector technical specifications	
Housing material	plastic
Number of PIN	12 (11+PE)
Nominal tension	50 V ~/=
Protection class	IP 65
Type of connection	contact crimp 0.5…1.5 mm^2

Selection table			
Type		**Number of PIN**	**Part number**
SSR 11, flying connector	straight	11 + PE	6 020 757
ASR 11, flying connector	angled	11 + PE	6 020 758
Connector	male socket	11 + PE	6 020 759
Cable gland M16			5 309 163
Cable gland M20			5 309 163
Cable gland PG 13.5			5 305 811

We recommend contacting Customer Service for product selection

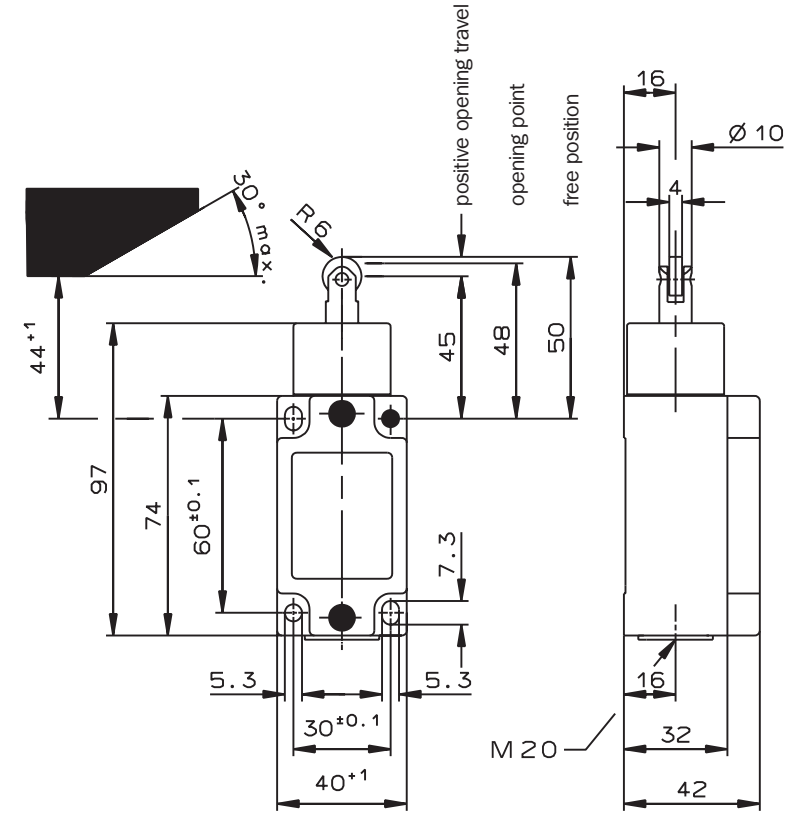
Safety interlocks
i100 P

The i100 P series safety position switches are designed to ensure reliability and safety in applications where movable guards and movable parts control machinery and equipment.

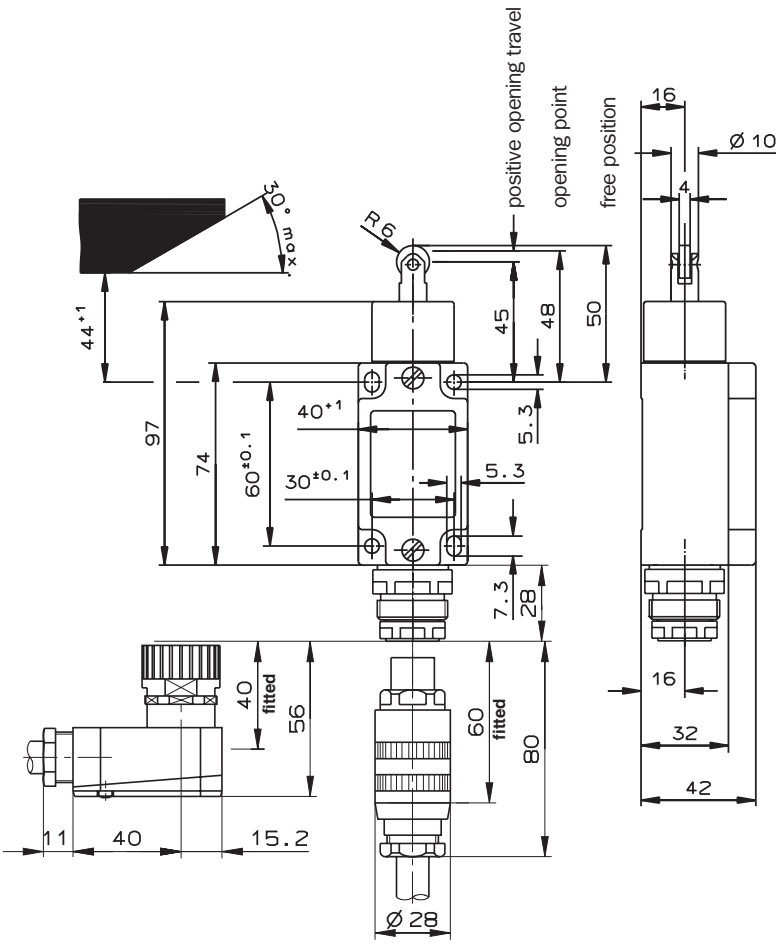
Available models have slow trigger 3 NC + 1 NO and optional rotation of the actuating head (4 x 90°).

Due to the i100 P series' aluminum housing and to the high protection rating (IP 67), it is suitable for a wide range of heavy-duty applications. Various models are available with either a metric electrical connection or a connection through SR 11 connector.

Drawings

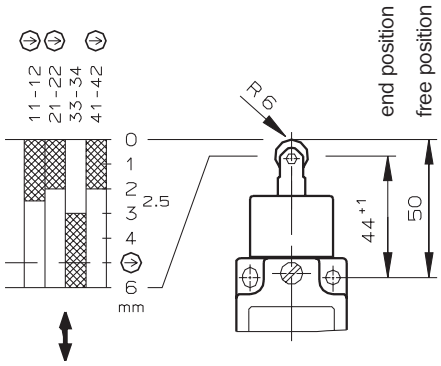


Version with metric connection



Version with SR 11 connection

Actuator travel

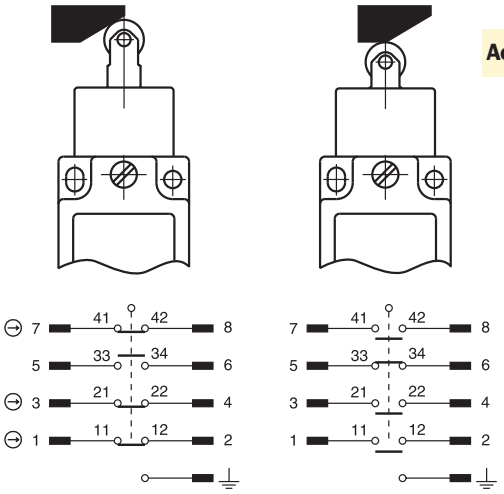


Technical specifications

	i100 P
Housing material	die-cast light alloy, anodized
Environmental protection to IEC 529	IP 67
Mounting position	optional
Mechanical service life	30 X 10 ^{6} switching cycles
Ambient temperature	-25…80° C
Plunger type	steel roller
Approach speed (max.)[1]	20 m/min
Approach speed (min.)	0.01 m/min
Pretravel up to switching point	see Actuator Travel diagram
Actuating force	15 N
Switching elements	31
Contact elements	3 NC ⊖ + 1 NO
Switching principle	slow-action
Closing time	< 4 ms
Bounce time	< 3 ms
Rated insulation voltage	250 V⎓ 50 V⎓ (version with connector)
Utilization category to IEC 947-5-1	AC-15 Ve 230 V Ie 6 A/DC-13 Ve 24 V Ie AC-15 Ue 50 VI e 6 A/DC-13 Ue 24 VIe 6A
Switching voltage (min.)	12 V
Switching current (min.)	10 mA
Contact material	silver alloy, gold-plated
Type of connection	screw terminal
Cable cross-section (max.)	2 X 1.5 mm
Short-circuit protection (control circuit fuse)	slow 10 A, fast 20 A
Weight	approx. 0.3 Kg
Certifications	CE, CSA, UL, BG

Switching elements

Not activated



Activated at 5 mm

If broken, entire switch has to be replaced

Product selection table

Model	Plunger	Communication element		Connector		Part number
		NC	NO	M20	SR 11	
i100 -	P	3	1	3		6 022 589
i100 -	P				2	6 012 132

We recommend contacting Customer Service for product selection

Accessories: connectors and cable glands

Connector technical specifications	
Housing material	plastic
Number of PIN	12 (11+PE)
Nominal tension	50 V ~/=
Protection class	IP 65
Type of connection	contact crimp 0.5…1.5 mm^2

Selection table			
Type		Number of PIN	Part number
SSR 11, flying connector	straight	11 + PE	6 020 757
ASR 11, flying connector	angled	11 + PE	6 020 758
Connector	male socket	11 + PE	6 020 759
Cable gland M16			5 309 163
Cable gland M20			5 309 163
Cable gland PG 13.5			5 305 811

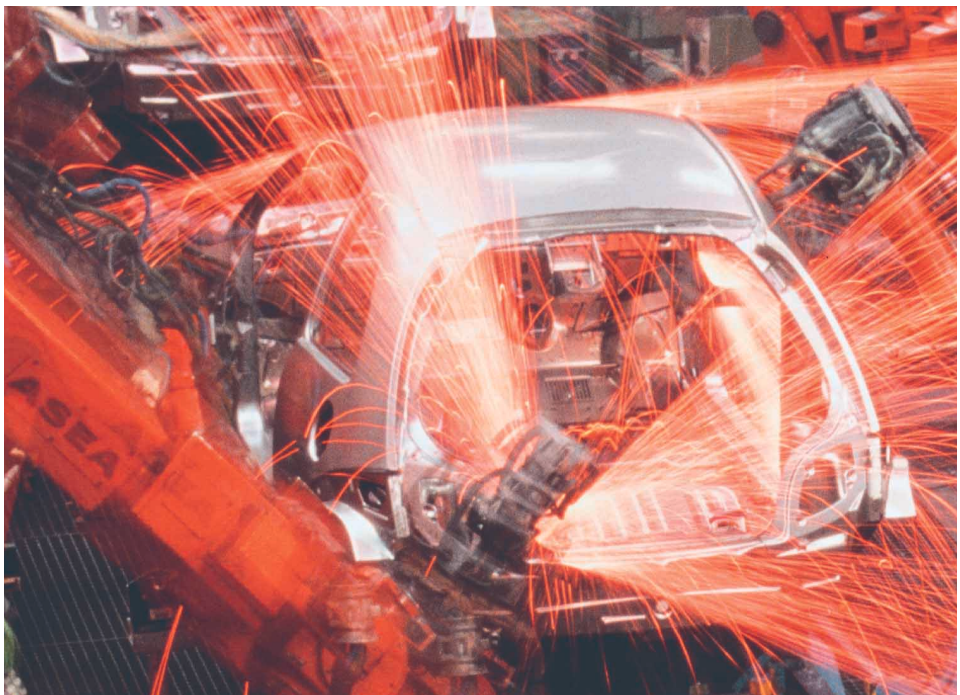
We recommend contacting Customer Service for product selection

Safety interlocks
i110 H

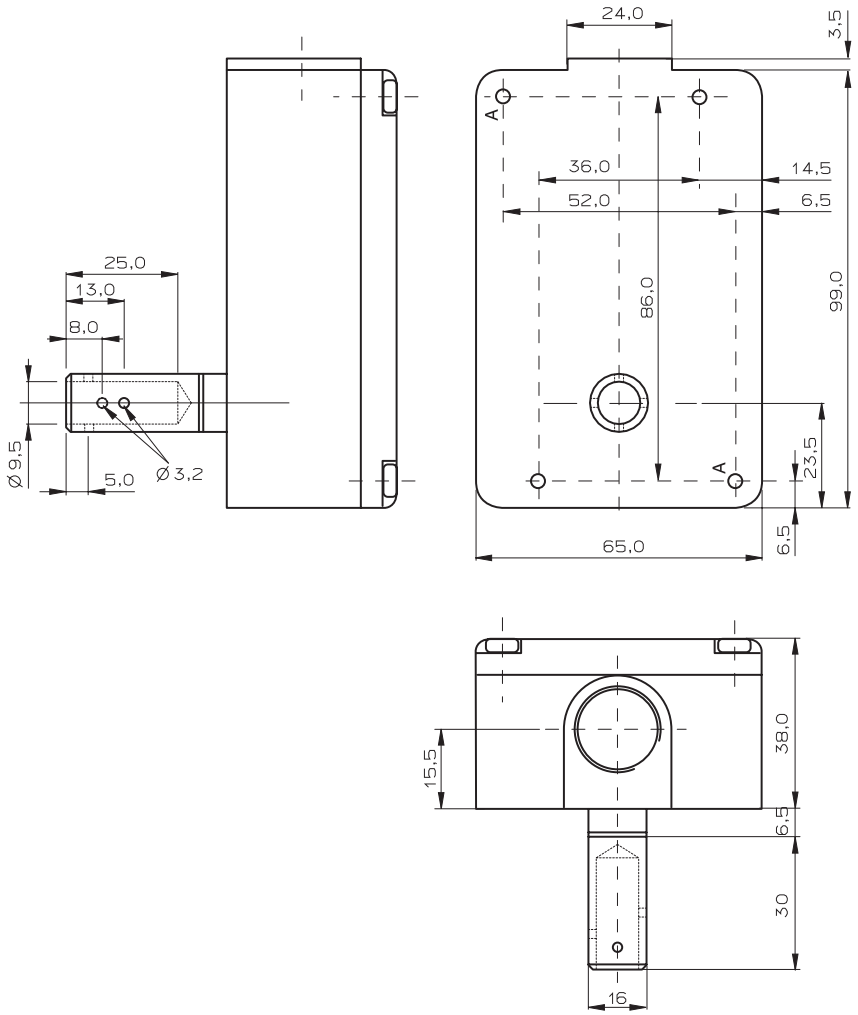
The i110 H hinge safety interlock can be directly connected to the guard pivots. A machine with this safety device will stop even when the guard is open only at 5°. For applications requiring a wider operating angle, the internal cam may be adjusted from 5° to 11°.

The i110 H models come with either 2 forced opening, normally closed contacts (NC) or with 1 signaling, normally open contact (NO). This device meets all safety requirements, and the equipment onto which the device is installed is consequently in compliance with the machinery directive.

The die-cast metal housing, IP 66 grade protection, and the M16 connection make the i110 H series suitable for heavy-duty applications.



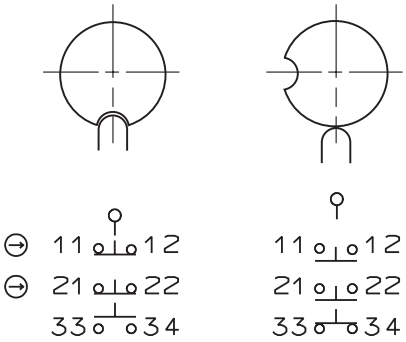
Drawings



Technical specifications

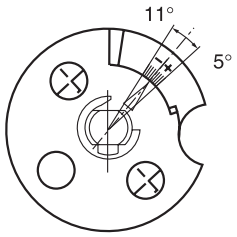
	i 110 H
Housing material	die-cast light alloy
Shaft material	stainless steel
Environmental protection to IEC 60 529	IP 66
Mechanical service life	10^6 switching operation
Ambient temperature	-25…80° C
Mounting position	optional
Connection type	M 20
Approach speed (max.)	160 mm/s
Switching angle	5…11° adjustable
Frequency of use (max.)	1 cycle/s
Contact elements positively guided NC/NO contacts	2/1
Rated insulation voltage	Vi = 250 V⎓
Utilization category to IEC 60 947-5-1	AC-15 AC: 2A (250 V), 5 A (100 V) DC 13/DC: 0.4 A (250 V), 2 A (24 V)
Switching voltage (min.)	5 V
Switching current (min.) at 5 V	5 mA
Cable cross-section	1 X 1.5 mm^2
Short-circuit protection	T 6
Weight	0.42 Kg
Certifications	CE, cULus

Switching elements



2 NC to forced opening positive + 1 NO

Adjusting the switching angle



The switching angle may be set in a range 5° … and 11° (after testing, the safety interlock and the cam switch should be securely linked to ensure connection integrity).

Installation notes

The safety interlock is ideal for the protection of hinged doors. This stop should not be used as a mechanical stop. The limit stop and the cam switch should be adequately secured against positional changes.

Product selection table

Model	Element of actuator to hinge	Communication element		Connector	Part number
		NC	NO	M20	
i 110 -	HA	2	1	3	6 025 072

We recommend contacting Customer Service for product selection

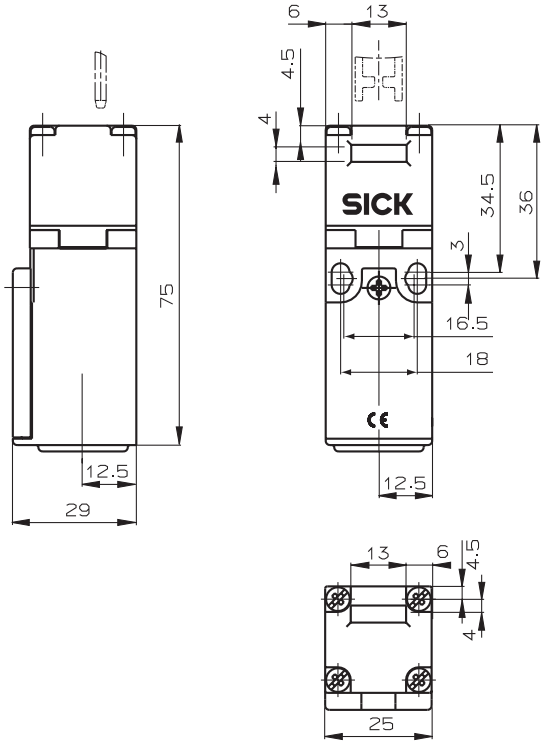
Safety interlocks
i12

The i12 series of safety switches are designed to ensure reliability and safety in movable guard control applications. The i12 comes in a variety of versions with 1 NC, 1 NC + 1 NO, or slow action 2 NC + 1 NO… and optional rotation of the actuating head (4 x 90°). This series also has a fiberglass reinforced thermoplastic housing and a high protection rating (IP 67).

The device's high retention force keeps the actuating key within the head even under demanding conditions such as strong vibrations, which prevents false opening of the guard.

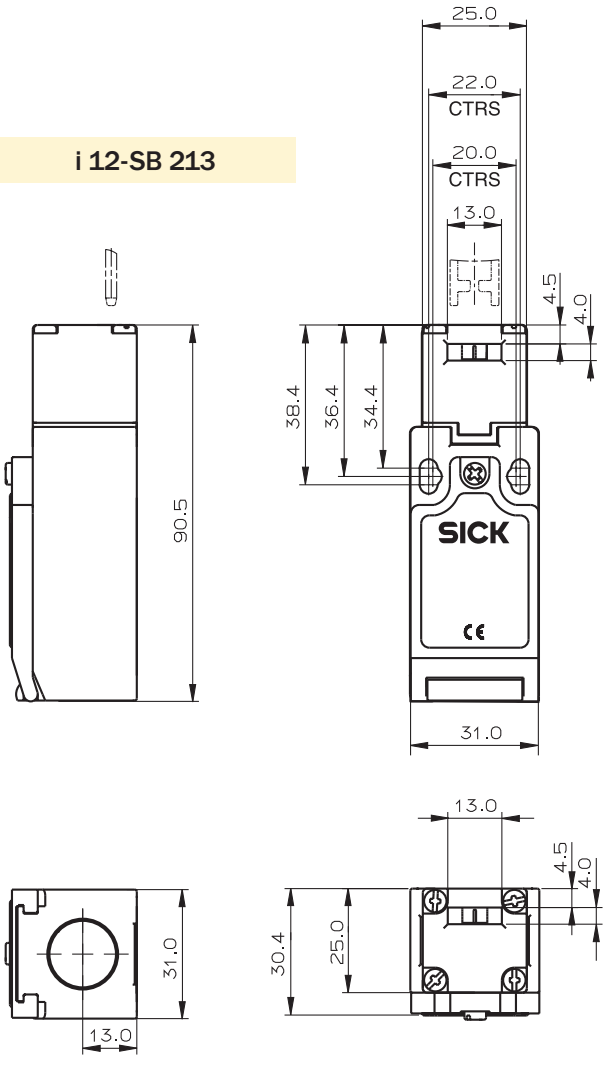
Accessories, such as a stainless steel covering head capable of engaging the key inside the actuating head, make the i12 series of safety switches ideal for many light-duty applications.

Drawings



i 12-SA103
i 12-SA113

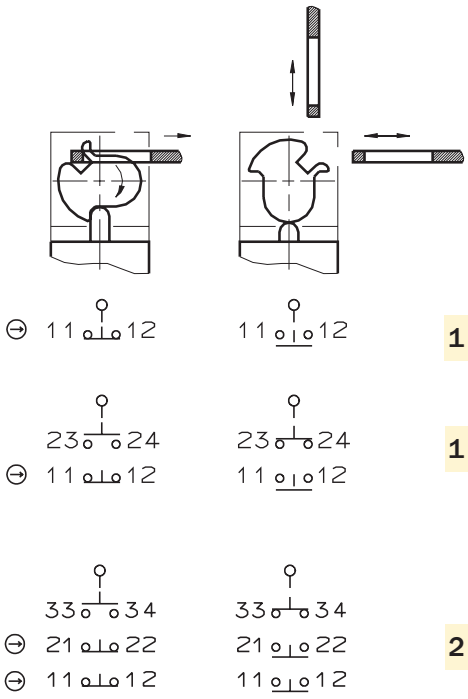
i 12-SB 213



Technical specifications

	i 12
Housing material	glass-reinforced plastic
Environmental protection to IEC 60 529	IP 67
Mechanical service life	10^6 switching cycles
Ambient temperature	-20…80° C
Mounting position	optional
Connection type	1 X M 16
Approach speed (max.)	160 mm/s
Actuating force	6 N
Frequency of use (max.)	1 cycle/second
Contact elements positively guided NC/NO contacts	2/1 or 1/1 or 1/0
Rated insulation voltage	Vi = 250 V
Utilization category to IEC 60 947-5-1	AC 15/3 A (240 V), 6 A (120V) DC 13/1.1 A (250 V), 2.2 A (125 V)
Switching voltage (min.)	5 V
Switching current (min.) at 5 V	5 mA
Cable cross-section	1 X 1.5 mm^2
Short-circuit protection	slow 10 A/10 A
Certifications	CE, cULus, TÜV

Switching elements

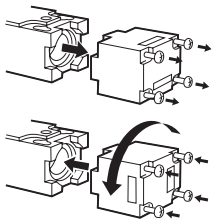


Installation notes

The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can not be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

Direction of actuator insertion

- The small head can be oriented according to the desired insertion direction by unscrewing the four clamping screws.
- The switch is supplied with the small head set positioned in the A direction



If broken, complete safety switch and actuator should be replaced

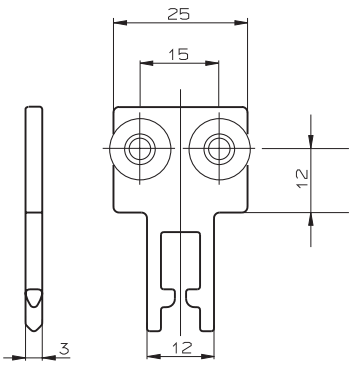
Product selection table

Model	Variant	Contact		Connector M 16	Part number
		NC	NO		
i 12	SA	1	0	3	6 025 056
i 12	SA	1	1	3	6 025 057
i 12	SB	2	1	3	6 025 059

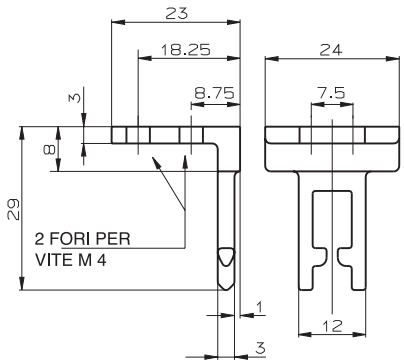
We recommend contacting Customer Service for product selection

Accessories

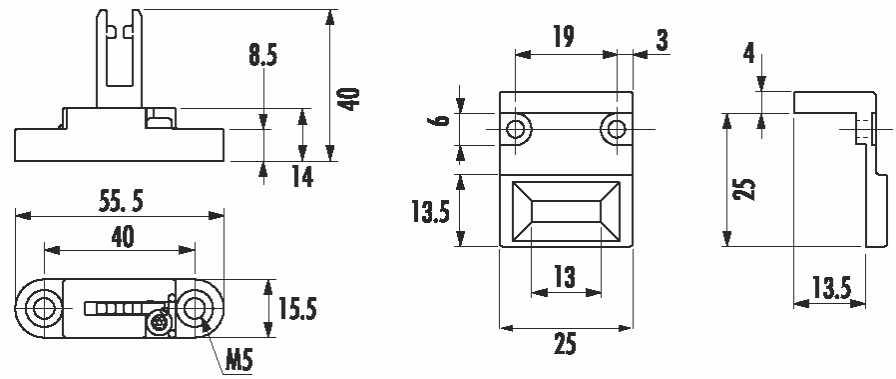
Straight actuator iE12-S1
Part number 5 311 131



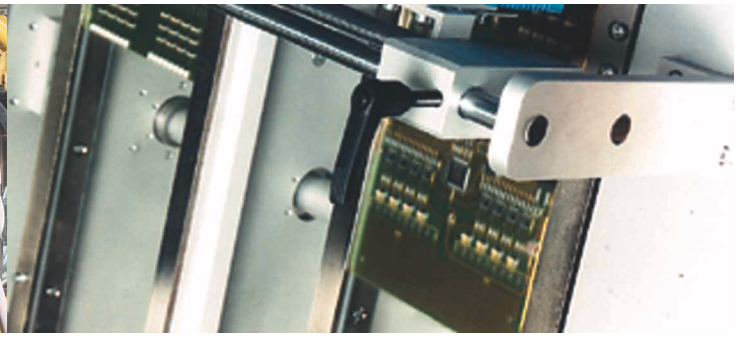
Actuator at 90° iE12-A1
Part number 5 311 132



Flexible actuator with stainless steel head iE 12-F1
Part number 5 308 842



Safety interlocks
i10



The i10 series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

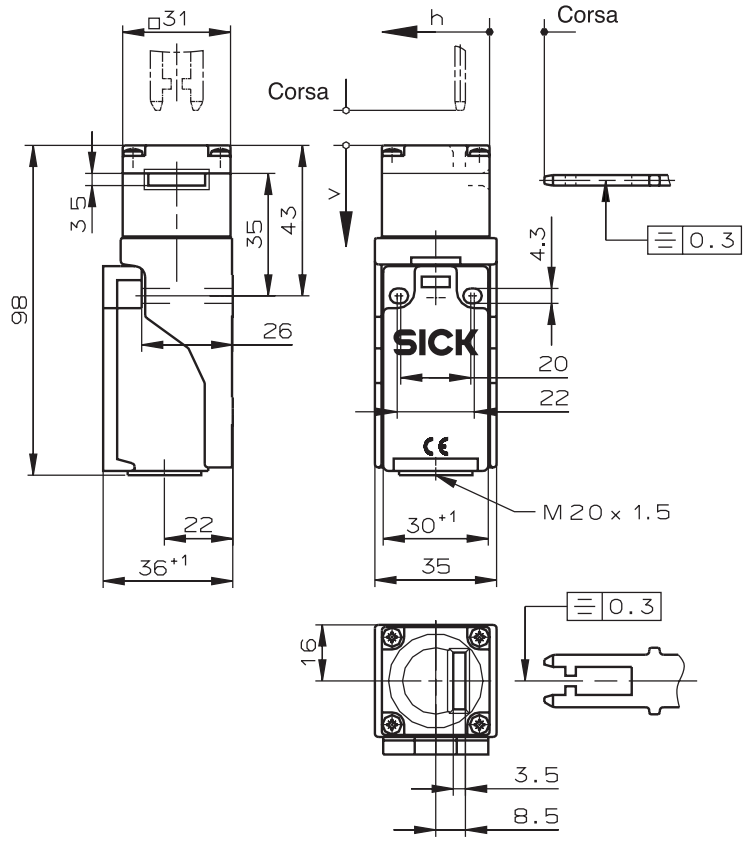
The i10 comes in a variety of versions with 1 NC, 1 NC + 1 NO, or slow action 2 NC + 1 NO… and optional rotation of the actuating head (4 x 90°). This series also has a fiberglass reinforced thermoplastic housing and a high protection rating (IP 67).

The device's high retention force keeps the actuating key within the head even under demanding conditions such as strong vibrations, which prevents false opening of the guard.

Accessories, such as a stainless steel covering head capable of engaging the key inside the actuating head, make the i10 series ideal for many light-duty applications.

The wide variety of accessories allows for greater flexibility- even on guards with difficult alignments.

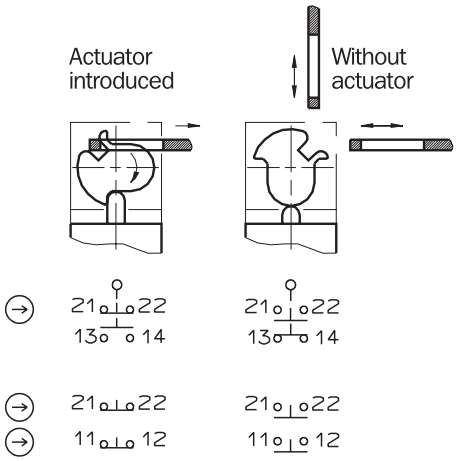
Drawings



Technical specifications

	i 10
Housing material	glass-reinforced plastic
Environmental protection to IEC 529	IP 67
Mounting position	optional
Mechanical service life	10^6 switching cycles
Ambient temperature	-20...80° C
Approach speed (max.)	20 m/min
Switching elements	11/20
Contact elements	1 NC ⊖ + 1 NO / 2 NC ⊖
Switching principle	dependent action contact element
Rated insulation voltage	Vi = 400 V ≂
Utilization category to IEC 947-5-1	AC-15 Ve 230 Vle 4 A/DC 13 Ve 234 V le 4 A
Switching voltage (min.)	24 V
Switching current (min.) 24 V	30 mA
Contact material	silver alloy
Connection type	screw terminal
Retained force	10 N
Cable cross-section	1.5 mm^2
Short-circuit protection (control circuit fuse)	slow 6A / fast 10A
Weight	approx. 0.1 Kg
Approach direction, from side (horizontal)	28 + 2 mm
Approach direction, from top (vertical)	29.5 + 1.5 mm
Certifications	CE, BG, CSA, SAQ, SOVA, CNA, INSAI, UL

Switching elements



11 depends on action of contact element, 1 NC to forced opening + 1 NO

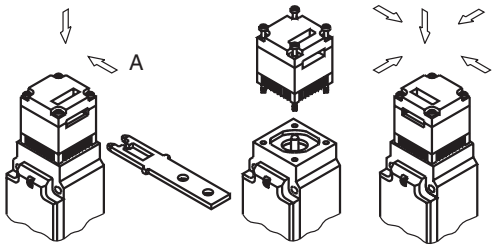
20 depends on action of contact element, 2 NC to forced opening

Installation notes

The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can no be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

Direction of insertion

- The small head can be oriented according to the desired insertion direction by unscrewing the four clamping screws.
- The switch is supplied with the small head set positioned in the A direction



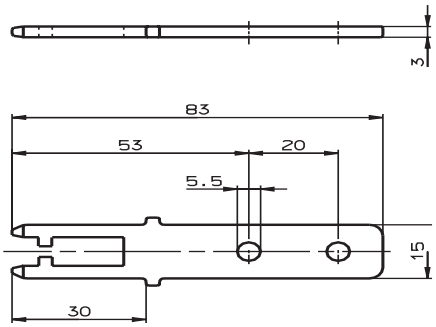
Product selection table

Model	Mounting EN 50 047	Dual pole switch NC	NO	Connector M 20	Part number
i 10	A	1	1	3	6 022 530
i 10	A	2	0	3	6 022 529

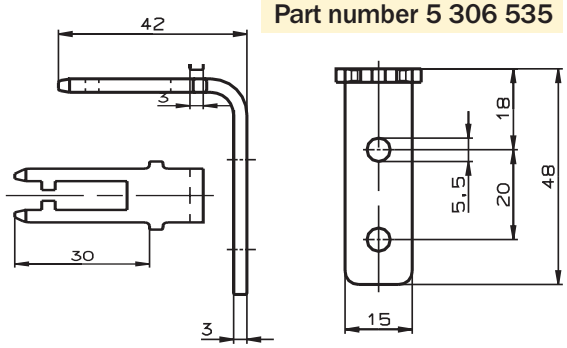
We recommend contacting Customer Service for product selection

Accessories

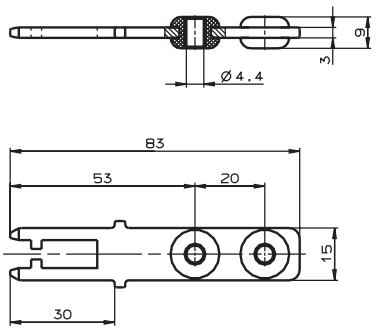
Straight actuator iE10-S1
Part number 5 306 527



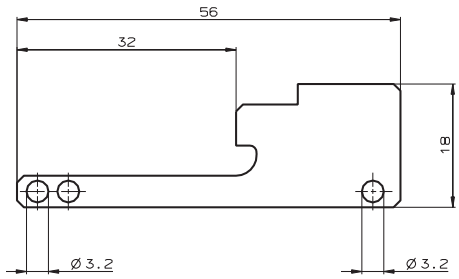
Actuator angled 90° iE10-A1
Part number 5 306 535



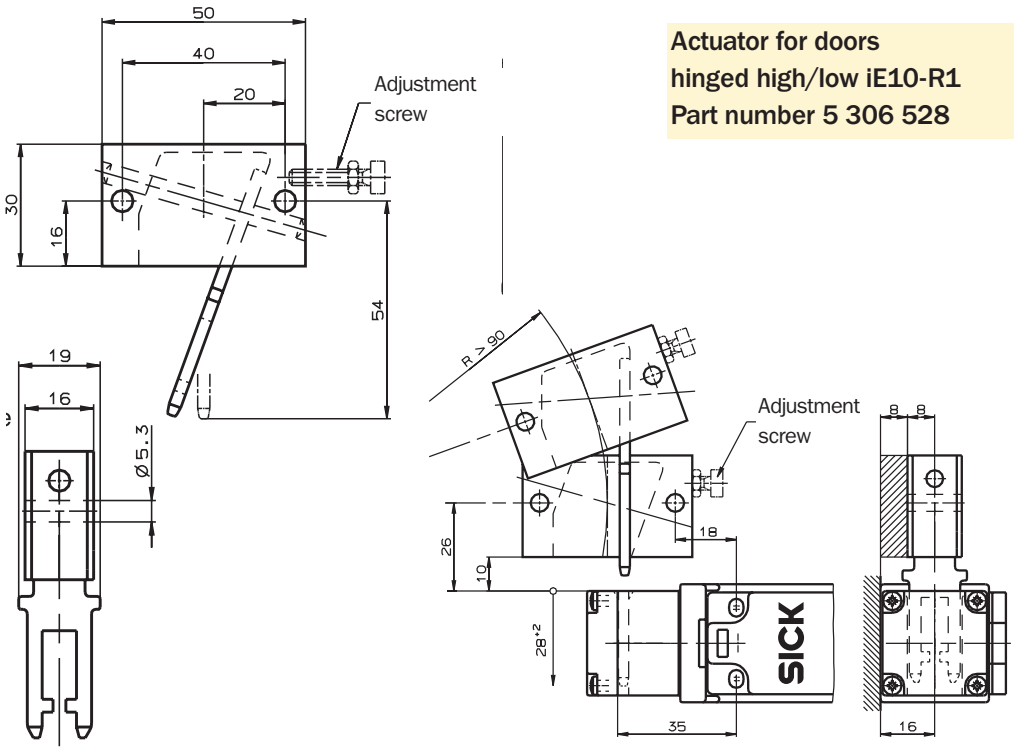
Straight actuator with fastening rubber iE10-S2
Part number 5 306 527



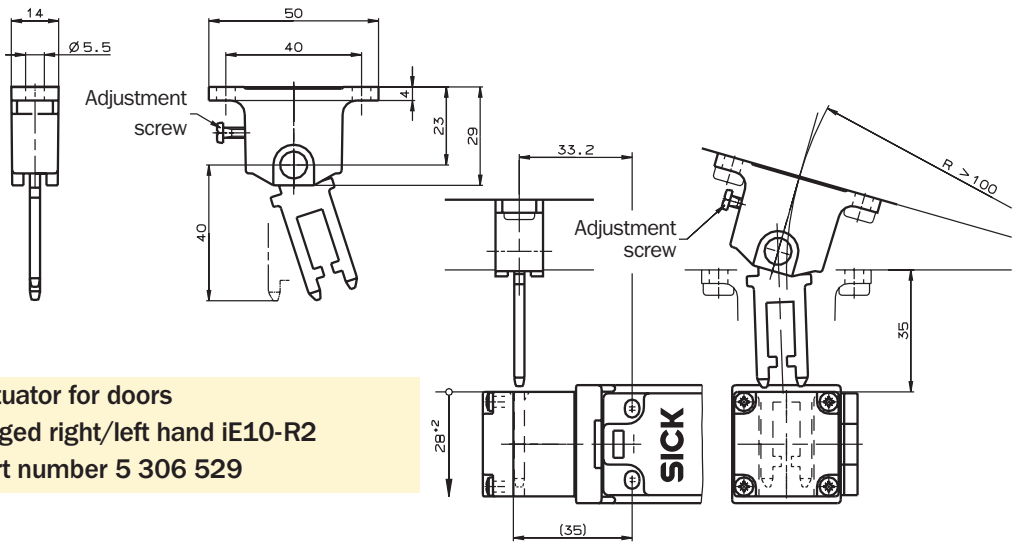
Lockable key iE10-S2
Part number 5 306 536



Actuator for doors hinged high/low iE10-R1
Part number 5 306 528



Actuator for doors hinged right/left hand iE10-R2
Part number 5 306 529



Safety interlocks
i16

The i16 series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

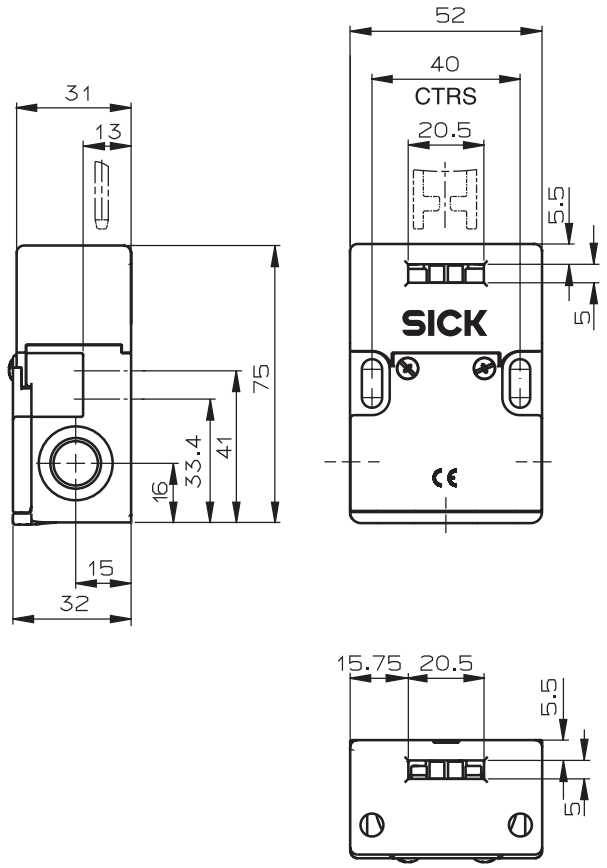
The i16 comes in a variety of versions with 1 NC, 1 NC + 1 NO, or slow action 2 NC + 1 NO… and optional rotation of the actuating head (4 x 90°). This series also has a fiberglass reinforced thermoplastic housing and a high protection rating (IP 67).

The device's high retention force keeps the actuating key within the head even under demanding conditions, which prevents false opening of the guard.

Accessories, such as a stainless steel covering head capable of engaging the key inside the actuating head, make the i16 series ideal for many light-duty applications.

Another auxiliary retention device allows the retention force to be increased up to 50 N when dealing with applications that have extreme operating conditions.

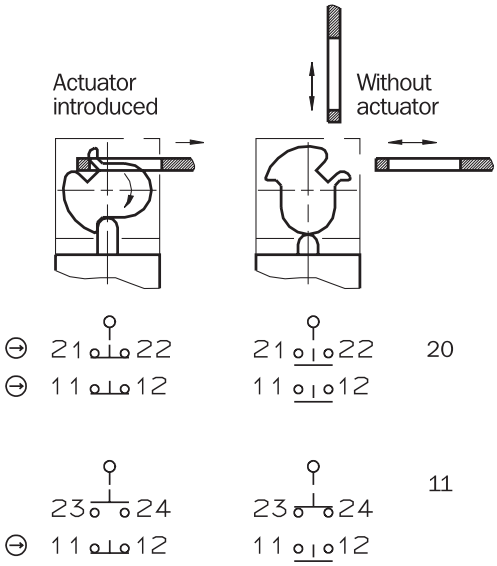
Drawings



Technical specifications

	i 16
Housing material	glass-reinforced plastic
Environmental protection to IEC 60 529	IP 67
Mechanical service life	10^6 switching cycles
Ambient temperature	-20…80° C
Mounting position	optional
Connection type	3 X M 20
Approach speed (max.)	160 m/s
Actuating force	30 N
Frequency of use	2 cycles/second
Contact elements positively guided NC/NO contacts	2/1 or 1/1
Rated insulation voltage	250 V
Utilization category to IEC 60 947-5-1	AC-15/AC: 2 A (250 V), 5 A (100 V) DC 13/DC: 0,5 A (250 V), 2 A (24 V)
Switching voltage (min.)	5 V
Switching current (min.)	5 mA
Cable cross-section	1 X 1.5 mm^2
Short-circuit protection	slow 10 A / 10 A
Certifications	CE, cULus, TÜV

Switching elements

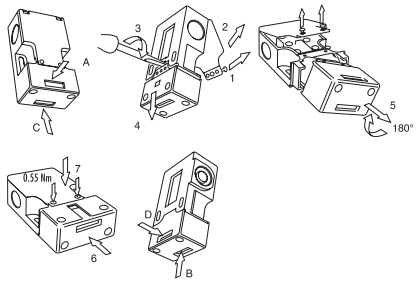


Installation notes

The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can no be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

Direction of insertion

- The small head can be oriented according to the desired insertion direction by unscrewing the four clamping screws.
- The switch is supplied with the small head set positioned in the A direction



If broken, complete safety switch and actuator should be replaced

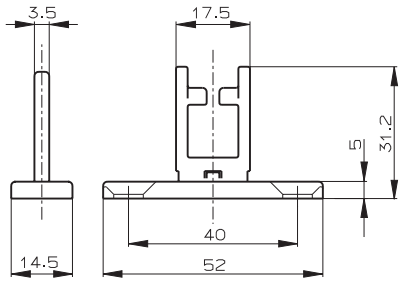
Product selection table

Model	Variant	Dual pole Switch		Connector M 20	Part number
		NC	NO		
i 16	SA	2	0	3	6 025 063
i 16	SA	1	1	3	6 025 065

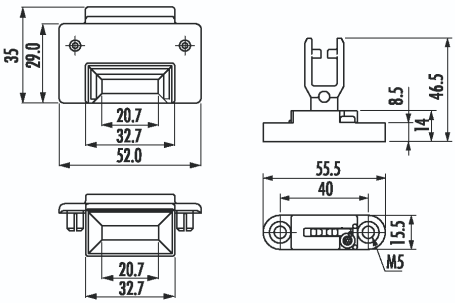
We recommend contacting Customer Service for product selection

Accessories

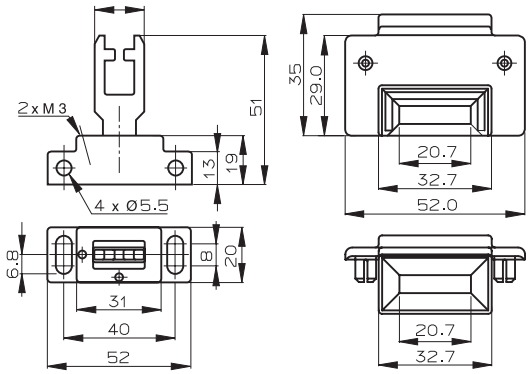
Actuator straight iE16-S1
Part number 5 311 128



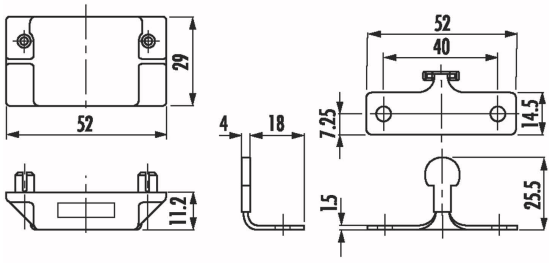
Flexible with technopolymer head
iE16-F2 - Part number 5 311 278



Flexible actuator iE16-F1
Part number 5 311 129



iE16-SCR - Part number 5 310 780
auxiliary holding device (50N)
(solo with actuator STD. iE16-S1)

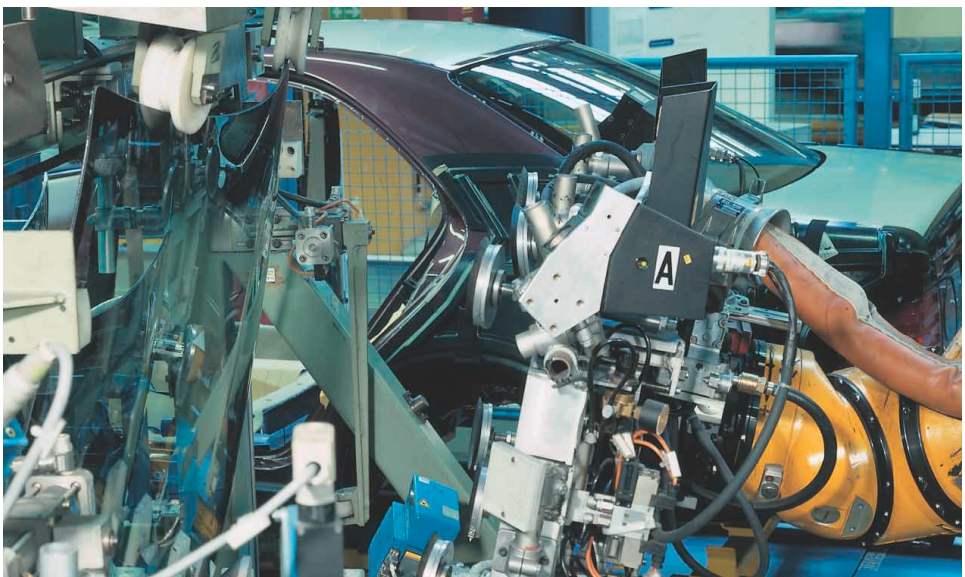


Safety interlocks
i17

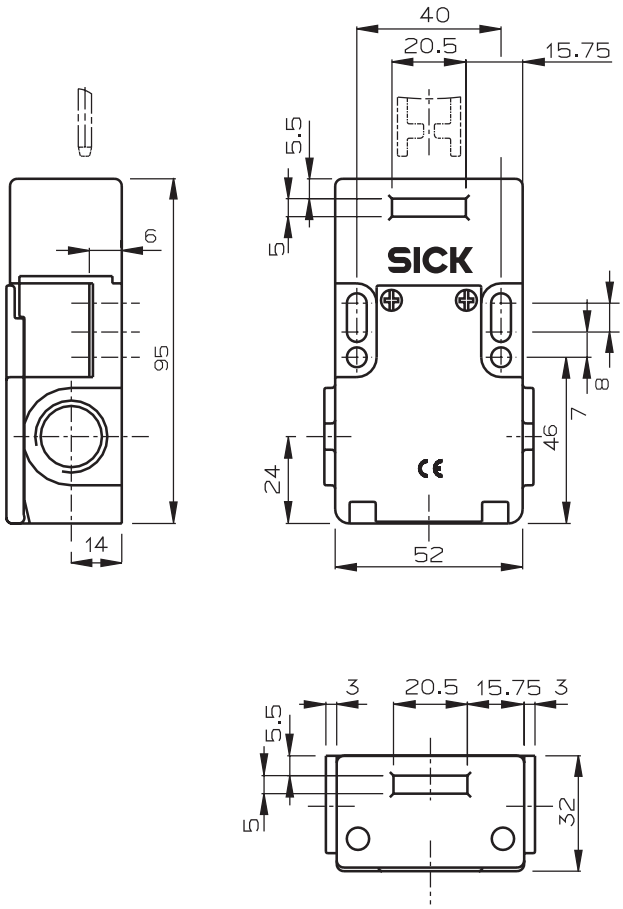
The i17 series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

Due to the contact block with slow action 2 NC + 1 NO and to the optional rotation of the actuating head (2 x 180°), the flexibility of this safety switch series makes it ideal for several applications. The i17 also has a fiberglass reinforced thermoplastic housing and a high protection rating (IP 67). The wide range of accessories, including a technopolymer covering head with flexible actuator engagement and 3 cable ports, make it suitable for many monitoring and safeguarding applications.

Another auxiliary retention device allows the retention force to be increased up to approximately 30 N when dealing with demanding applications.



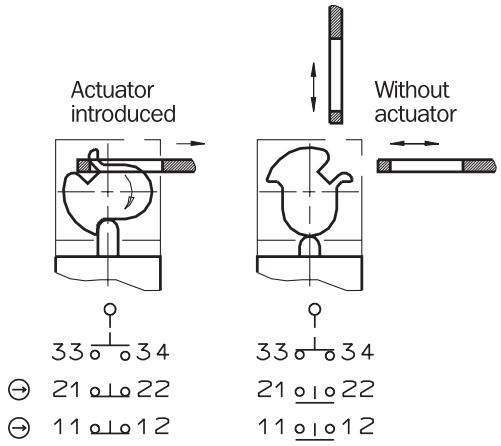
Drawings



Technical specifications

	i 17
Housing material	glass-reinforced plastic
Environmental protection to IEC 60 529	IP 67
Mechanical service life	$1x10^5$ switching cycles
Ambient temperature	-20…80° C
Mounting position	selectable
Connection type	3 X M 20
Approach speed (max.)	1 m/s
Actuating force (min.)	12 N
Frequency of use (max.)	2 cycles/second
Contact elements positively guided (NC/NO)	2/1
Rated impulse with stand voltage U_{imp} contacts referred to housing	2500 V
Rated insulation voltage U_i	250 V
Utilization category to IEC 60947-5-1	CA 15 CA: 2 A (250 V), 5 A (100 V); CC 13 CC: 0.5 A (250 V, 2 A (24 V)
Switching voltage (min.)	5 V CC
Switching current (min.) at 5 V CC	5 mA
Wire cross-section	1 x 1.5 mm^2
Short-circuit protection (control circuit fuse EN 60269)	T10/10 A

Switching elements



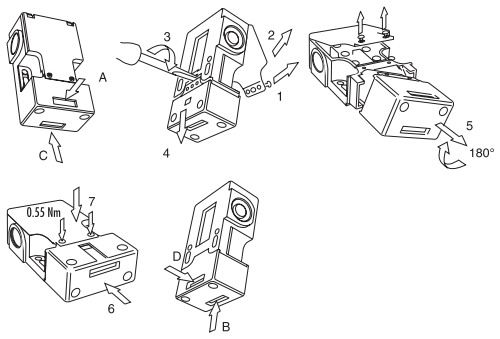
i17-SA213

Installation notes

The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can no be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

Direction of insertion

- The small head can be oriented according to the desired insertion direction by unscrewing the four clamping screws.
- The switch is supplied with the small head set positioned in the A direction



If broken, complete safety switch and actuator should be replaced

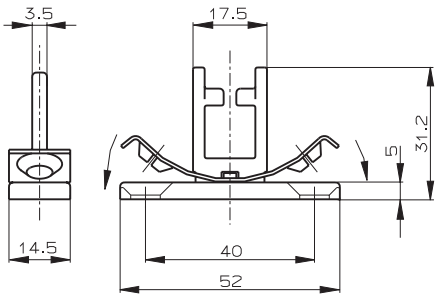
Product selection table

Model	Variant	Dual pole Switch		Connector M 20	Part number
		NC	NO		
i 17	SA	2	1	3	6 025 067

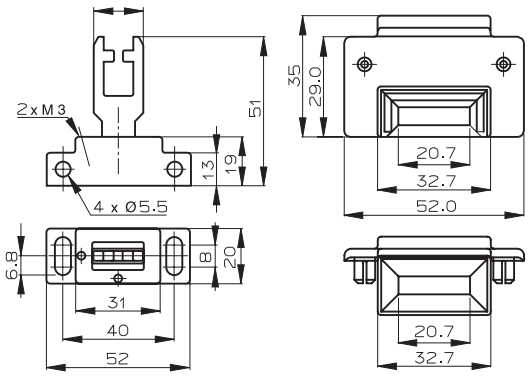
We recommend contacting Customer Service for product selection

Accessories

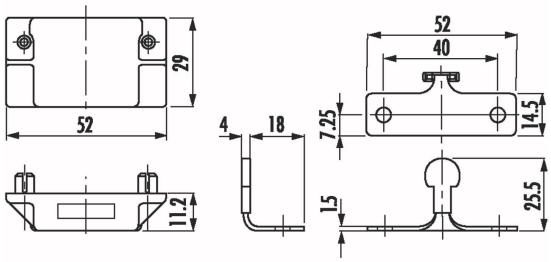
Actuator straight iE17-S1
Part number 5 311 130



Flexible with technopolymer head iE16-F1
Part number. 5 311 129



Auxiliary holding device (~ 30N) iE 16-SCR
Solo with actuator STD iE16-S1
Part number 5310780

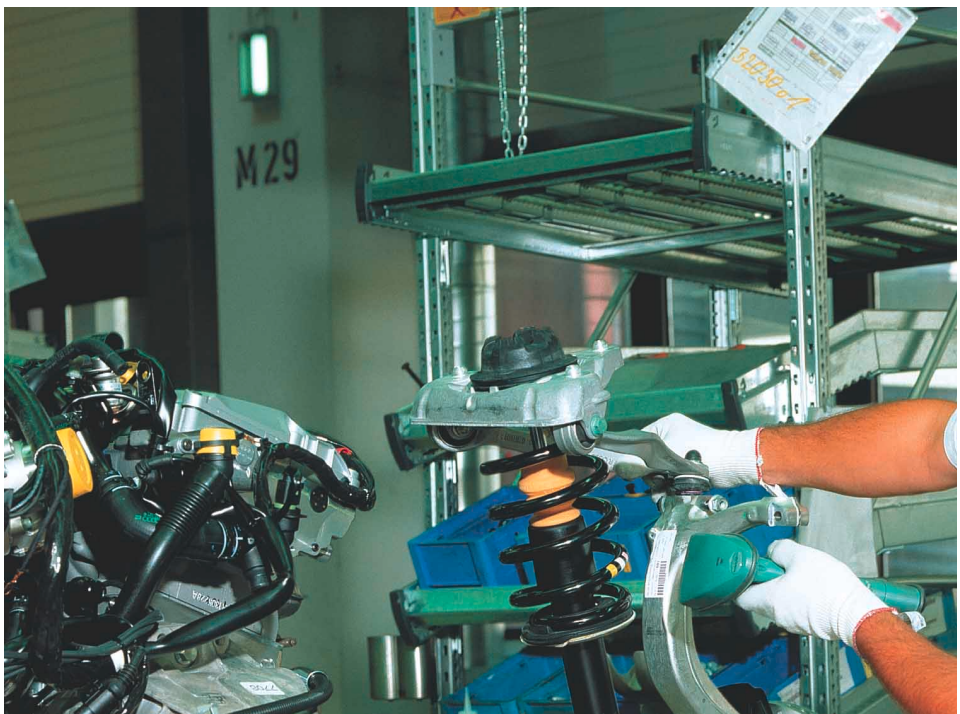


Safety interlocks
i110 S

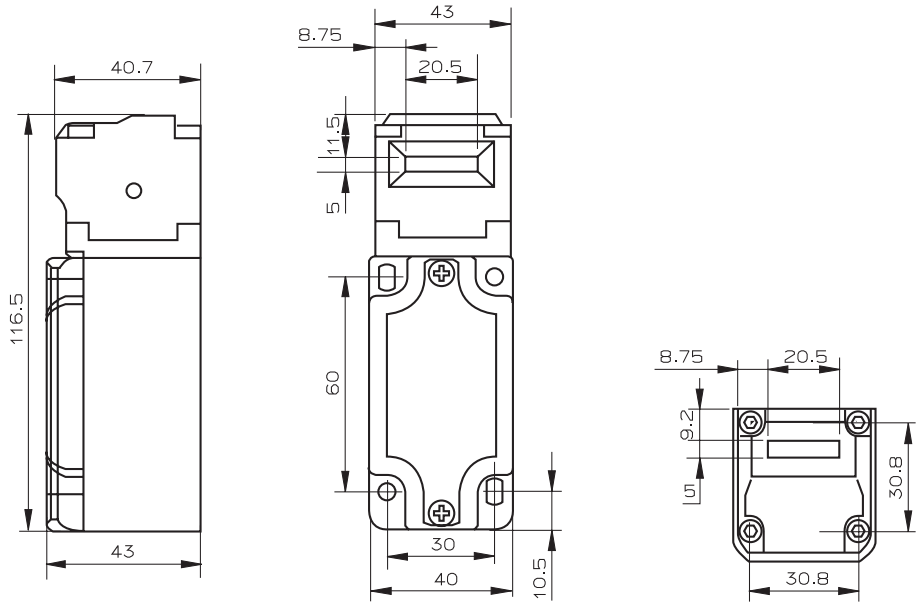
The i110 S series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

The i110 S comes in a variety of versions with 1 NC, 1 NC + 1 NO, or slow action 2 NC + 1 NO… and optional rotation of the actuating head (4 x 90°). The i110 S's sturdy metal housing and high protection rating (IP 67) make this series suitable for heavy-duty applications in the automotive industry.

Due to the special design of the insertion head with an engagement for the actuating key, the safety switch is ideal for applications where heavy guards prevent misalignment problems.



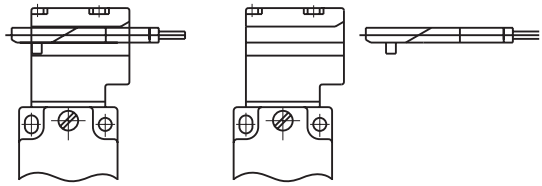
Drawings

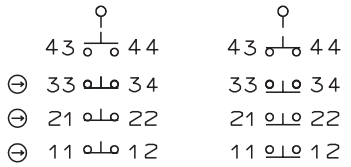


Technical specifications

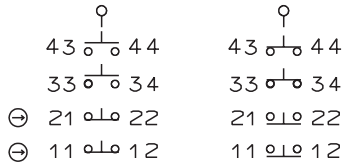
	i110 S
Housing material	die-cast zinc
Environmental protection to IEC 60 529	IP 67
Mechanical service life	10^6 switching cycles
Ambient temperature	-20…80° C
Mounting position	optional
Connection type	M 20
Approach speed (max.)	1 m/s
Actuating force (min.)	12 N
Frequency of use	2 cycle/second
Contact elements positively guided (NC/NO)	3/1 or 2/2
Rated insulation voltage	Ui = 250 V⎓
Utilization category to IEC 60 947-5-1	AC 15/AC: 2A (250 V), 5A (100 V) DC 13/DC: 2A (250 V), 2A (24 V)
Switching voltage (min.)	5 V
Switching current (min.) at 5 V	5 mA
Wire cross-section	1 x 1.5 mm^2
Short-circuit protection	slow 10A/10A
Weight	0.52 Kg
Certifications	CE, cULus

Switching elements





31 — **3 NC to forced opening positive + 1 NO**



22 — **2 NC to forced opening positive + 2 NO**

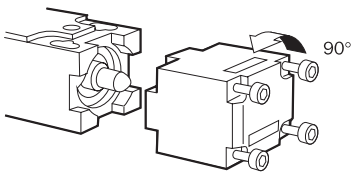
Installation notes

The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can no be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

Any unused slots should be covered with the appropriate supplied covers.

Direction of insertion

- **Once the 4 screws are removed, the head can be rotated according to individual requirements.**



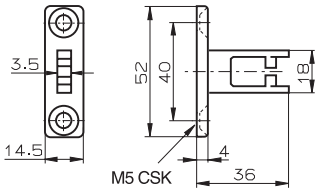
If broken, safety switch should be replaced

Product selection table

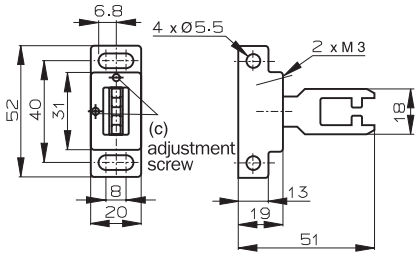
Model	Separate Actuator Key	Switching elements NC	Switching elements NO	Connector M 20	Part number
i 110-	SA	3	1	3	6 025 073
i 110-	SA	2	2	3	6 025 074

We recommend contacting Customer Service for product selection

Accessories



Straight actuator iE110-S1
Part number 5 311 134



Actuator flexible iE 110-F1
Part number 5 311 135

Safety interlocks
i100 S

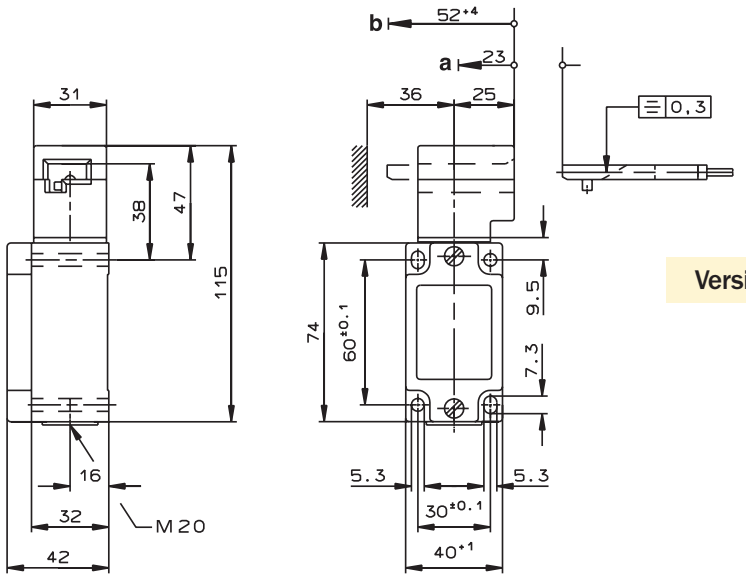
The i100 S series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

The wide-range of switches with slow-action 3 NC + 1 NO and the optional rotation of the actuating head (4 x 90°), makes this series flexible enough to meet a variety of requirements.

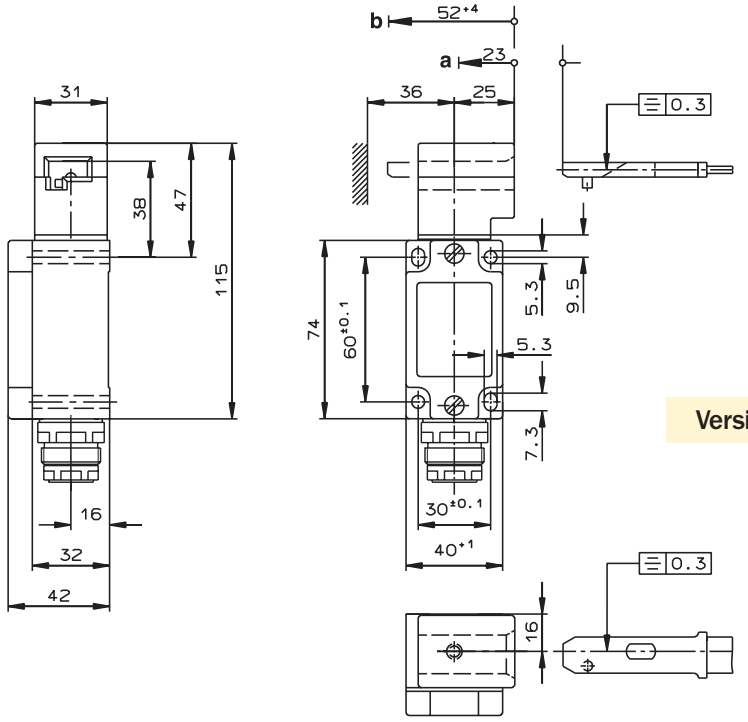
The metal enclosure and high protection rating (IP 65), makes the i100 S series suitable for heavy-duty applications in the automotive and other industries.

The triple codification (3 dimensional) of actuators make tampering difficult. The i100 S series safety switches are available with either an M20 electrical connection or with an SR 11 connector for plug & play connections.

Drawings



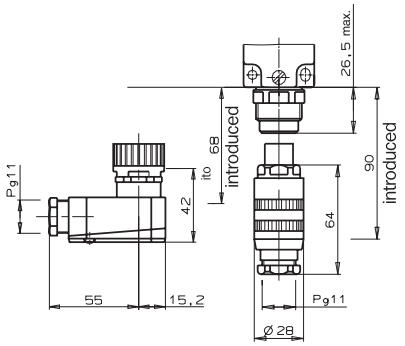
Version with metric connection



Version with SR 11 connection

a) Pre-run: the actuator is in the guard, but does not initiate the switching operation

b) Switching operation completed: to ensure switching, the actuator should be inserted up to this point

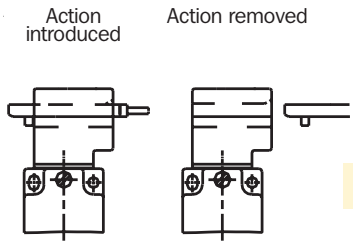


SR 11 connection

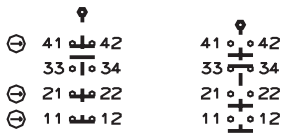
Technical specifications

	i 100 S
Housing material	die-cast light alloy, anodized
Environmental protection to IEC 529	IP 67
Mounting position	optional
Mechanical service life	2 x 10^6 switching cycles
Ambient temperature	-25…80° C
Approach speed (max.)	20 m/min
Actuating force	35 N
Switching elements	31
Contact elements	3 NC ⊖ + 1 NO
Switching principle	slow action
Rated insulation voltage	250 V≂/50 V⎓ (for version with connector SR 11)
Utilization category to IEC 947-5-1	AC-15 Ue 230 Vle 6A/DC-13 Ue 24 V le 6A
Switching voltage (min.)	12 V
Switching current (min.) at 24 V	10 mA
Contact material	silver alloy, gold-plated
Connection type	screw terminal/ connector 11 pins + PE (DIN 43651)
Cable cross-section	1.5 mm^2
Short-circuit protection	slow 10 A, fast 20 A
Weight	approx. 0.3 Kg
Certifications	CE, BU, CSA SAQ, SUVA CNA INSAI, UL

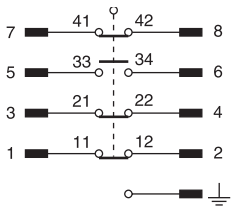
Switching elements

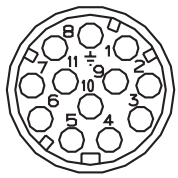


3 NO to forced opening positive + 1 NC



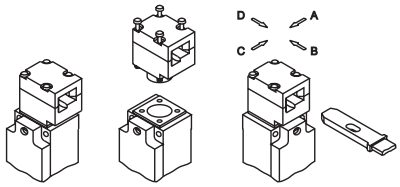
Position of switching contacts





Direction of insertion

- The small head can be oriented according to the desired insertion direction by unscrewing the four clamping screws.
- The switch is supplied with the small head set positioned in the A direction



If broken, safety interlock should be replaced

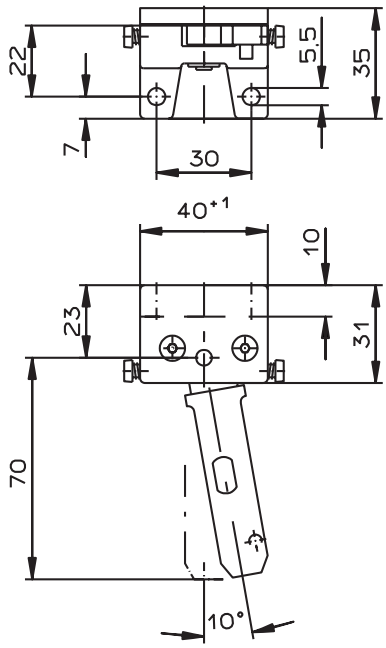
Product selection table

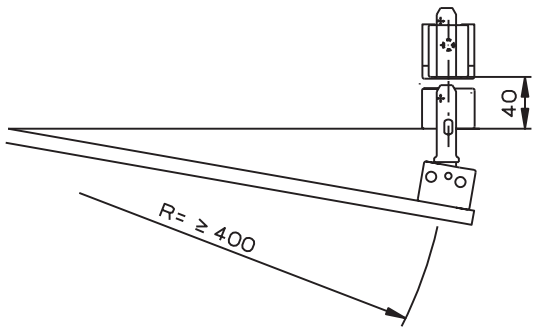
Model	Separate Actuator Key	Communication elements NC	NO	Connector M 20	SR 11	Part number
i 100-	S	3	1	3		6 022 590
i 100-	S				2	6 012 133

We recommend contacting Customer Service for product selection

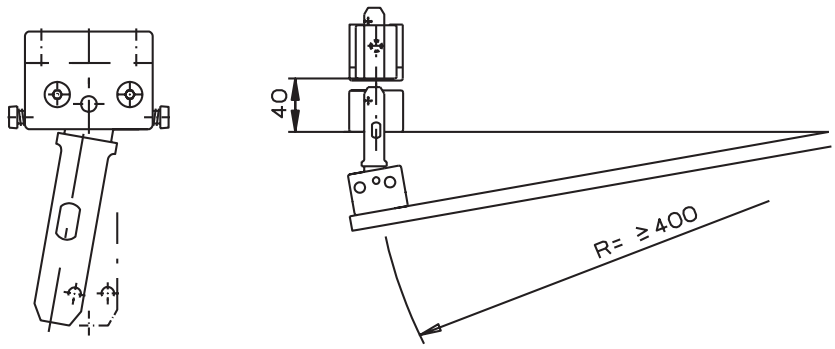
Accessories

Actuator for door hinged to left iE100-R1 - Part number 5 306 498

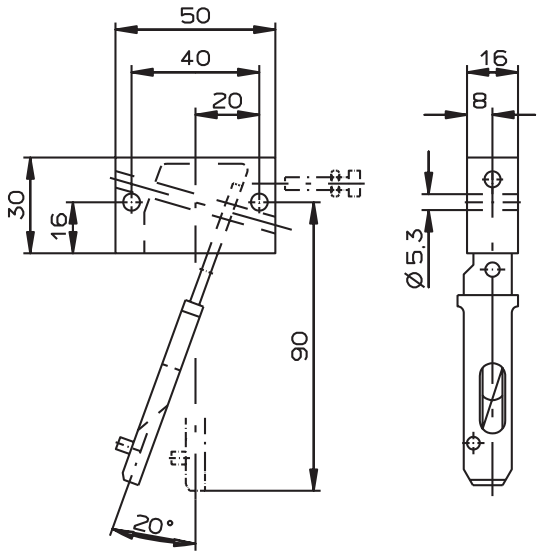


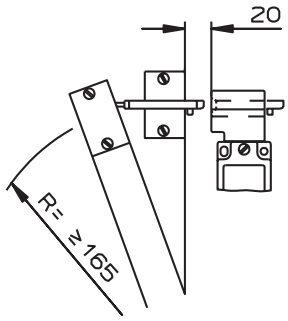


Actuator for doors hinged to right iE100-R2 - Part number 5 306 499

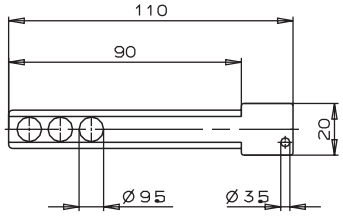


Actuator for doors hinged at bottom iE100-R3 - Part number 5 306 500

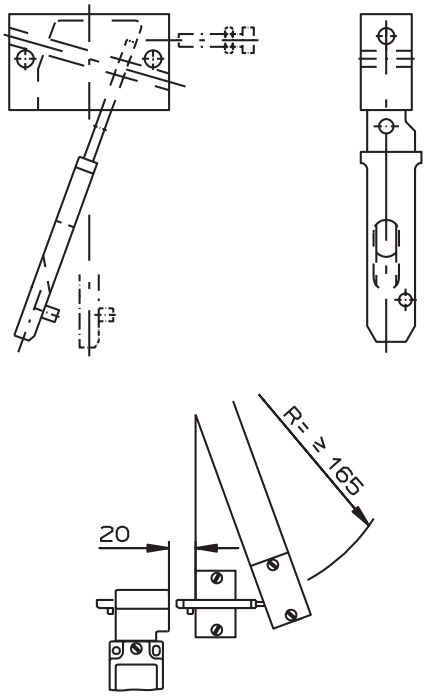




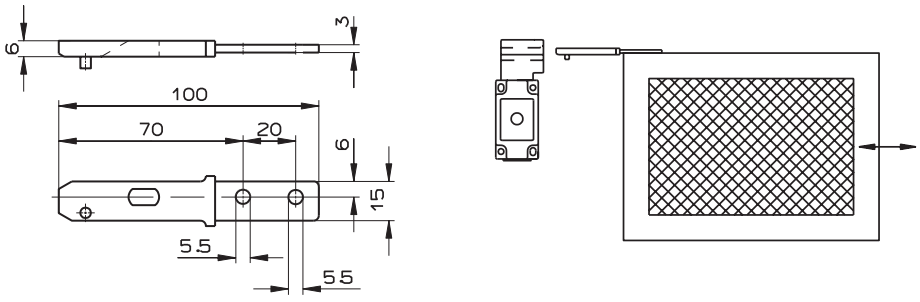
Lockout bar - Part number 5 603 534



Actuator for doors hinged at the top iE100-R4 - Part number 5 306 526



Actuator straight iE100-S1 - Part number 5 306 497



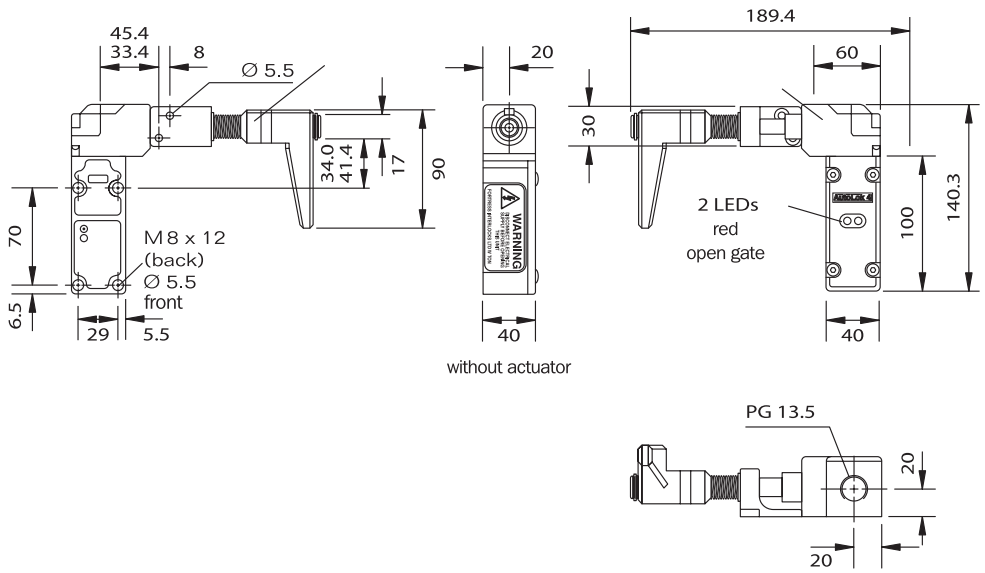
Safety interlocks
i1001

The i1001 series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

The wide-range of switches with slow-action 2 NC + 1 NO and the optional rotation of the actuating head (2 x 180°), makes this series flexible enough to meet a variety of requirements.

The galvanized die-cast aluminum alloy housing and the stainless steel head, make this locking device suitable for extreme applications, like in robotic cells or with very heavy guards. The safety interlock modular design allows for direct placement of various accessories on the enclosure (like access keys, maintenance keys, emergency stops, light indicators, manual control devices), so that total control of the protected area is available directly on the guard. In addition, the handle-shaped special actuator supplied with the safety interlock enclosure is intended for use as a latch handle integrated in the safety interlock, eliminating the need for configuring it as an optional measure.

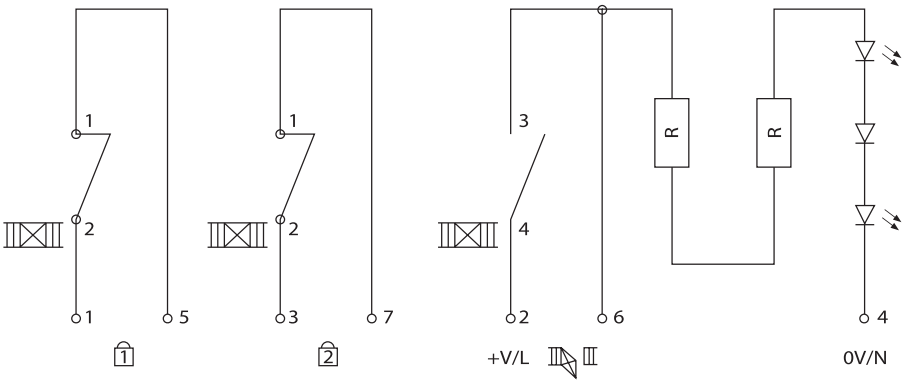
Drawings



Technical specifications

	i 1001
Housing material	powder-coated die-cast, stainless steel
Color	black, yellow, steel
Protection class	IP 67 (DIN 400050)
Actuator turning moment	5 Nm
Retaining power, locked	2500 N
Approach speed (max.)	20 m/min
Mechanical service life	$>10^6$ switching action
Frequence of use (max.)	7200/h
Ambient temperature	-5…40° C
Cable cross-section	2.5 mm^2
Connection	PG 13.5
Switching conformity	DIN VDE 0660 part 206 & IEC 947-5-1
Switching contacts	2 NC + 1 NO
Type of contacts	captive opening
Switching current	max 10 A
Switching voltage	max 230 V AC
Gap of isolation	2 x 2 mm for switching contacts
Contact material	90% silver, 10% nickel
Utilization category	AC 15 or DC 13
Operating voltage	24 V AC/DC, 110 V AC or 230 V AC
Insulation resistance	20 M Ω
Rated impulse voltage	2500 V AC
Certifications	CE, BG, CSA, UL

Switching element



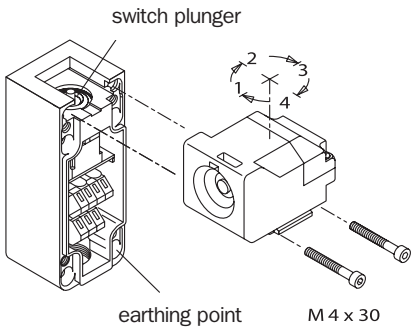
Control tension	24 V AC/DC ± 10% 110 V AC/DC ± 10% 230 V AC/DC ± 10%

Installation note

The main unit is generally installed on a fixed section of the fence, with the actuator on the entrance gate. The actuator may be installed in any position on the sliding or hinged gate. The safety interlock should not be used as a mechanical stopper.

Direction of insertion

- Unscrew the cover
- Unscrew and remove both M4 x 30 screws and take off the head
- Reposition the head and the base. One piston prevents the head motion. Use a screwdriver to push the piston in order to bring back the head to the initial point
- Make sure that the head is well secured to the body



Product selection table

Model	Voltage			Part number
	24 V AC/DC	110 V AC	230 V AC	
i 1001	24			6 021 016
i 1001		110		6 021 017
i 1001			230	6 021 018

We recommend contacting Customer Service for product selection

Accessories

Adapter for safety key

Model	Number					Part Number
	1	2	3	4	5	
E 1000	SK 1					5 308 297
		SK 2				5 308 298
			SK 3			5 308 299
				SK 4		5 308 300
					SK 5	5 308 301

Replacement key

Model	Number					Part Number
	1	2	3	4	5	
Key	SK 1					5 308 307
		SK 2				5 308 308
			SK 3			5 308 309
				SK 4		5 308 310
					SK 5	5 308 311

The device is inserted between the safety interlock enclosure and the head.
When the guard is closed, the key is secured inside the device. Access is allowed only if the key has been turned and removed (auto-ejection device).

Enabling unit

Model	Number					Part Number
	1	2	3	4	5	
iE 1000	ES 1					6 021 019
		ES 2				6 021 020
			ES 3			6 021 021
				ES 4		6 021 022
					ES 5	6 021 023

The device is inserted below the lower section of the safety interlock enclosure. Once the plant safety operator has inserted the coded key, the device allows manual control of the machinery's hazardous motion using the 2 NC + 2 NO.

Adapter for access key

Model	Number					Part Number
	1	2	3	4	5	
iE 1000	AK 1					5 308 302
		AK 2				5 308 303
			AK 3			5 308 304
				AK 4		5 308 305
					AK 5	5 308 306

Replacement key

Model	Number					Part Number
	1	2	3	4	5	
Key	AK 1					5 308 686
		AK 2				5 308 687
			AK 3			5 308 688
				AK 4		5 308 689
					AK 5	5 308 690

The device is inserted between the safety interlock enclosure and the head.
The guard is blocked if the key is not inserted in device. The guard can be open only by inserting and turning the key.

Emergency stop/Restart unit

Model		Part Number
iE 1000	ER	6 021 024

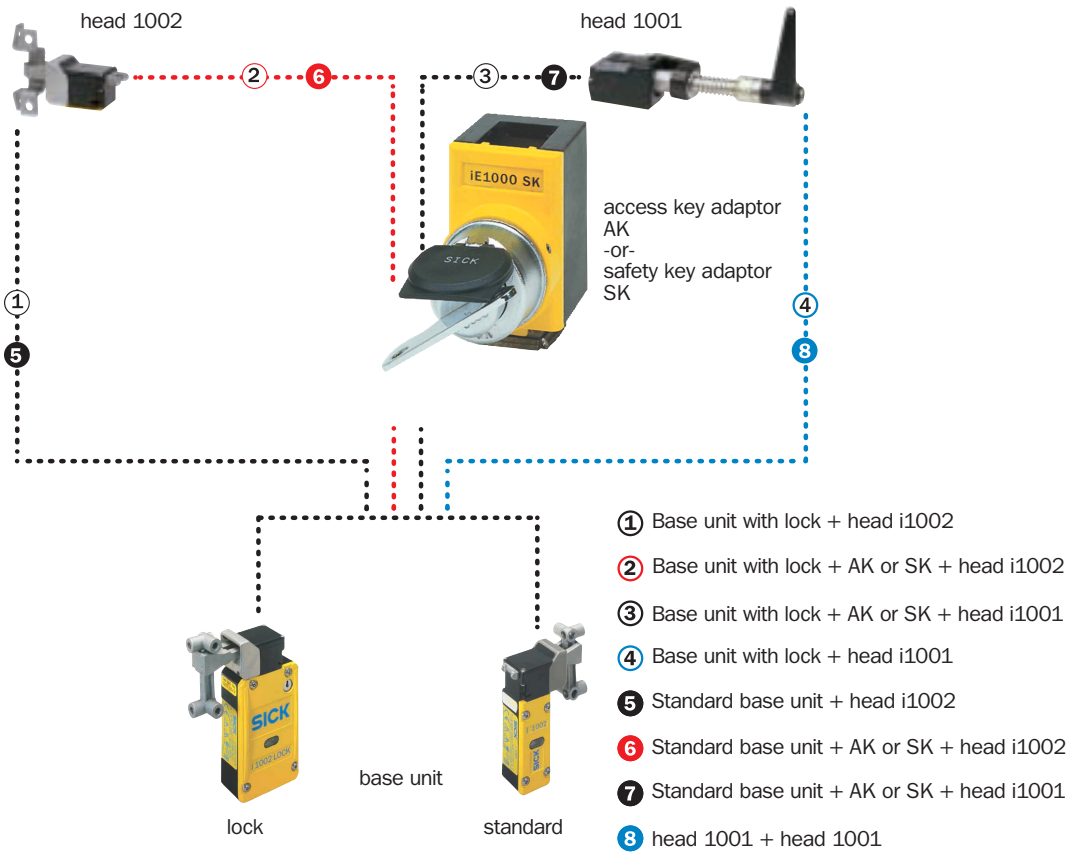
The device is inserted in the lower section of the safety interlock housing and it enables an emergency stop directly at the guard access point.
The integrated reset device enables the machine to restart once the guard is closed.

Indicator lamp

Model		Part Number
iE 1000	ML	6 021 025

The device is inserted in the lower section of the safety interlock housing. The device is inserted in the lower section of the housing. It is designed to visually alert the operator of hazardous or safe conditions, depending on the internal contacts wiring.

Actuator iE1001-R1 - Part number 5308316



Safety interlocks
i1002

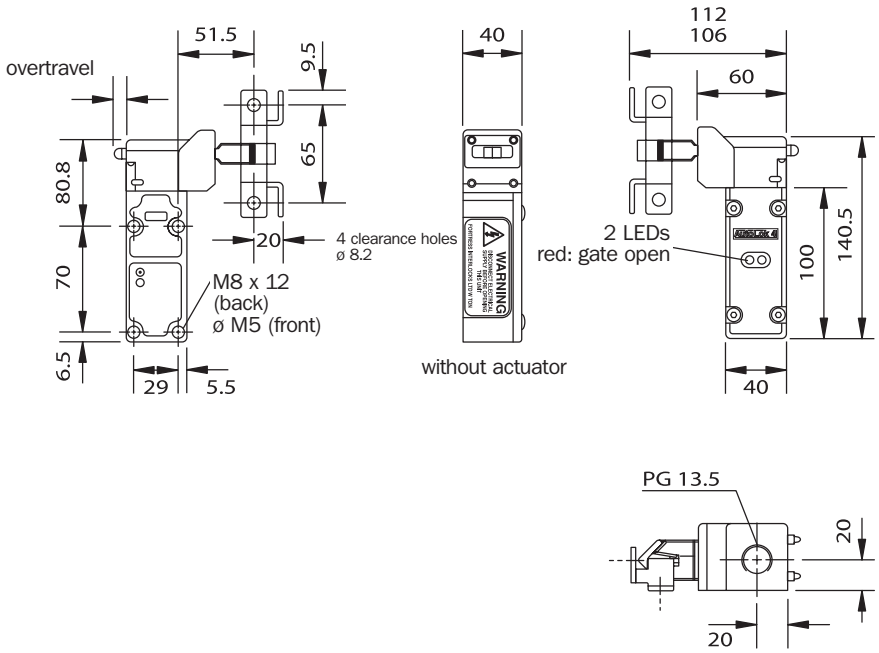
The i1001 series safety switches are designed to ensure reliability and safety in movable guard control applications whether hinged or sliding.

The wide range of switches with slow-action 2 NC + 1 NO and the optional rotation of the actuating head (2 x 180°), makes this series flexible enough to meet a variety of requirements.

The galvanized die-cast aluminum alloy housing and the stainless steel head, make this locking device suitable for extreme applications, like in robotic cells or with very heavy guards. The safety interlock modular design allows for direct placement of various accessories on the enclosure (like access keys, maintenance keys, emergency stops, light indicators, manual control devices), so that total control of the protected area is available directly on the guard.

Furthermore, the special sliding stainless steel actuator allows for perfect alignment and adjustment even in the case of vertical misalignment of the guard with the interlock.

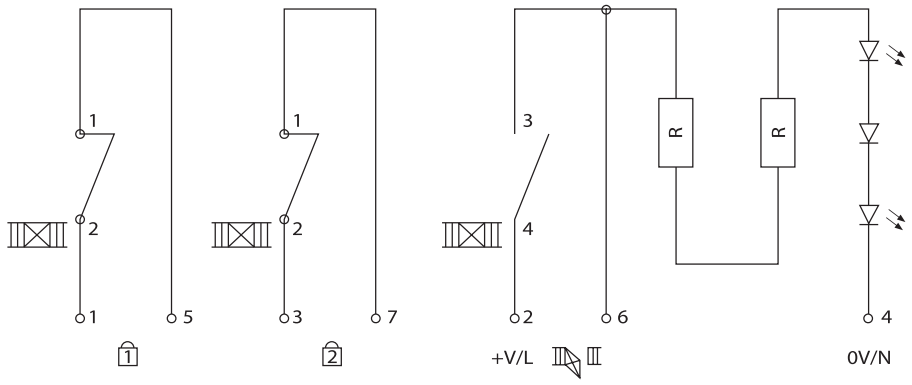
Drawings



Technical specifications

	i 1002
Housing material	die-cast zinc
Color	black, yellow, steel
Protection class	IP 67 (DIN 400050)
Actuator turning moment	5 Nm
Retaining power, locked	2500 N
Approach speed (max.)	20 m/min
Mechanical service life	$> 10^6$ switching action
Frequency of use (max.)	7200/h
Ambient temperature	-5…40° C
Cable cross-section	2.5 mm^2
Connection	PG 13.5
Switching conformity	DIN VDE 0660 part 206 & IEC 947-5-1
Switching contacts	2 NC + 1 NO
Contact type	captive opening
Switching current	max 10 A
Switching voltage	max 230 V AC
Gap of isolation	2 x 2 mm for switching contacts
Contact material	90% silver, 10% nickel
Utilization category	AC 15 or DC 13
Operating tension	24 V AC/DC, 110 V AC or 230 V AC
Insulation resistance	20 M Ω
Rated impulse voltage	2500 V AC
Certifications	CE, BG, CSA, UL

Switching elements



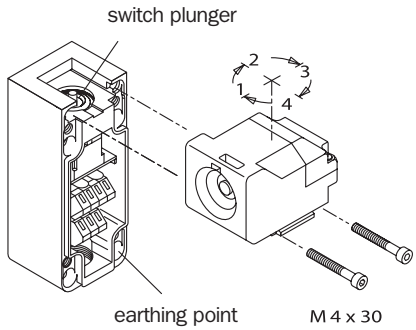
Voltage control	24 V AC/DC ± 10% 110 V AC/DC ± 10% 230 V AC/DC ± 10%

Installation notes

The main unit is generally installed on a fixed section of the fence, with the actuator on the entrance gate. The actuator may be installed in any position on the sliding or hinged gate. The safety interlock should not be used as a mechanical stopper.

Direction of insertion

- Unscrew the cover
- Unscrew and remove both M4 x 30 screws and take off the head
- Reposition the head and the base. One piston prevents the head motion. Use a screwdriver to push the piston in order to bring back the head to the initial point
- Make sure that the head is well secured to the body



Product selection table

Model	Voltage			Part number
	24 V AC/DC	110 V AC	230 V AC	
i 1002	24			6 021 010
i 1002		110		6 021 011
i 1002			230	6 021 012

We recommend contacting Customer Service for product selection

Accessories

Adapter for safety key

Model	Number					Part number
	1	2	3	4	5	
E 1000	SK 1					5 308 297
		SK 2				5 308 298
			SK 3			5 308 299
				SK 4		5 308 300
					SK 5	5 308 301

Replacement key

Model	Number					Part number
	1	2	3	4	5	
Key	SK 1					5 308 307
		SK 2				5 308 308
			SK 3			5 308 309
				SK 4		5 308 310
					SK 5	5 308 311

The device is inserted between the safety interlock enclosure and the head.
When the guard is closed, the key is secured inside the device.
Access is allowed only if the key has been turned and removed (auto-ejection device).

Enabling unit

Model	Number					Part number
	1	2	3	4	5	
iE 1000	ES 1					6 021 019
		ES 2				6 021 020
			ES 3			6 021 021
				ES 4		6 021 022
					ES 5	6 021 023

The device is inserted below the lower section of the safety interlock enclosure. Once the plant safety operator has inserted the coded key, the device allows manual control of the machinery's hazardous motion using the 2 NC + 2 NO.

Adapter for access key

Model	Number					Part number
	1	2	3	4	5	
iE 1000	AK 1					5 308 302
		AK 2				5 308 303
			AK 3			5 308 304
				AK 4		5 308 305
					AK 5	5 308 306

Replacement key

Model	Number					Part number
	1	2	3	4	5	
Key	AK 1					5 308 686
		AK 2				5 308 687
			AK 3			5 308 688
				AK 4		5 308 689
					AK 5	5 308 690

The device is inserted between the safety interlock enclosure and the head.
The guard is blocked if the key is not inserted in device. The guard can be open only by inserting and turning the key.

Emergency stop/Restart unit

Model		Part number
iE 1000	ER	6 021 024

The device is inserted in the lower section of the safety interlock housing and it enables an emergency stop directly at the guard access point.
The integrated reset device enables the machine to restart once the guard is closed.

Indicator lamp

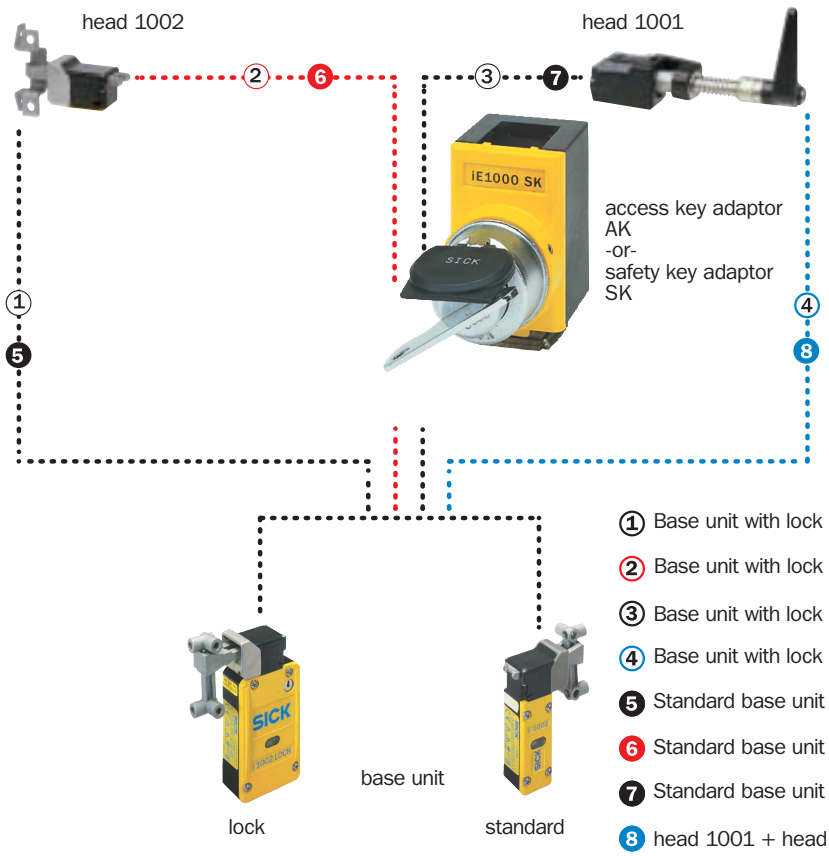
Model		Part number
iE 1000	ML	6 021 025

The device is inserted in the lower section of the safety interlock housing. It is designed to visually alert the operator of hazardous or safe conditions, depending on the internal contacts wiring.

Lockout bar iE1002-S3 - Part number5308312

Lockout bar iE1002-R1 - Part number 5308313

Actuator iE1002-S2 - Part number 5308315



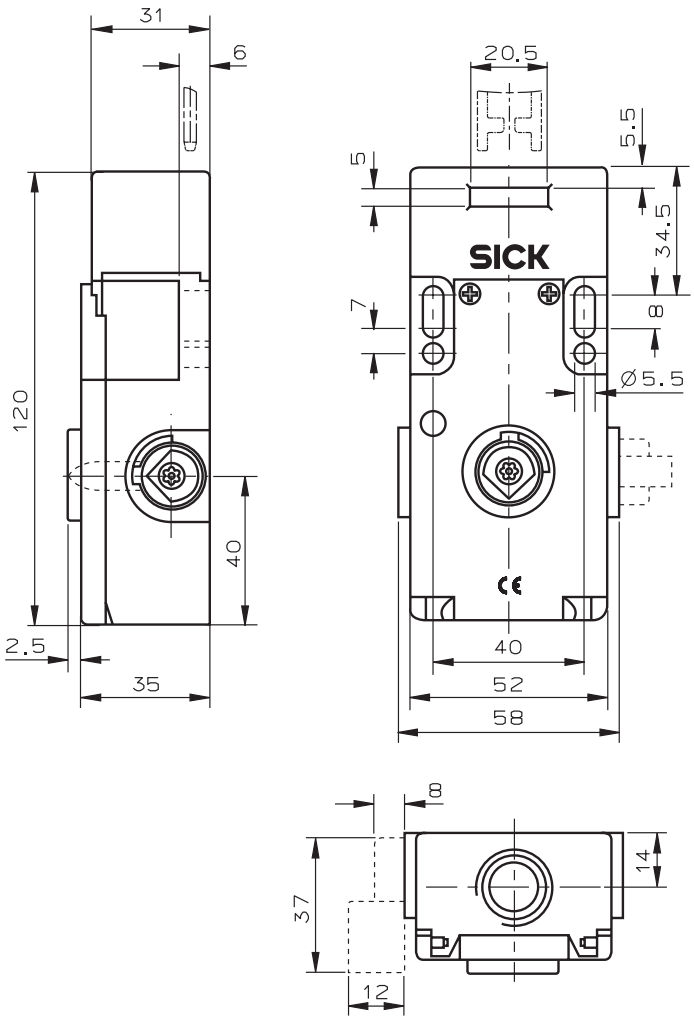
Safety interlocks
i14 Lock

The i14 Lock is a safety locking device with an actuator lock that can prevent the machine guard from opening until the release mechanism is activated. This device is available with either 2 forced opening- normally closed contacts (NC) and with 1 signaling, normally open contact (NO), or with 3 forced opening-normally closed contacts (NC). The i14 Lock head can be turned 180° and provides two actuating directions. With the i14 Lock M... safety interlock (with mechanical locking), the guard can be open only by applying voltage to the coil. This device is an ideal solution for machinery with a long stopping time, when premature interruption of the machine could cause damage to personnel or tools.

The locking mechanism can tolerate holding forces up to 1200 N. The auxiliary manual release mechanism (3-way) releases the guard in the event of general failure or of a power interruption.

The LED monitor, located on the housing, provides a visual assessment of the coil conditions.

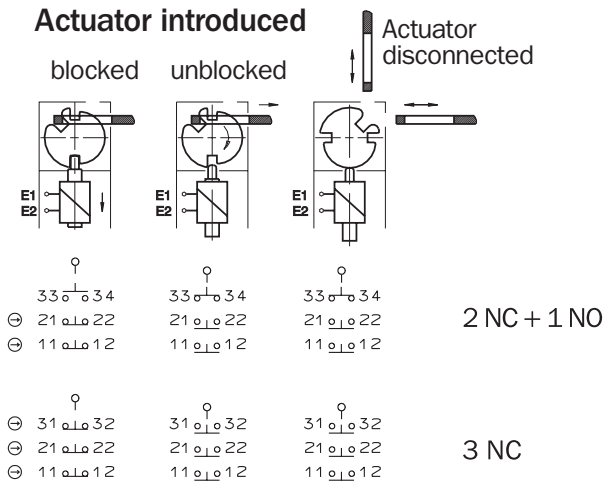
Drawings



Technical specifications

	i14 Lock
Housing material	glass-reinforced plastic
Environmental protection to IEC 60 529	IP 65
Mechanical service life	10^6 switching operations
Ambient temperature	-10…60° C
Mounting position	optional
Connection type	M 20
Approach speed (max.)	160 mm/s
Actuating force (max.)	12 N
Retaining force in locked condition	1200 N
Contact elements positively guided NC/NO contacts	2/1 or 3/0
Utilization category to IEC 60 947-5-1	AC 15/AC: 2 A (250 V), 5 A (100 V) DC 13 DC: 0.5 A (250 V), 2 A (24 V)
Switching voltage (min.)	5 V
Switching current (min.) at 5 V DC	5 mA
Wire cross-section	1 X 1.5 mm^2
Short-circuit protection	slow 10 A
Solenoid operating voltage	24 V DC, 110 V AC, 230 V AC
On time	100%
Power consumption	typical 7 W
Certifications	CE, cULus

Switching elements



SOLENOID OPERATING VOLTAGE

24 V DC - 15…+10% | **110 V AC - 15…+10%** | **230 V AC - 15…+10%**

Installation notes

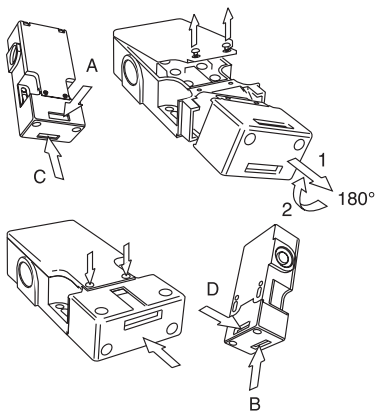
The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can no be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

LED

The safety device is open, the solenoid is activated.

Locking method

i14 Lock M...: mechanically locked actuator, extractable by applying voltage.



If broken, complete safety switch should be replaced

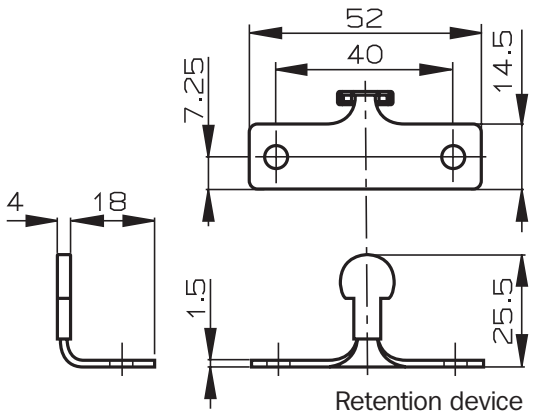
Product selection table

Model	Solenoid release		Solenoid tension			Connector		Connection type			Part number
	mechanical	electrical	24 V DC	110 V AC	230 V AC	NO	NC	PG 13.5	SR 11	M 20	
i 14-	M		0			2	1			3	6 025 060
i 14-	M		0			3	0			3	6 025 062
i 14-	M			1		2	1			3	6 025 064
i 14-	M			1		3	0			3	6 025 066
i 14-	M				2	2	1			3	6 025 068
i 14-	M				2	3	0			3	6 025 070

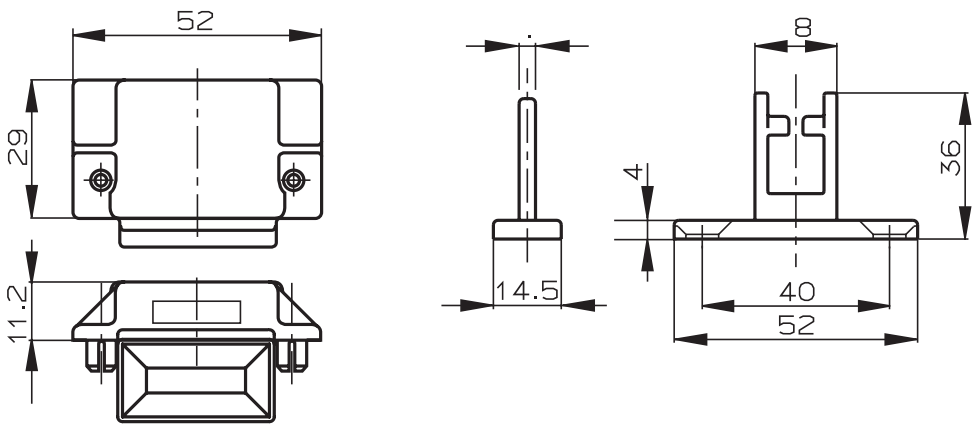
We recommend contacting Customer Service for product selection.

Accessories

Straight actuator with additional retention device and head cover iE 14-S1
Part number 5 311 133

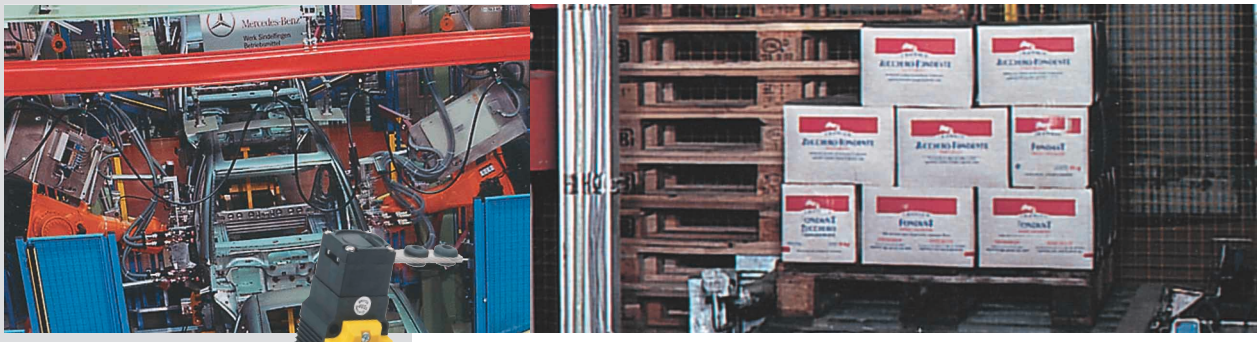


Retention device



Head covering

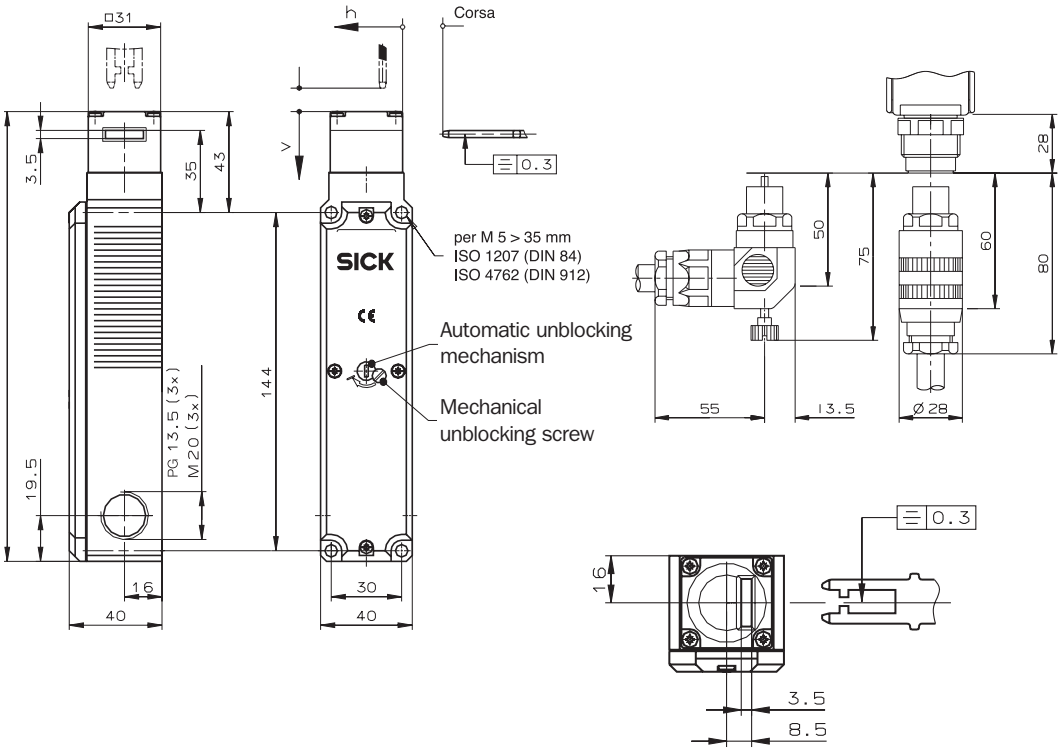
Safety interlocks
i10 Lock



The i10 Lock is a safety interlock that is guard lock capable. It can prevent the machine guard from opening until the release mechanism is activated. This device is available with 2 forced opening, normally closed contacts (NC), 1 signaling, normally open contact (NO), and with 1 normally closed contact (NC) for guard condition monitoring. The i10 Lock head can be turned (4 x 90°) and provides five ways of access for the actuator. With the i10 Lock M version (with mechanical locking), the guard can be opened only by applying voltage to the coil. With the i10 Lock E version (with electrical lock), the guard can be opened only by removing voltage from the coil. This device is an ideal solution for machinery with long stopping time, when premature interruption of the machine could cause damage to tools and components or cause additional hazards for the operator.

The locking mechanism can tolerate holding forces up to 1200 N. The auxiliary manual release mechanism (3-way) releases the guard in the event of general failure or of a power interruption.

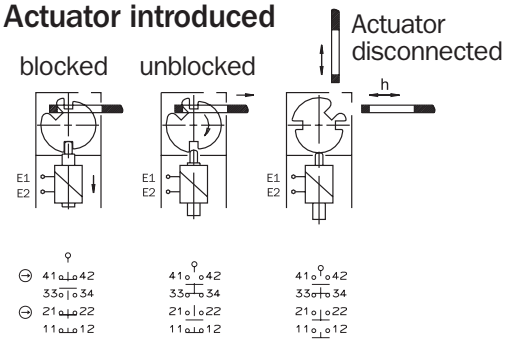
Drawings



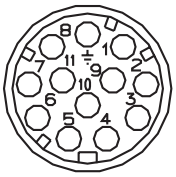
Technical specifications

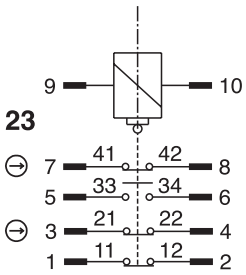
	i10 Lock
Housing material	glass-reinforced plastic
Environmental protection to IEC 60529	i 10-M/E...3 IP 67 i10-M/E...2 IP 65
Mechanical service life	10^6 switching cycles
Ambient temperature	-20…55° C
Mounting position	optional
Approach speed (max.)	20 m/min
Frequency of approach (max.)	max 7000 h
Switching principle	slow acting
Contact material	Silver alloy, gold plated
Conductor cross section	i10-M/E...3 max 1.5 mm^2 i10 M/E...2 0.5 mm^2
Rated insulation voltage U_i	i10-M/E...3 U_i = 250 V i10-M/E....2 U_i = 50 V
Utilization category to IEC 60947-5-1	i10-M/E...3 AC-15 230 V, 6 A, DC-13 24 V, 6 A i10-M/E...2 AC-15 50 V, 4 A, DC-13 24 V, 4 A
Switching voltage (min.)	12 V
Switching current (min.) at 24 V	10 mA
Short-circuit protection (Control circuit fuse) IEC 60269-1	i10-M/E...3: 6 A gG i10-M/E...2: 4 A gG
Solenoid operating voltage (+ 10%...-15%)	AC/DC 24 V AC 110 V AC 230 V
Duty cycle	100%
Power consumption	8 W
Actuating force	8 N
Retaining force (max.)	1200 N

Switching elements



Allocation

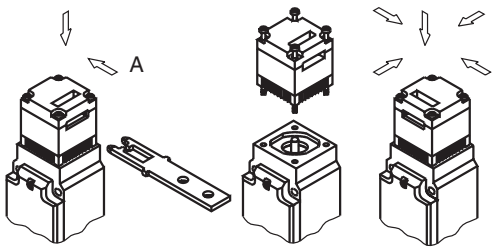




Contact NC positive guide to NO
Contact NC positive guide to
1 NC carry 1 NC

Changing direction of approach

- The small head can be oriented according to the desired insertion direction by unscrewing the four clamping screws.
- The switch is supplied with the small head set positioned in the A direction



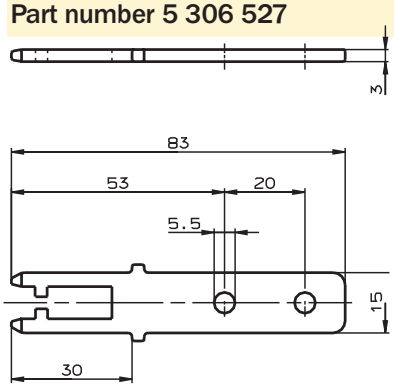
Product selection table

Model	Block function		Reel voltage			Connection	Connection type			part number
	mechanical	electrical	24 V DC	110 V AC	230 V AC		PG 13.5	SR 11	M 20	
i10 -	M				230		1			6 012 137
i10 -	M		024					2		6 012 139
i10 -		E	024					2		6 012 140
i10 -	M		0			23			3	6 022 580
i10 -		E	0			23			3	6 022 585
i10 -	M				2	23			3	6 022 582
i10 -		E			2	23			3	6 022 586
i10-	M			1		23			3	6 022 581
i10-		E		1		23			3	6 022 587
i10	M		0			23		2		6 025 101

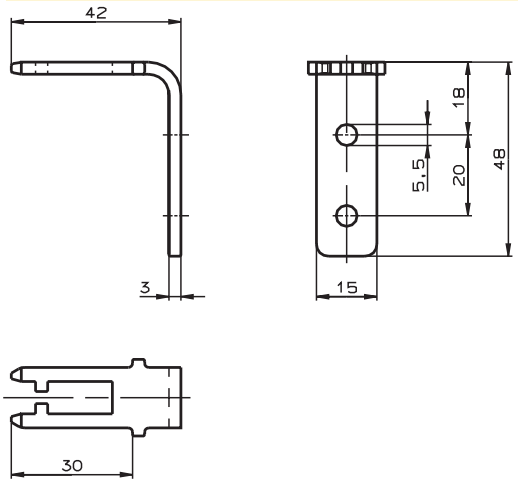
We recommend contacting Customer Service for product selection.

Accessories

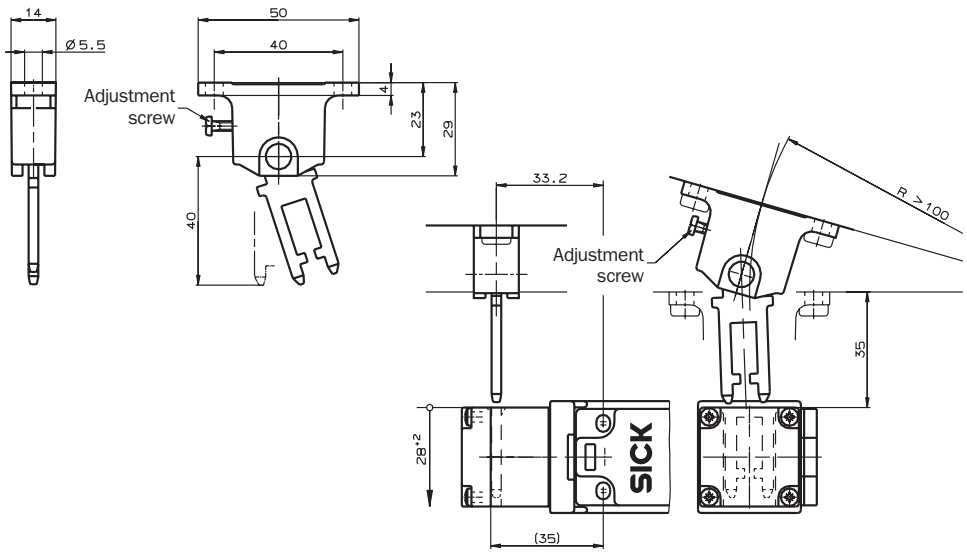
Actuator straight iE10-S1 - Minimum door radius 1000 mm
Part number 5 306 527



Actuator at 90° iE10-A1 - Minimum door radius 1000 mm
Part number 5 306 535

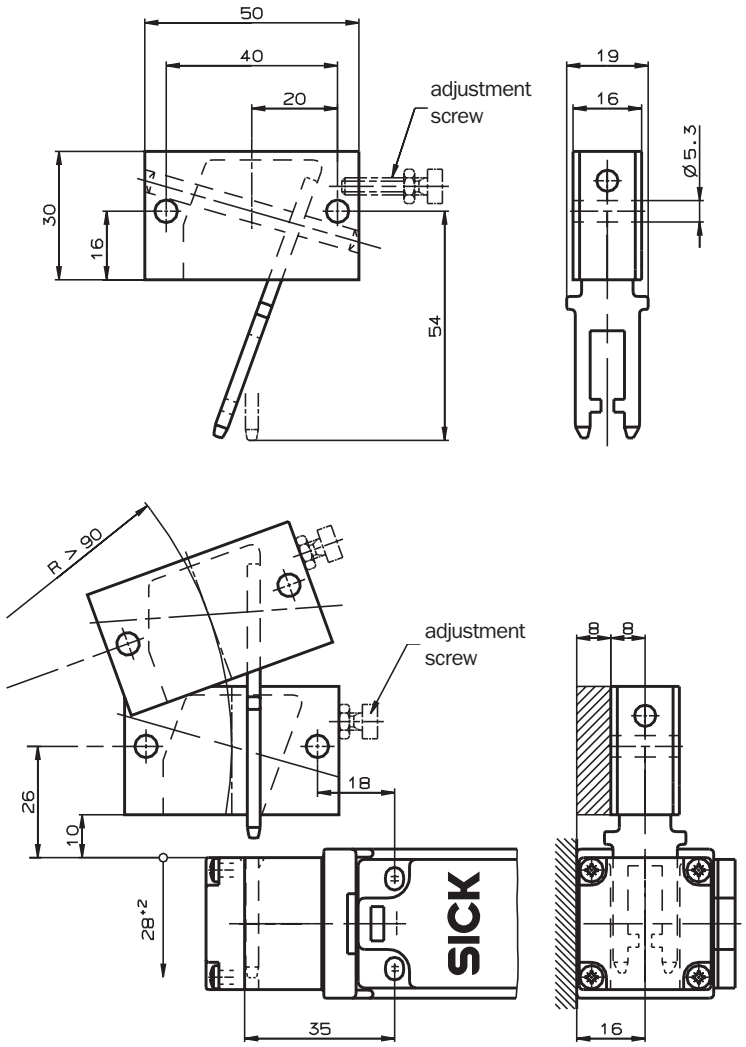


iE10-R2 radius actuator – Minimum door radius 100 mm
Part number 5 306 529



Accessories

Radial actuator for top and bottom hinged doors
Minimum door radius: 90 mm iE10-R1
Part number 5 306 528



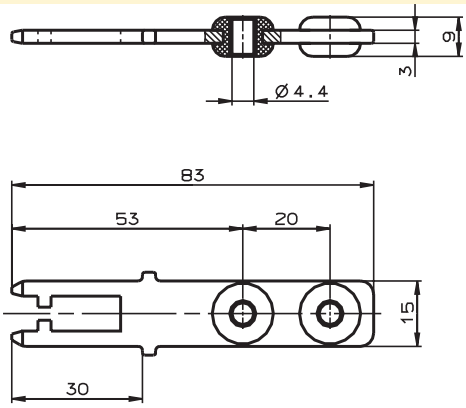
Accessories: connector and cable glands

	Connector technical specifications
Housing material	plastic
Number of PIN	12 (11+PE)
Nominal voltage	50 V ~/=
Protection class	IP 65
Connection type	contact crimp 0.5…1.5 mm^2

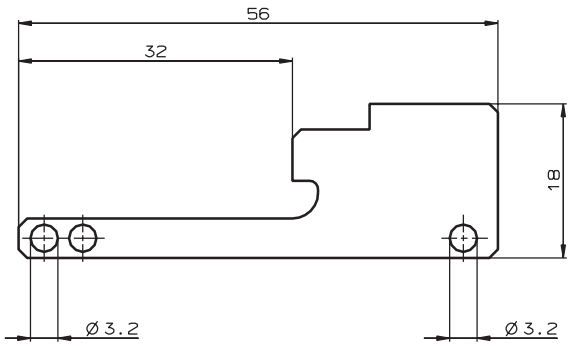
Selection table			
Type		**Number of PIN**	**Part number**
SSR 11, connector	straight	11+PE	6 020 757
ASR 11, connector	angled	11+PE	6 020 758
Connector	side limit stop	11+PE	6 020 759
Cable gland M16			5 309 163
Cable gland M20			5 309 163
Cable gland PG 13.5			5 305 811

Accessories

Actuator flexible straight iE10-S2 - minimum door radius 1000 mm
Part number 5 306 530

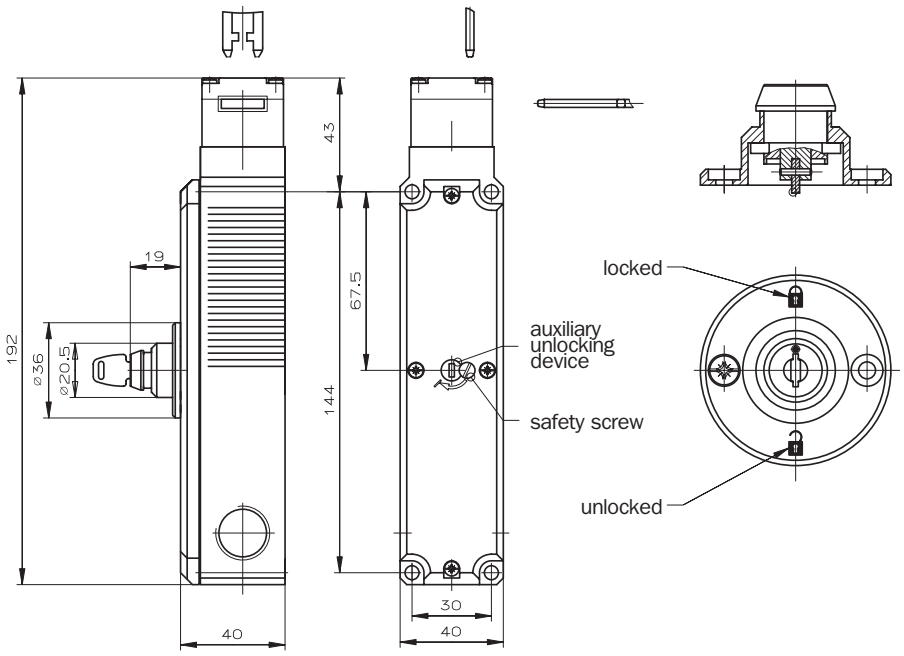


Lockable bar iE10-S3
Part number 5 306 536



When opening the guard, this lockable bar is inserted within the safety switch head. Once the bar is in the head, a lock is placed in one of the holes in order to prevent the guard from closing behind the operator.

Unlocking key iE10-K1, iE10-K2
Part number K1: 5 308 269, K2: 5 308 270



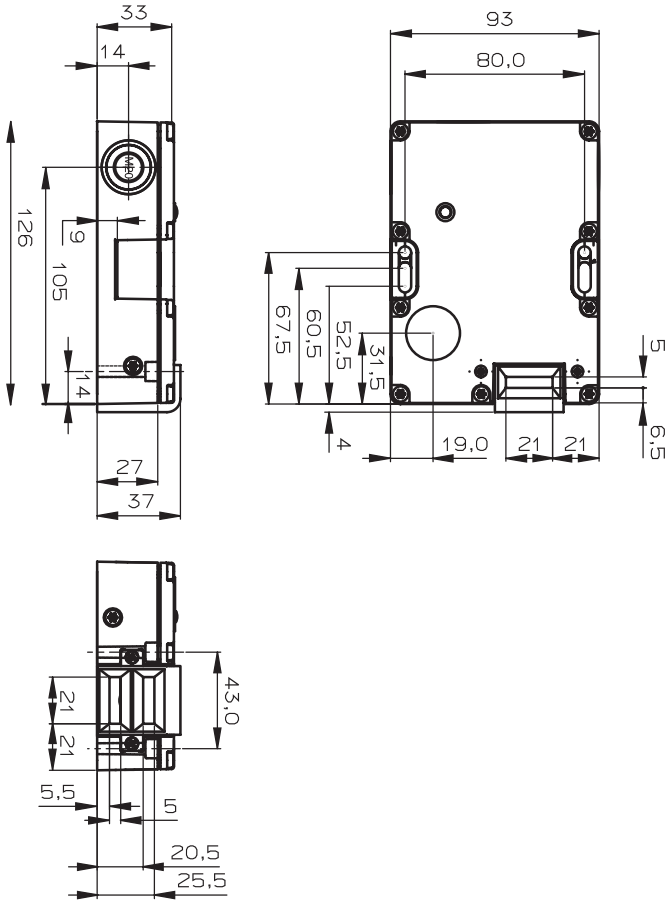
Safety interlocks
i200 Lock

The i200 series safety interlocks with guard lock are designed to prevent the operator from opening the guard before the machine hazard motion has stopped. The i200 series has been designed with a mechanical lock that can be released by applying voltage to the electrical coil.

The high retention force (2000 N) and the availability of safety and alert contacts associated with the coil and the actuator, allow to it to distinguish a guard that has been released from one that has been released and opened.

Thanks to the fiberglass reinforced thermoplastic housing and to the stainless steel head, this safety interlock performs better than standard limit stops with locks made of metal. Due to the availability of 3-way insertion for the actuator and to the 180° head rotation capability, this interlock is suitable for a wide range of applications. A coil status LED indicator and the availability of 3-way auxiliary release allow the operator to program and view all the interlock operating conditions associated with the machine operating modes.

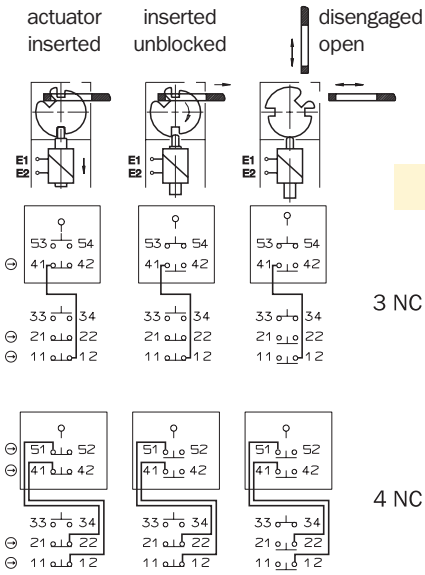
Drawings



Technical specifications

	i200 Lock
Housing material	glass-reinforced plastic
Environmental protection to IEC 60 529	IP 65
Mechanical service life	10^6 switching operations
Ambient temperature	-20…60° C
Mounting position	optional
Connection type	3 X M 20
Approach speed (max.)	160 mm/s 160 mm (80 mm flexible actuator)
Retaining force in locked condition	1500 N (when using locating pins) 2000 N (for threaded M5 metal bolts)
Maximum force against which unlocking is possible	100 N
Contact elements positively guided NC/NO contacts	3/2 or 4/1
Rated insulation voltage	Vi = 250 V⎓
Utilization category to IEC 60 947-5-1	AC 15/AC: 2 A (250V), 5 A (100 V)
Switching power (max.)	250 V / 500 VA
Switching voltage (min.)	5 V
Switching current (min.) at 5 V DC	5 mA
Short-circuit protection	6 A (slow), positively guided
Solenoid operating voltage	24 V DC/Ac, 110 V AC, 230 V AC
Power consumption, typical	7 W
LED	illuminated with solenoid is active
Weight	0.4 Kg
Certifications	CE, cULus, TÜV

Switching elements



OPERATING VOLTAGE OF THE SOLENOID

3 NC + 2NO	**24 V DC -15…+10%**
	110 V AC -15…+10%
4 NC + 1NO	**230 V AC -15…+10%**

LED

The safety device is able to open, the solenoid is activated.

Locking method

i 200 Lock M...: mechanically locked actuator, extractable by applying voltage.

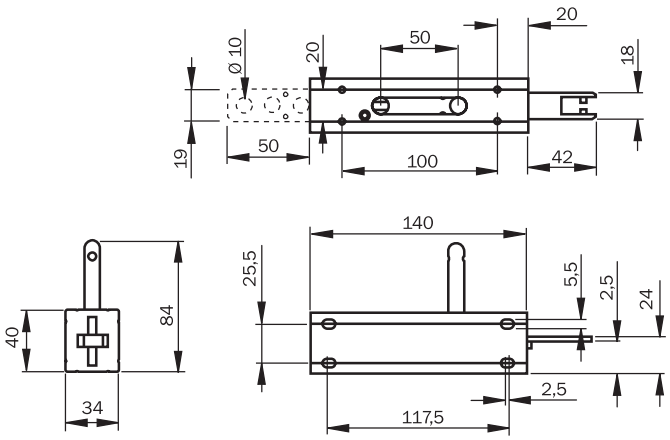
Product selection table

Model	Block type	Solenoid voltage			Contacts		Connection	Part number
		24 V DC	110 V AC	230 V AC	NC	NO	M20	
i200 -	M	0			3	2	3	6 025 113
i200 -	M	0			4	1	3	6 025 115
i200 -	M		1		3	2	3	6 025 117
i200 -	M		1		4	1	3	6 025 119
i200 -	M			2	3	2	3	6 025 121
i200 -	M			2	4	1	3	6 025 123

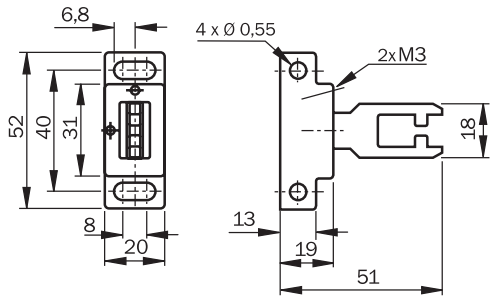
We recommend contacting Customer Service for product selection.

Accessories

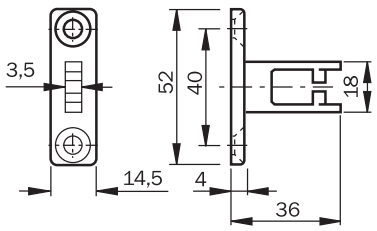
Closing key iE200-B1
Part number 5 308 760



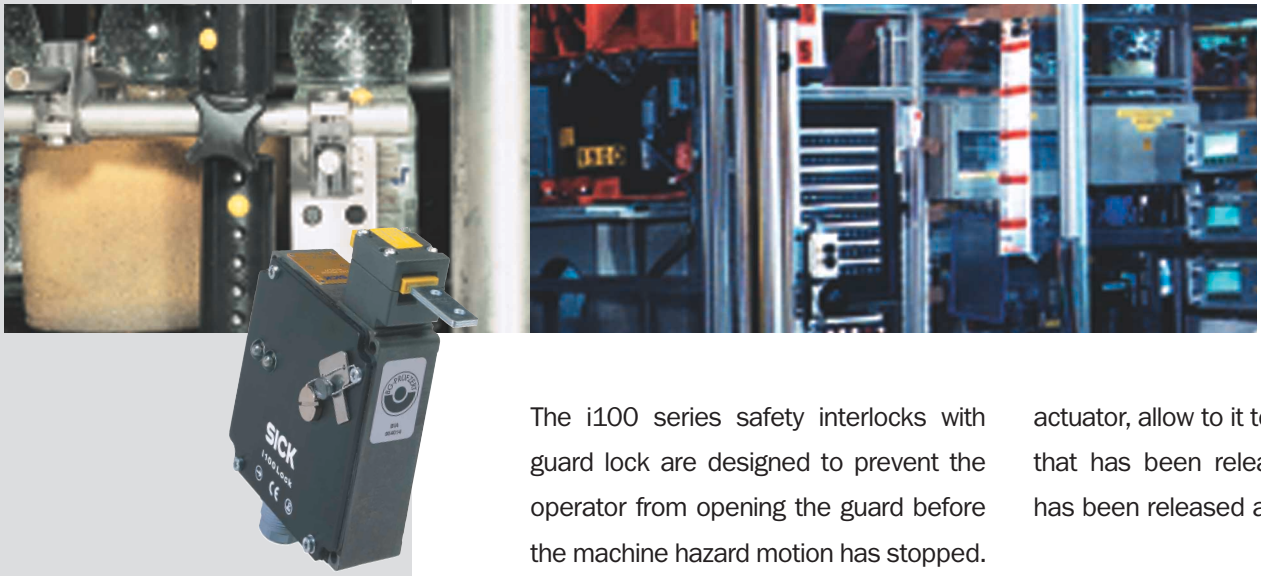
Actuator flexible iE200-F1
Part number 5 308 759



Actuator straight iE200-S1
Part number 5 308 758



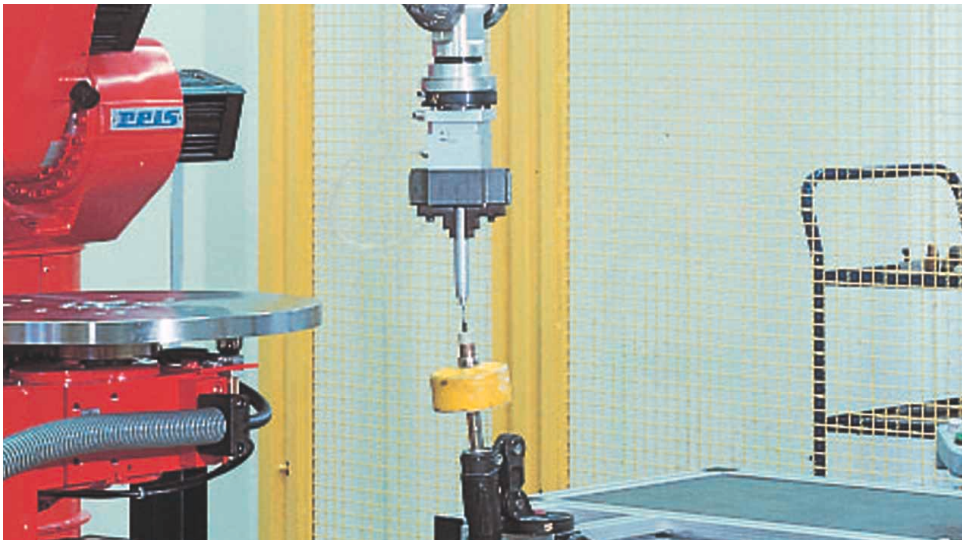
Safety interlocks
i100 Lock



The i100 series safety interlocks with guard lock are designed to prevent the operator from opening the guard before the machine hazard motion has stopped. The i100 series has been designed with a mechanical lock that can be released by applying voltage to the electrical coil (i100 M) or with an electrical lock that can be released by removing voltage from the electrical coil (i100 E).

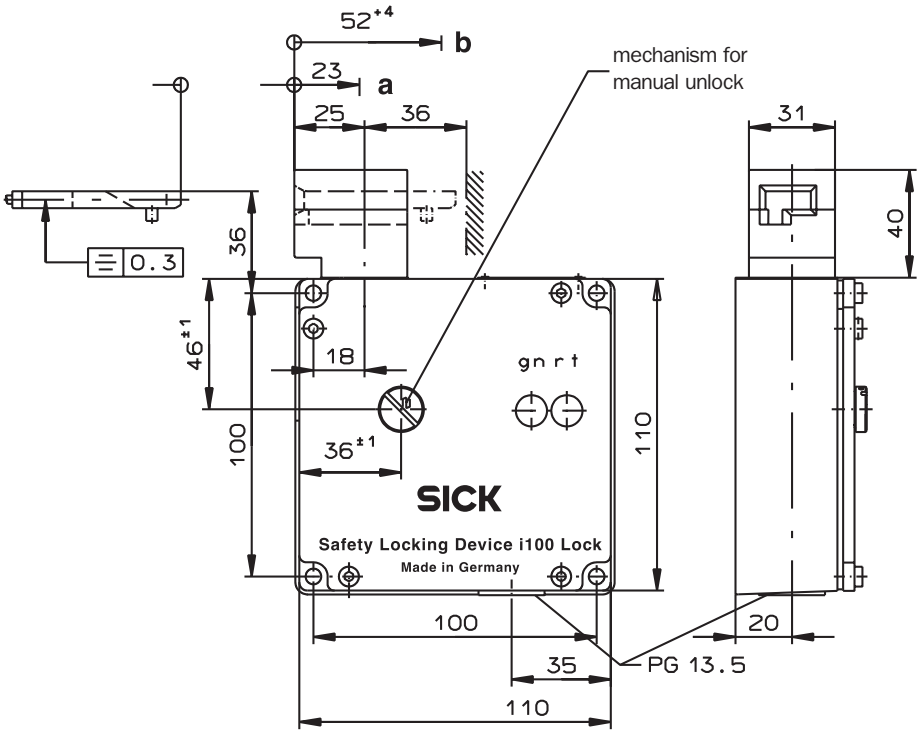
The high retention force (1000 N) and the availability of safety and alert contacts associated with the coil and the actuator, allow to it to distinguish a guard that has been released from one that has been released and opened.

Thanks to the anodized die-cast aluminum alloy enclosure, the high performance of this safety interlock is suitable for the most demanding heavy-duty industrial environments. Two coil status LED indicators and the availability of auxiliary release, allow the operator to program and monitor operating conditions.

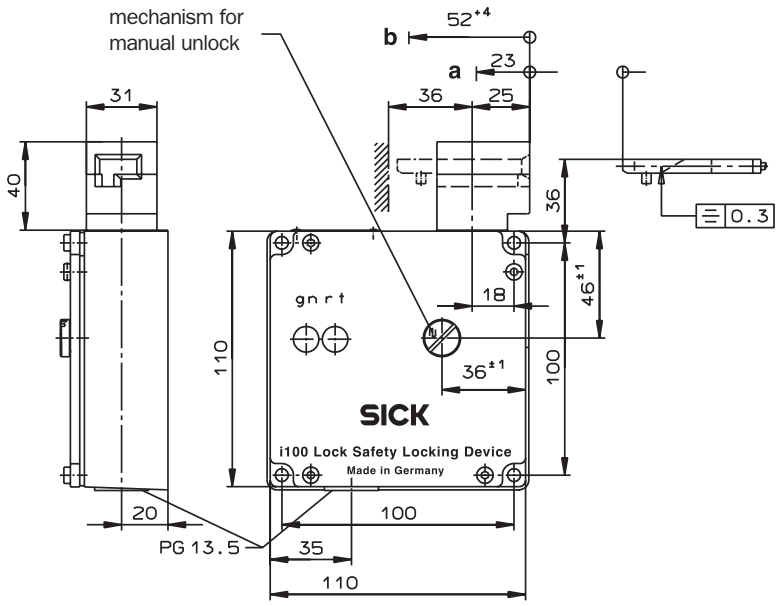


Drawings

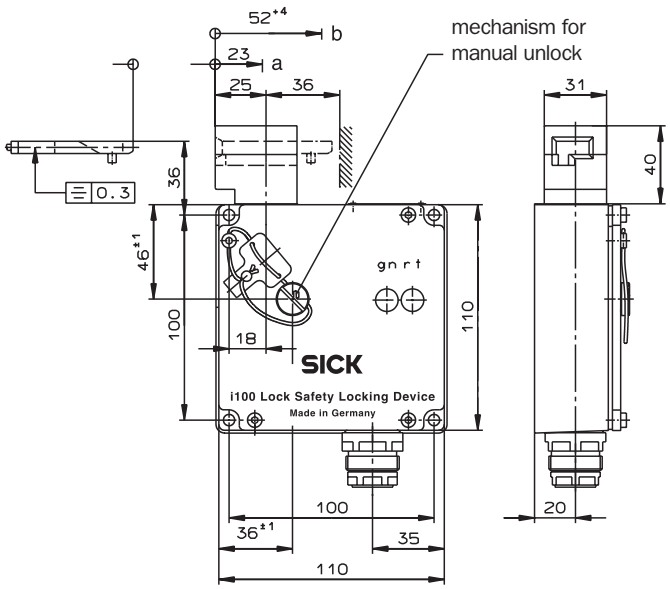
Actuating head oriented to the left and electrical connection PG/M20



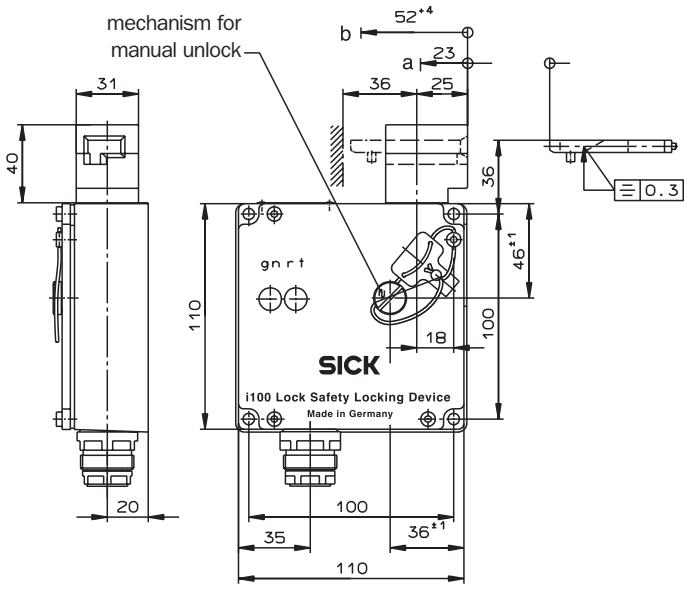
Actuating head oriented to the right and electrical connection PG/M20



Actuating head oriented to the left and electrical connection SR 11



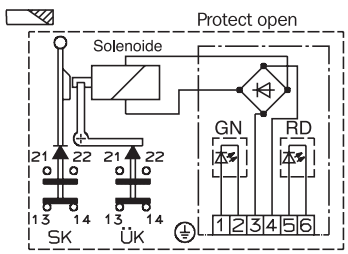
Actuating head oriented to the right and electrical connection SR 11

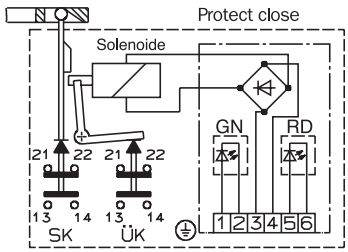


Technical specifications

	i100 Lock
Housing material	die-cast silver alloy
Housing color	black
Environmental protection to IEC 60 529	IP 67
Mounting position	optional
Mechanical service life	2 X 10^6 switching cycles
Ambient temperature	-25…80° C
Approach speed (max.)	20m/min
Actuating force	35 N
Retaining force in locked condition	1000 N
Switching elements	2 X 11
Contact elements	1 NO + 1 NC ⊖
Switching principle	slow action
Rated insulation voltage	Vi = 250 V⎓
Utilization category IEC 947-5-1	AC-15 Ue 230 Ie 6 A/ DC 13 Ve 24 Ule 6 A
Switching voltage (min.)	12 v
Switching current (min.) at 24 V	10 mA
Contact material	silver alloy, gold-plated
Connection type	screw terminal
Cable cross-section (max.)	1.5 mm^2
Short-circuit protection	slow 10 A, fast 20 A
Weight	1.07 Kg
Solenoid	
Solenoid operating voltage	24/110/230 V⎓
On time	100%
Connected load	7 W

Switching elements



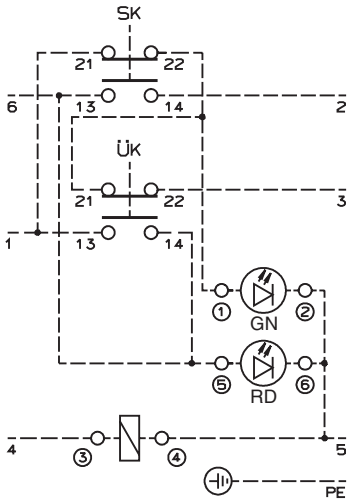


11 gold-plated, slow action, 1 NC forced opening positive + 1 NO

OPERATING VOLTAGE OF SOLENOID

24 V DC -15…+10% | **110 V AC -15…+10%** | **230 V AC -15…+10%**

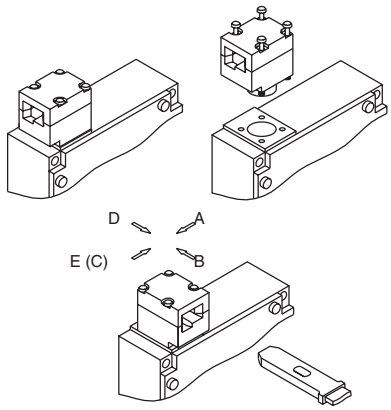
System connection



Voltage control	24 V AC/DC ± 10% 110 V AC/DC ± 10% 230 V AC/DC ± 10%

Insertion direction

- The head can be rotated by unscrewing the four clamping screws.



LED function

The LED allows operating check of safety interlock:

Green: safety circuit closed
Red: key unblocked, safety circuit open

Installation note

The safety switch and actuator must be assembled for installation purposes. The actuator must be permanently secured to the safety device such that it can no be detached, e.g., with unscrewable screws, rivets or welding. The safety switch should not be used as a mechanical stop plate.

Auxiliary locking device

In case of failure, the mechanical release can be used to unlock safety devices with a mechanical lock.
The mechanical release mechanism may be sealed to prevent tampering.

Product selection table

Model	Block		Action		Solenoid voltage			Switching	Connections			Part
	Mechanical	Electrical	right	left	24 V DC	110 V AC	230 V AC	Element	PG 13.5	SR 11	M 20	number
i 100		E			024				1			6 012 122
i 100		E		L	024				1			6 012 118
i 100	M		R				230		1			6 012 123
i 100		E	R				230		1			6 012 124
i 100	M			L			230		1			6 012 119
i 100		E		L			230		1			6 012 120
i 100	M		R		024					2		6 012 127
i 100		E	R		024					2		6 012 128
i 100	M			L	024					2		6 012 125
i 100		E		L	024					2		6 012 126
i 100	M			L		110			1			6 021 907
i 100		E		L		110			1			6 021 908
i 100	M		R			110			1			6 021 909
i 100		E	R			110			1			6 021 910
i 100	M		R		0			11			3	6 022 595
i 100	M			L	0			11			3	6 022 591
i 100		E		L	0			11			3	6 022 592
i 100	M			L			2	11			3	6 022 593
i 100		E		L			2	11			3	6 022 594
i 100		E	R		0			11			3	6 022 596
i 100	M		R				2	11			3	6 022 597
i 100		E	R				2	11			3	6 022 598
i 100	M			L		1		11			3	6 022 599
i 100		E		L		1		11			3	6 022 600
i 100	M		R			1		11			3	6 022 601
i 100		E	R			1		11			3	6 022 602

We recommend contacting Customer Service for product selection.

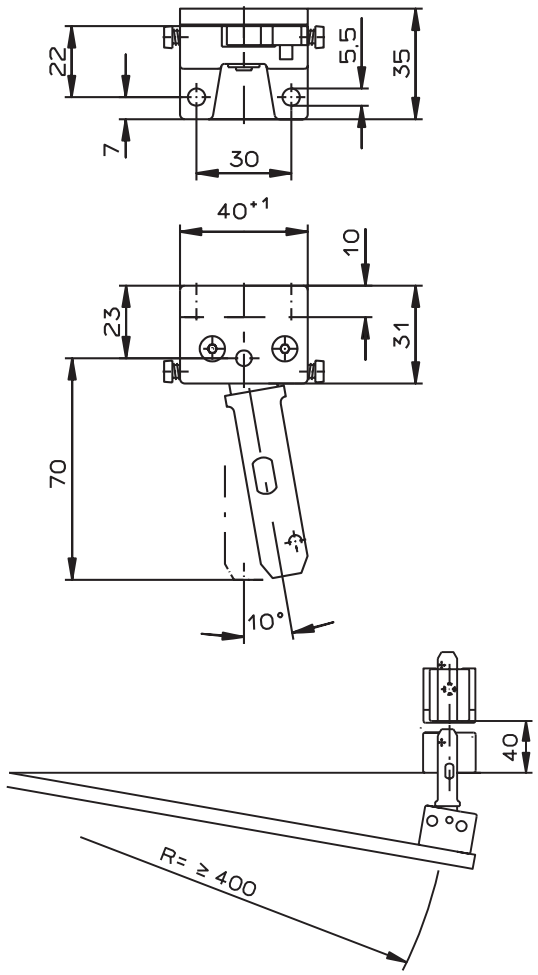
Accessories: connectors and cable glands

Connector technical specifications	
Housing material	plastic
Number of PINs	12 (11+PE)
Nominal voltage	50 V ~/=
Protection class	IP 65
Connection type	crimp contacts 0.5…1.5 mm^2

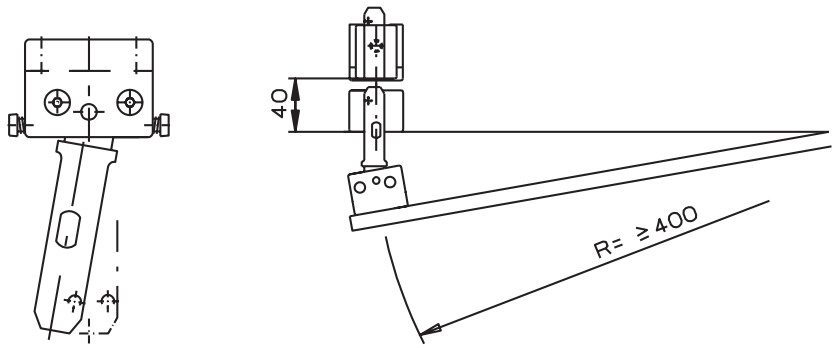
Selection table			
Type		Number of PIN	Part number
SSR 11, connector	straight	11+PE	6 020 757
ASR 11, connector	angled	11+PE	6 020 758
Connector	for safety switch	11+PE	6 020 759
Cable gland M16			5 309 163
Cable gland M20			5 309 163
Cable gland PG 13.5			5 305 811

We recommend contacting Customer Service for product selection.

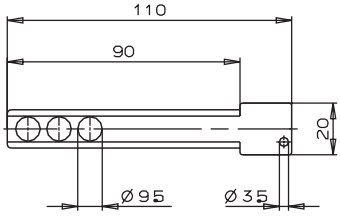
Actuator for hinged door to left iE100-R1 - part number 5 306 498



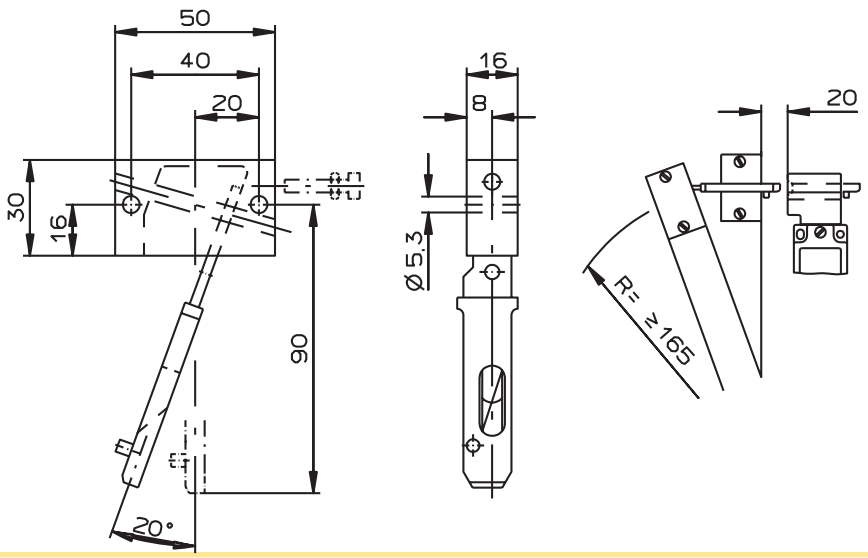
Actuator for hinged door to right iE100-R2 - Part number 5 306 499



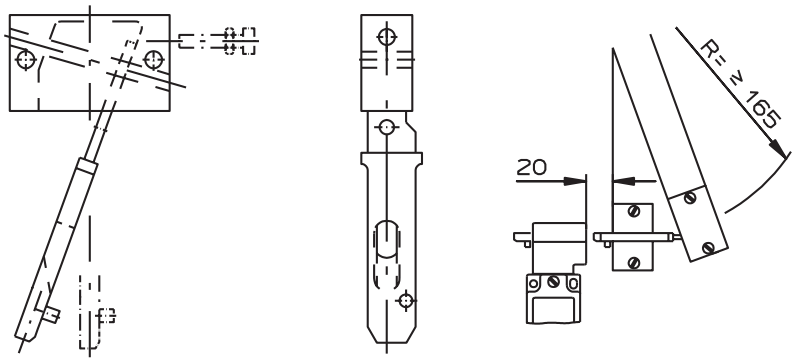
Lockout bar - Part number 5 603 534



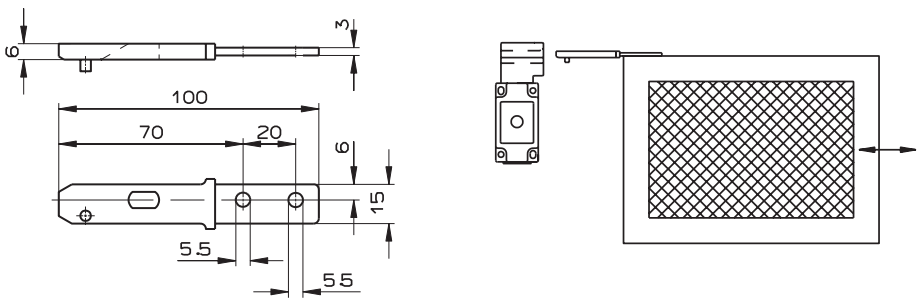
Actuator for hinged door on bottom iE100-R3 - Part number 5 306 500



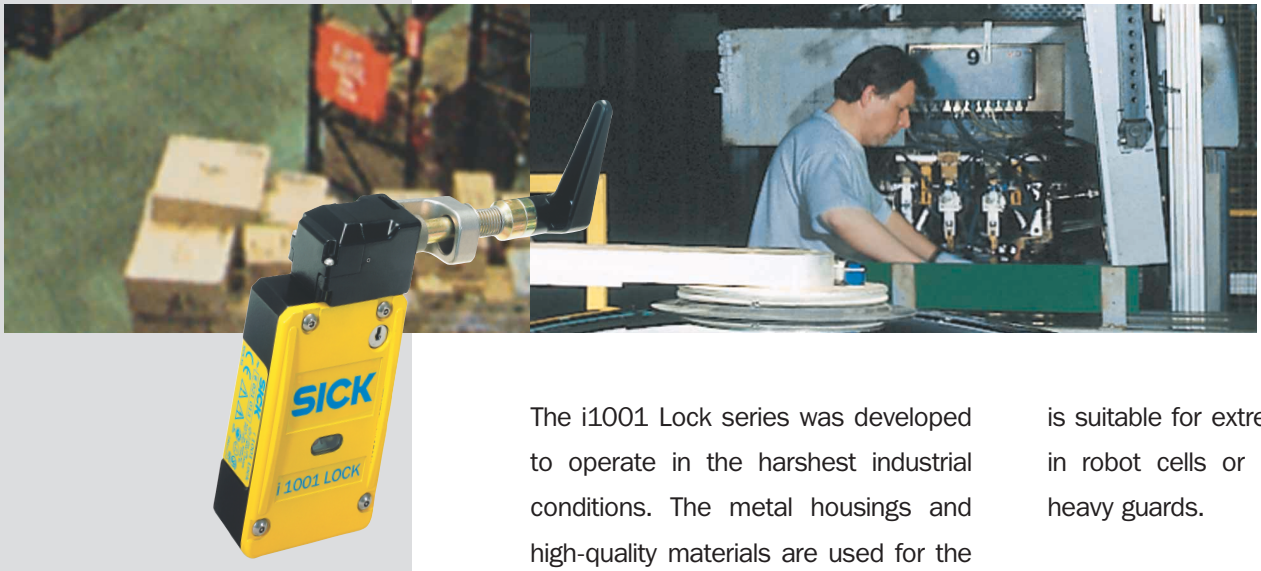
Actuator for hinged door on top iE100-R4 - part number 5 306 526



Actuator straight iE100-S1 - part number 5 306 497



Safety interlocks
i1001 Lock



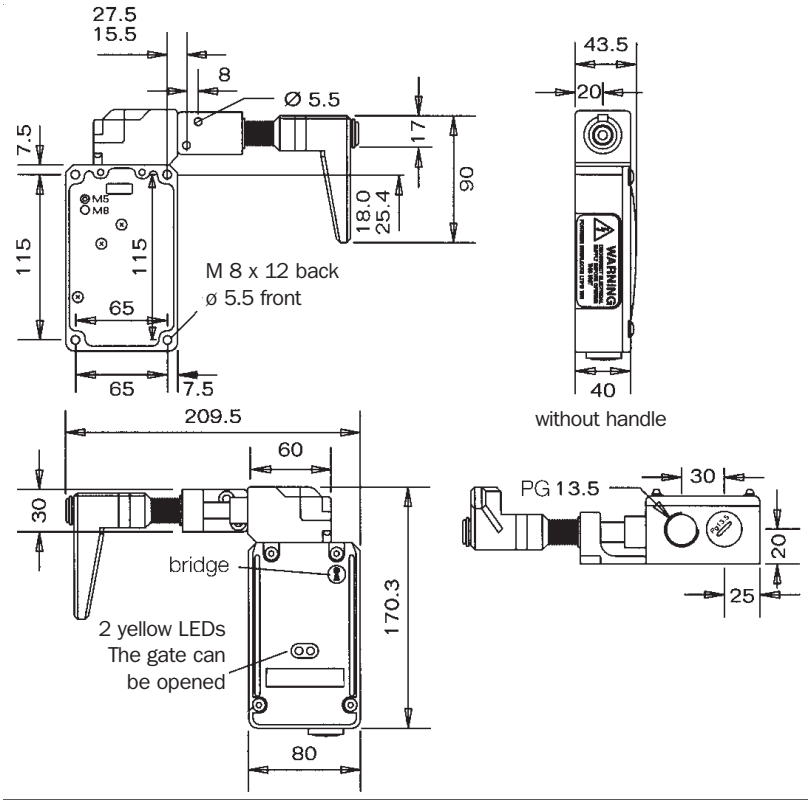
The i1001 Lock series was developed to operate in the harshest industrial conditions. The metal housings and high-quality materials are used for the plunger, driving mechanism and seals. The i100 Lock series is designed to prevent the operator from opening the guard before the machine's hazardous motion has been stopped.

The wide-range of switches with slow-action 4 x NC + 2 x NO and the optional rotation of the actuating head (2 x 180°), makes this series flexible enough to meet a variety of requirements.

Thanks to high retention force of the actuating key (2500 N), to the galvanized die-cast aluminum alloy housing and to the stainless steel head, this device is suitable for extreme applications, as in robot cells or in the presence of heavy guards.

The safety interlock's modular design enables various accessories to be directly mounted on the enclosure (e.g., access keys, maintenance keys, emergency stops, light indicators, manual control devices), so that total control of the protected area is available directly on the guard. In addition, the handle shaped special actuator with the limit stop enclosure is ideal for use as a latch handle integrated in the i1001, eliminating the need to configure it as an optional measure.

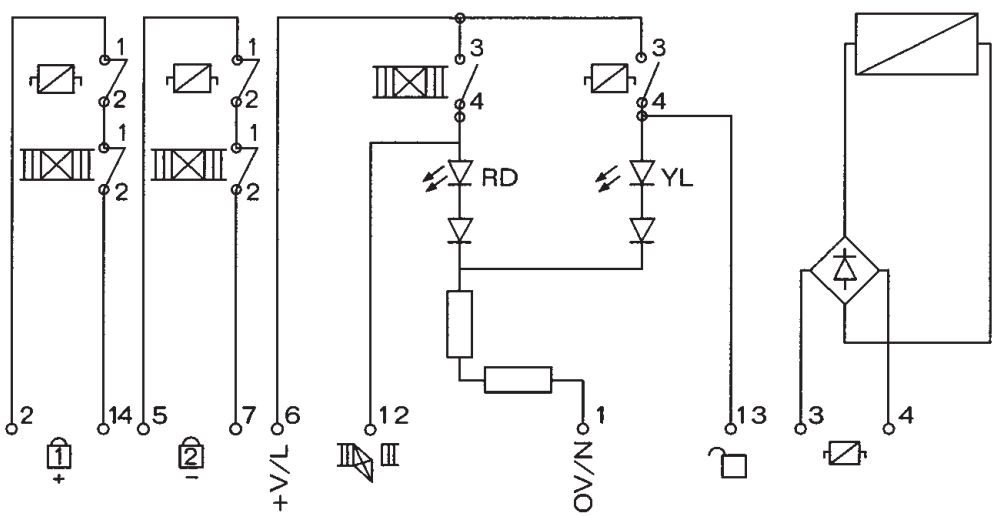
Drawings



Technical specifications

	i1001 Lock
Housing material	zinc alloy and stainless steel
Protection class	IP 67 (DIN 40 0050)
Actuator turning moment	5 Nm
Retaining power, locked	2500 N
Approach speed (max.)	20 m/min
Mechanical service life	$> 10^6$ switching cycles
Frequency of use (max.)	7200/h
Ambient temperature	-5…40° C
Cross-section of cables (max.)	2.5 mm^2
Connection	PG 13.5
Switching conformity	DIN VDE 0660 parte 206 & IEC 947-5-1
Switching contacts	4 NC + 2 NO
Contact type	captive opening
Switching current	max 10 A
Switching voltage	max 230 V AC
Insulation gap	2 X 2 mm per switching contact
Contact material	90% silver and 10% nickel
Utilization category	AC 15 or DC 13
Operating voltage	24 V AC/DC, 110 V AC, 230 V AC
Rated impulse voltage	20 M Ω
Coil current at 24 V DC nominal voltage	500 mA
Solenoid	
Operating voltage	24 V AC/DC, 110 V AC, 230 V AC
Voltage tolerances	85% to 110% of nominal value
Certifications	CE, BG, CSA, UL

Switching elements

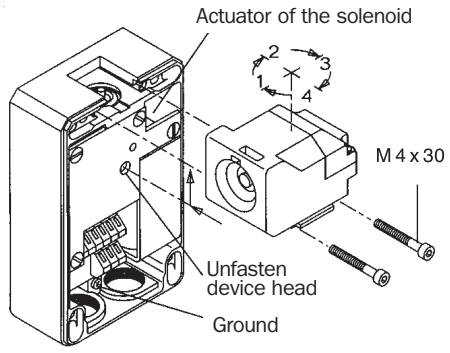


Control voltage	24 V AC/DC ± 10% 110 V AC/DC ± 10% 230 V AC/DC ± 10%

LED indicator functionality

When the machine is running, the device keeps the gate locked to the handle: the solenoid can be used to prevent the handle removal. In order to open the gate, the operator should first turn off the machine from the control panel. The solenoid is activated only once the machine operation has stopped completely. At this point, the yellow LED indicates that the handle may be removed. After removing the handle, the red LED indicates that access is allowed.

Direction of insertion



Installation note

The main unit is generally installed on a fixed section of the fence, with the actuator on the entrance gate. The actuator may be installed in any position on the sliding or hinged gate. The safety interlock switch should not be used as a mechanical stop.

Mechanism for manual unlock

In case of failure, the manual mechanism can be used to release the solenoid. The solenoid can only be released by using the supplied key. The release can also be used with the anti-lock insert.

Product selection table

Model	Voltage			Part number
	24 V AC/DC	110 V AC	230 V AC	
i1001 Lock	24			6 021 013
i1001 Lock		110		6 021 014
i1001 Lock			230	6 021 015

We recommend contacting Customer Service for product selection.

Accessories

Adapter for safety key

Model	Number					Part number
	1	2	3	4	5	
E 1000	SK 1					5 308 297
		SK 2				5 308 298
			SK 3			5 308 299
				SK 4		5 308 300
					SK 5	5 308 301

Replacement key

Model	Number					Part number
	1	2	3	4	5	
Key	SK 1					5 308 307
		SK 2				5 308 308
			SK 3			5 308 309
				SK 4		5 308 310
					SK 5	5 308 311

The device is inserted between the safety switch enclosure and the head.
When the guard is closed, the key is secured inside the device.
Access is allowed only if the key has been turned and removed (auto-ejection device).

Enabling unit

Model	Code					Part Number
	1	2	3	4	5	
iE 1000	ES 1					6 021 019
		ES 2				6 021 020
			ES 3			6 021 021
				ES 4		6 021 022
					ES 5	6 021 023

The device is inserted below the lower section of the safety interlock enclosure. Once the plant safety operator has inserted the coded key, the device allows manual control of the machinery's hazardous motion using the 2 NC + 2 NO.

Adapter for access key

Model	Number					Part number
	1	2	3	4	5	
iE 1000	AK 1					5 308 302
		AK 2				5 308 303
			AK 3			5 308 304
				AK 4		5 308 305
					AK 5	5 308 306

Replacement key

Model	Number					Part number
	1	2	3	4	5	
Key	AK 1					5 308 686
		AK 2				5 308 687
			AK 3			5 308 688
				AK 4		5 308 689
					AK 5	5 308 690

The device is inserted between the safety switch enclosure and the head.
The guard is blocked if the key is not inserted in device. The guard can be open only by inserting and turning the key.

Emergency stop/Restart unit

Model		Part number
iE 1000	ER	6 021 024

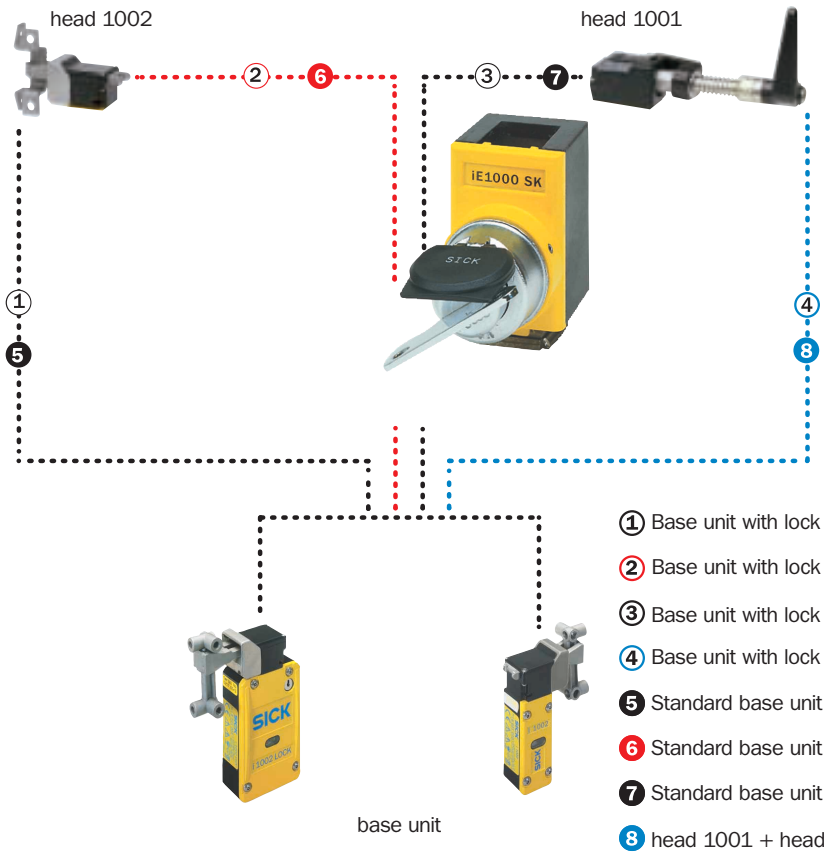
The device is inserted in the lower section of the safety interlock housing and it enables an emergency stop directly at the guard access point.
The integrated reset device enables the machine to restart once the guard is closed.

Indicator lamp

Model		Part number
iE 1000	ML	6 021 025

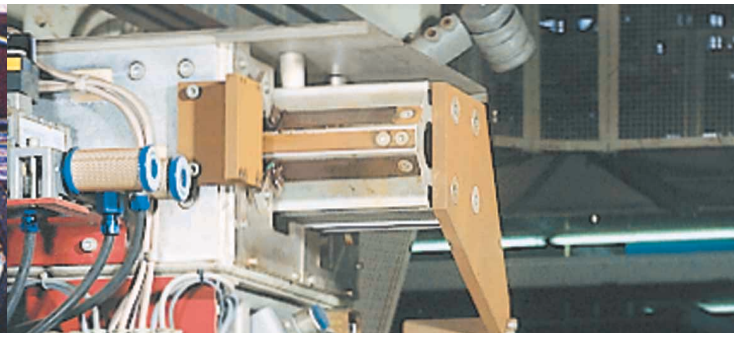
The device is inserted in the lower section of the safety interlock housing. The device is inserted in the lower section of the housing. It is designed to visually alert the operator of hazardous or safe conditions, depending on the internal contacts wiring.

Actuator iE1001-R1
part number 5 308 316



① Base unit with lock + head i1002
② Base unit with lock + AK or SK + head i1002
③ Base unit with lock + AK or SK + head i1001
④ Base unit with lock + head i1001
⑤ Standard base unit + head i1002
⑥ Standard base unit + AK or SK + head i1002
⑦ Standard base unit + AK or SK + head i1001
⑧ head 1001 + head 1001

Safety interlocks
i1002 Lock



The i1002 Lock series was developed to operate in the harshest industrial conditions. The metal housings and high-quality materials are used for the plunger, driving mechanism and seals. The i1002 Lock series is designed to prevent the operator from opening the guard before the machine's hazardous motion has been stopped.

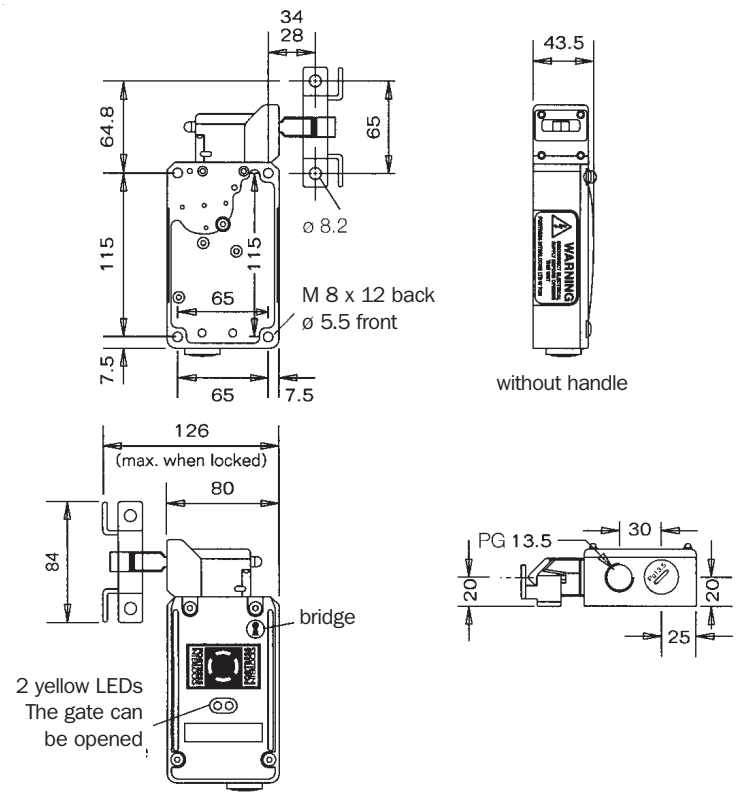
The wide-range of switches with slow-action 4 x NC + 2 x NO and the optional rotation of the actuating head (2 x 180°), makes this series flexible enough to meet a variety of requirements.

Thanks to high retention force of the actuating key (2500 N), to the galvanized die-cast aluminum alloy housing and to the stainless steel head, this device is suitable for extreme applications, as in robot cells or in the presence of heavy guards.

The safety interlock's modular design enables various accessories to be directly mounted on the housing (e.g., access keys, maintenance keys, emergency stops, light indicators, manual control devices), so that total control of the protected area is available directly on the guard.

In addition, the special sliding stainless steel actuator allows for precise alignment and adjustment, even in the case of vertical misalignment of the guard with the interlock.

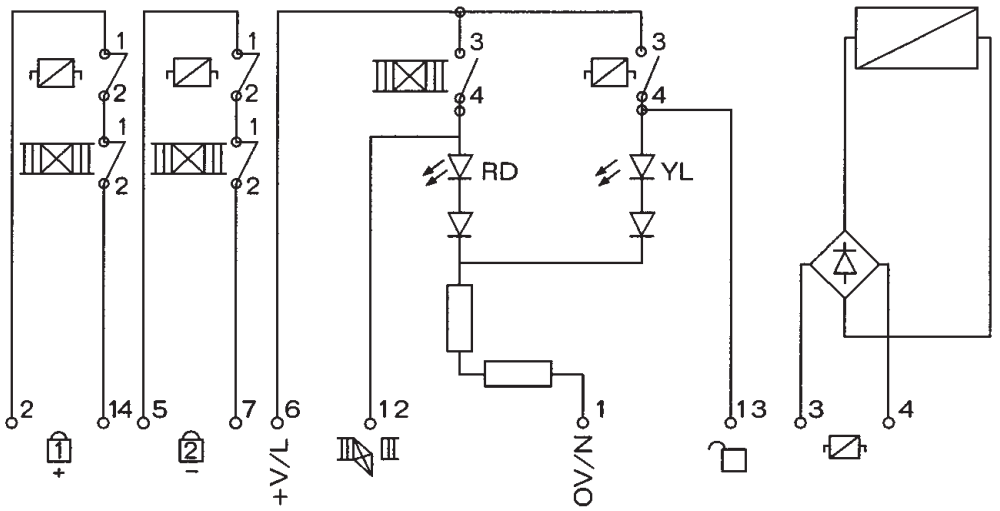
Drawings



Technical specifications

	i1002 Lock
Housing material	Powder-coated die-cast, stainless steel
Protection class	IP 67 (DIN 40 0050)
Actuator turning moment	5 Nm
Retaining power, locked	2500 N
Approach speed (max.)	20 m/min
Mechanical service life	$> 10^6$ switching actions
Frequency of use (max.)	7200/h
Ambient temperature	-5…40° C
Cross-section of cables (max.)	2.5 mm^2
Connection	PG 13.5
Switching conformity	DIN VDE 0660 part 206 & IEC 947-5-1
Switching contacts	4 NC + 2 NO
Contact type	Captive opening
Switching current	max 10 A
Switching voltage	max 230 V AC
Insulation gap	2 X 2 mm for switching contacts
Contact material	90% silver and 10% nickel
Utilization category	AC 15 or DC 13
Operating voltage	24 V AC/DC, 110 V AC, 230 V AC
Rated impulse voltage	20 M Ω
Coil current at 24 V DC nominal voltage	500 mA
Solenoid	
Operating voltage	24 V AC/DC, 110 V AC, 230 V AC
Voltage tolerances	85% to 110% of nominal value
Certifications	CE, BG, CSA, UL

Switching elements

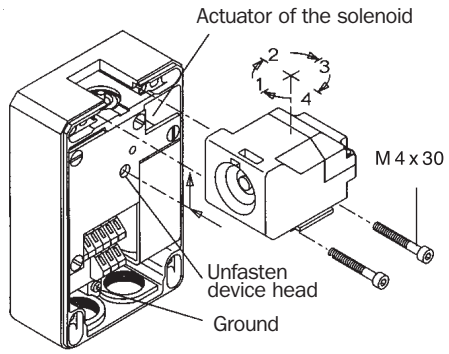


Control voltage	24 V AC/DC ± 10% 110 V AC/DC ± 10% 230 V AC/DC ± 10%

LED indicator functionality

When the machine is running, the device keeps the gate locked to the handle: the solenoid can be used to prevent the handle removal. In order to open the gate, the operator should first turn off the machine from the control panel. The solenoid is activated only once the machine operation has stopped completely. At this point, the yellow LED indicates that the handle may be removed. After removing the handle, the red LED indicates that access is allowed.

Direction of insertion



Installation note

The main unit is generally installed on a fixed section of the fence, with the actuator on the entrance gate. The actuator may be installed in any position on the sliding or hinged gate. The safety interlock should not be used as a mechanical stop.

Mechanical unlocking mechanism

In case of failure, the manual mechanism can be used to release the solenoid. The solenoid can only be released by using the supplied key. The release can also be used with the anti-lock insert.

Product selection table

Model	Voltage			Part number
	24 V AC/DC	110 V AC	230 V AC	
i1002 Lock	24			6 021 007
i1002 Lock		110		6 021 008
i1002 Lock			230	6 021 009

We recommend contacting Customer Service for product selection.

Accessories

Adaptor for safety key

Model	Number					Part number
	1	2	3	4	5	
iE 1000	SK 1					5 308 297
		SK 2				5 308 298
			SK 3			5 308 299
				SK 4		5 308 300
					SK 5	5 308 301

Replacement key

Model	Number					Part number
	1	2	3	4	5	
Key	SK 1					5 308 307
		SK 2				5 308 308
			SK 3			5 308 309
				SK 4		5 308 310
					SK 5	5 308 311

The device is inserted between the safety interlock enclosure and the head.
When the guard is closed, the key is secured inside the device.
Access is allowed only if the key has been turned and removed (auto-ejection device).

Enabling unit

Model	Number					Part number
	1	2	3	4	5	
iE 1000	ES 1					6 021 019
		ES 2				6 021 020
			ES 3			6 021 021
				ES 4		6 021 022
					ES 5	6 021 023

The device is inserted below the lower section of the safety interlock enclosure. Once the plant safety operator has inserted the coded key, the device allows manual control of the machinery's hazardous motion using the 2 NC + 2 NO.

Adaptor for access key

Model	Number					Part number
	1	2	3	4	5	
iE 1000	AK 1					5 308 302
		AK 2				5 308 303
			AK 3			5 308 304
				AK 4		5 308 305
					AK 5	5 308 306

Replacement key

Model	Number					Part number
	1	2	3	4	5	
Key	AK 1					5 308 686
		AK 2				5 308 687
			AK 3			5 308 688
				AK 4		5 308 689
					AK 5	5 308 690

The device is inserted between the safety interlock enclosure and the head.
The guard is blocked if the key is not inserted in device. The guard can be open only by inserting and turning the key.

Emergency stop/Restart unit

Model		Part number
iE 1000	ER	6 021 024

The device is inserted in the lower section of the safety interlock housing and it enables an emergency stop directly at the guard access point.
The integrated reset device enables the machine to restart once the guard is closed.

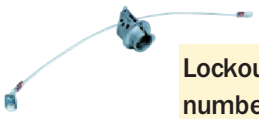
Indicator lamp

Model		Part number
iE 1000	ML	6 021 025

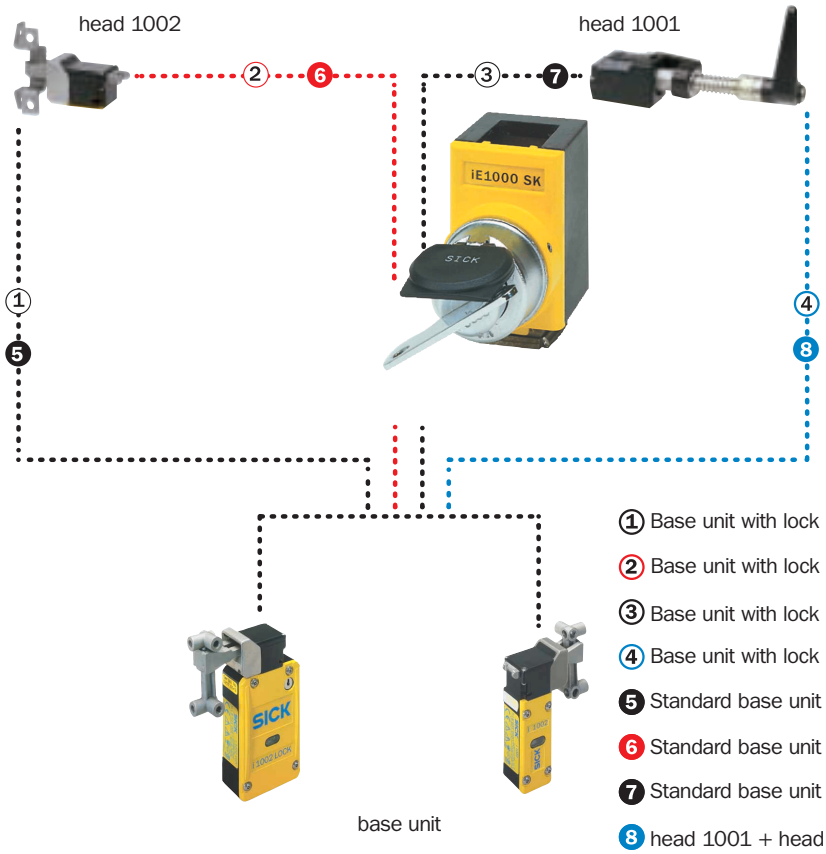
The device is inserted in the lower section of the safety interlock housing. The device is inserted in the lower section of the housing. It is designed to visually alert the operator of hazardous or safe conditions, depending on the internal contacts wiring.

Lockout bar iE1002-S3 part number 5 308 312

Actuator iE1002-S2 part number 5 308 315

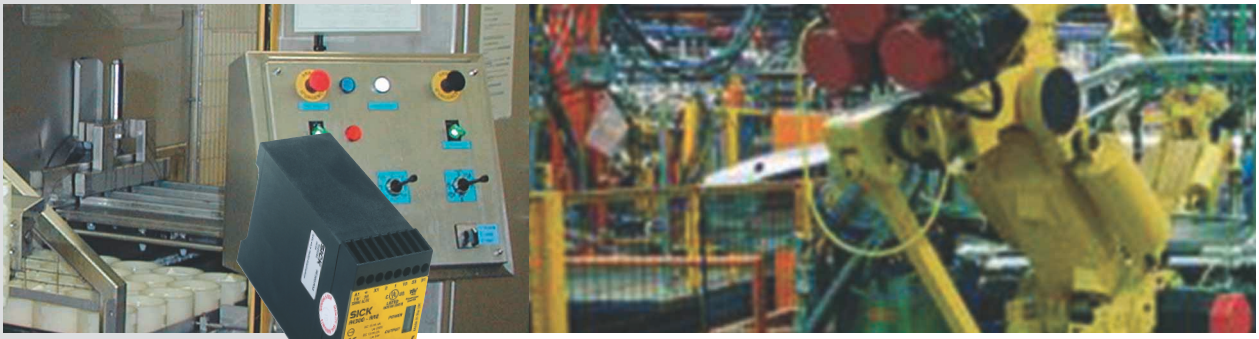


Lockout bar iE1002-R1 part number 5 308 313



① Base unit with lock + head i1002
② Base unit with lock + AK or SK + head i1002
③ Base unit with lock + AK or SK + head i1001
④ Base unit with lock + head i1001
⑤ Standard base unit + head i1002
⑥ Standard base unit + AK or SK + head i1002
⑦ Standard base unit + AK or SK + head i1001
⑧ head 1001 + head 1001

Non-contact safety sensor RE 300



Safety sensors in the RE 300 series are magnetically actuated, non-contact safety switches with an evaluation unit. The system consists of 3 parts:

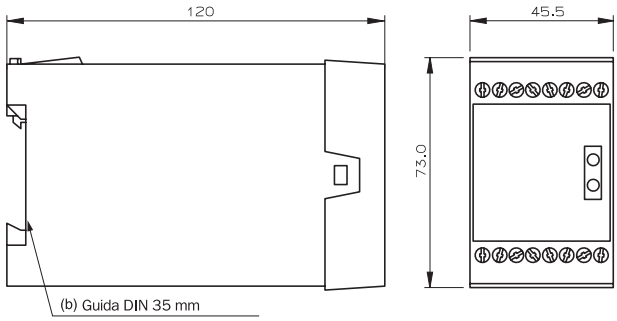
- Safety controller
- Sensor
- Actuator

The RE 300 Safety Sensor is intended for use mainly in applications where a mechanical interlock can't be installed because of guard misalignment, strong vibrations or high sanitary requirements (food industry).

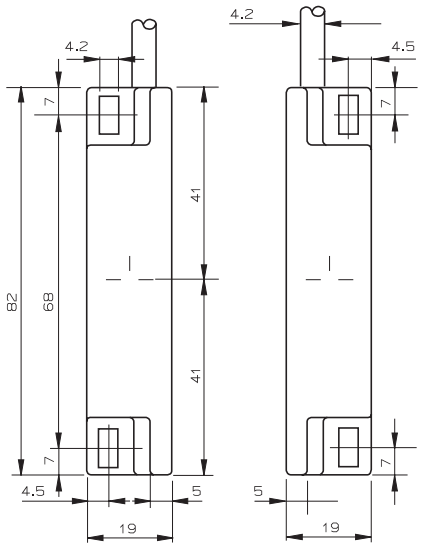
The REED technology integrated in the sensor/actuator (1 NC + 1 NO) allows for detection fields of 4 - 5 mm in the actuating phase, and of 15 mm in the deactivation phase (hysteresis). Coded magnets within the sensor and the actuator prevent the system from being activated using simple external magnets. The dedicated safety controller evaluates signals coming from the sensor (only 1 sensor/actuator couple can be connected) providing outputs of 2 safety NO and 1 signal NC.

Due to the 24 V AC/DC or 110/230 V AC rating, this device can be used with any supply current. The system is certified as Safety Class 3, as per EN 954-1.

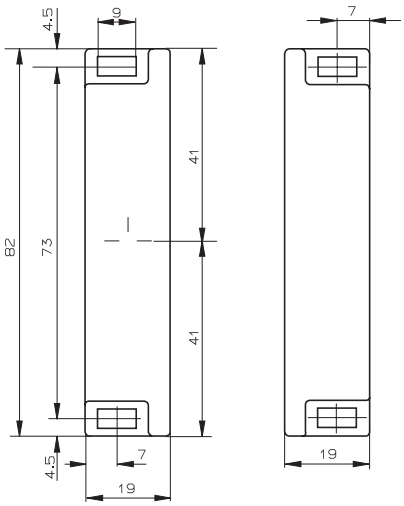
Drawings



Controller dimensional drawing



Sensor dimensional drawing



Actuator dimensional drawing

Technical specifications

Evaluation unit	RE 300
Control category to EN 954-1	3
PDF Class to EN 60 947-5-3	PDF-S
Housing material	polycarbonate
Environmental protection to IEC 60529	IP 20
Weight	590 g
Protection class	in conformity a EN 50 178, VDE 0110
Ambient temperature	–10 °C ... + 55 °C
Outputs	2 safety outputs (closing element) 13/14 and 23/24 1 auxiliary output (opening element) 31/32
Type of connection	Terminals1/2/3/4
Input resistance sensor (max.)	75 Ω
Tightening torque of the connecting terminals	1.0 Nm
Utilization category	AC-15, DC-13
Mechanical service life	1 x 10^6 switching operations
Current/operating voltage (max.)	AC: 4 A/250 V AC DC: 2 A/30 V DC
Switching capacity (max.)	1000 VA with COS Φ =1
Current/operating voltage (min.)	10 mA/10 V AC/DC
Output fuzing	5 A max. quick-action for AC; 3 A max. quick-action for DC
Operating voltage ±10%	+/–: 24 V AC/DC PELV [1] A1/A2: 110 V AC or 230 V AC [2]
Consumed power (max.)	< 4 VA (AC)
Rated impulse withstanding voltage U_{imp}	4 kV
Wire cross-section (max.)	1 x 2.5 mm^2
Release delay	25 ms
Shock-proof nach IEC 68 -2 27	30 G/11 ms
Vibration-proof to IEC 68 -2 -6	10…55 Hz (amplitude 0.35 mm ± 15 %)
Indicators	LED OUTPUT, green = safety contacts 13/14 and 23/24 closed, LED POWER green = power ON
Sensor and actuator	
Housing material	molded ABS
Environmental protection to IEC 60529	IP 67
Weight	0.1 kg
Temperature	operation: -10…55° C storage: -25…70° C
Shock-proof nach IEC 68-2-27	30 g/11 ms
Vibration-proof to IEC 68-2-6	10…55 Hz, amplitude 0.35 mm ± 15%
Response time	$T_{switching\ on}$ 5 mm, $T_{extinguishing}$ 15 mm (T = travel)
Approach speed (max.)	> 17 mm/s
Cable length (max.)	overall resistance < 75 Ω

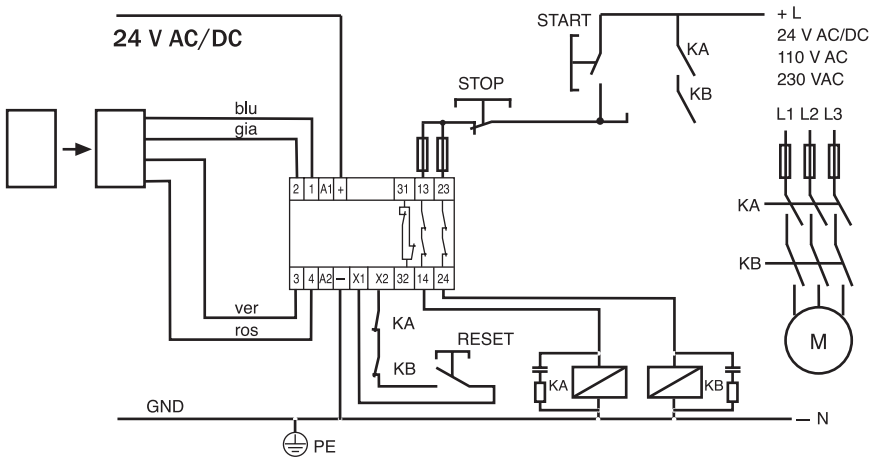
1) Low protection voltage and PELV ground. If +/– terminals are used, the –/PE terminal should be connected to the PE ground wire.
2) If the operating voltage is 110 V AC or 230 V AC, the PE ground wire should be connected to the – PE terminal.

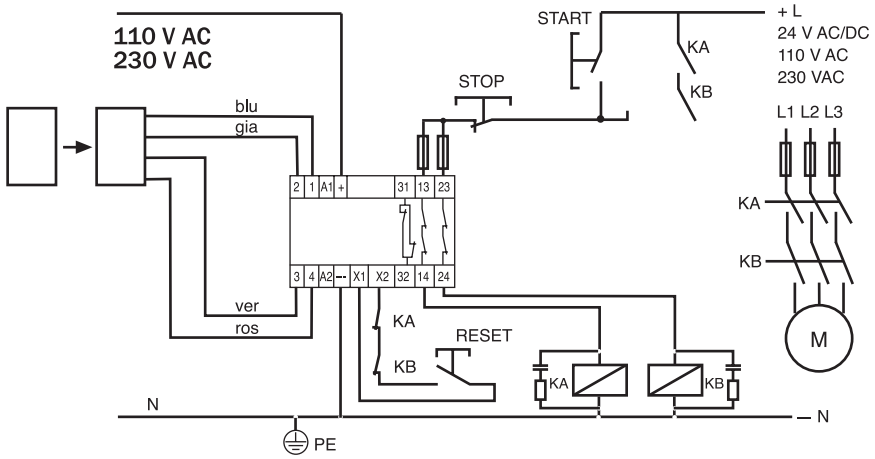
Selection table

Relay control unit		Part number
RE 300-RA2		6 025 082
Sensors (actuators + sensors)	**cable length**	**Part number**
RE 300-DA	03P	6 025 080
RE 300-DA	10P	6 025 079
Spare part (actuating key)		**Part number**
RE 300-KA		5 311 140

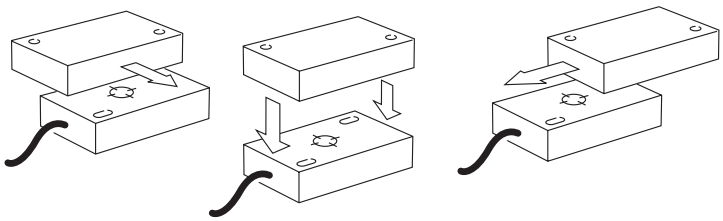
We recommend contacting Customer Service for product selection.

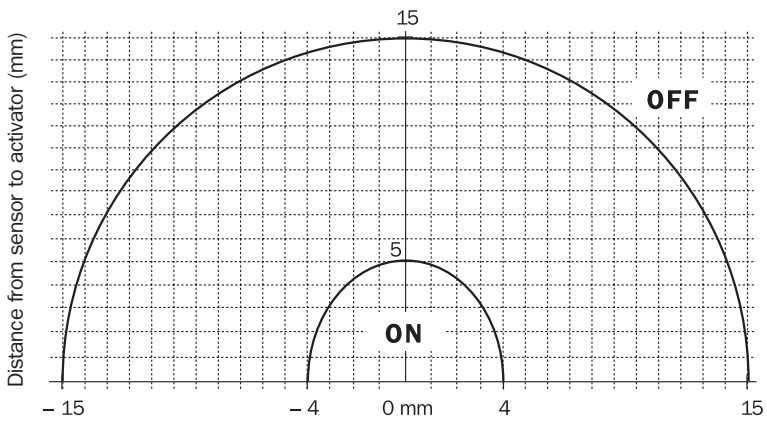
Electrical wiring





Operating field





Tolleranza laterale di disassamento

Non-contact safety sensor, multiple heads
RE 4000

The RE 4000 magnetic safety sensors operate with coded actuators. The system's main advantage is non-contact operation, which eliminates the maintenance costs associated with mechanical devices, where guard's misalignment and components' physical damage require constant monitoring of installed devices.

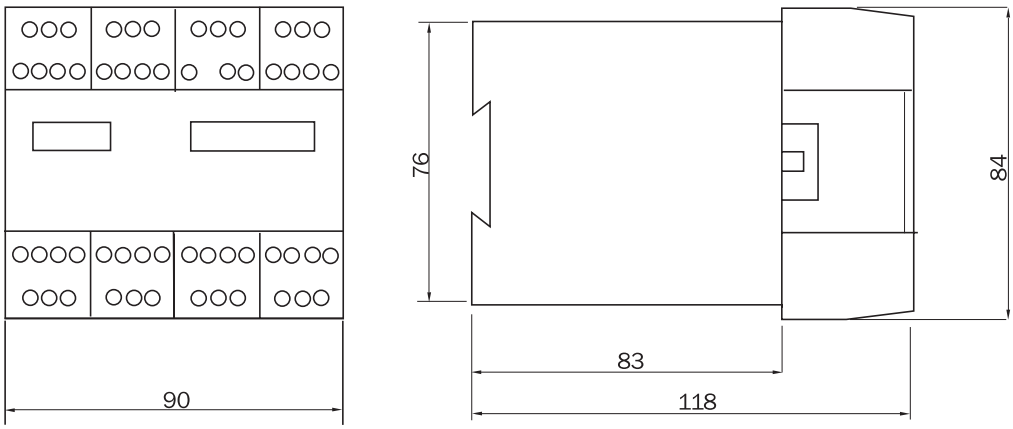
The connected sensors (2 to 6) are positioned on the guards' fixed section and connected to the processing unit by means of a 4-conductor cable. The actuators are installed on the movable parts of the same guards. During the guard's closing phase, as soon as the actuator reaches the sensor's detection area, the processing unit registers the respective channel switching and switches the safety contacts, after ensuring that all other associated guards and connected sensors are closed.

Features of the RE 4000:

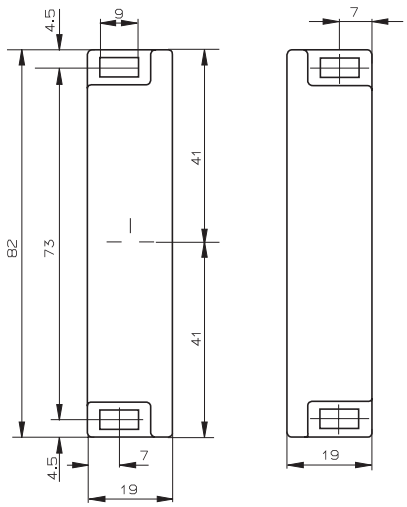
- 2 to 6 connectable sensors
- Supply voltage 24 V AC/DC, 110/230 V AC
- Outputs: 3 NO + 1 NC + 1 NO delayed (0.6 - 30 sec)
- Integrated reset and EDM
- Safety Category 4

Drawings

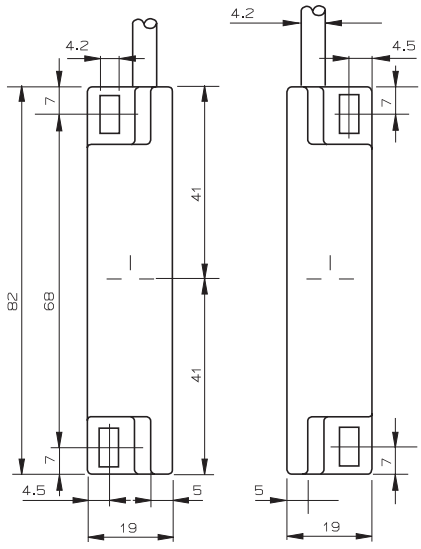
Data processing unit



Sensor



Actuator



Technical specifications

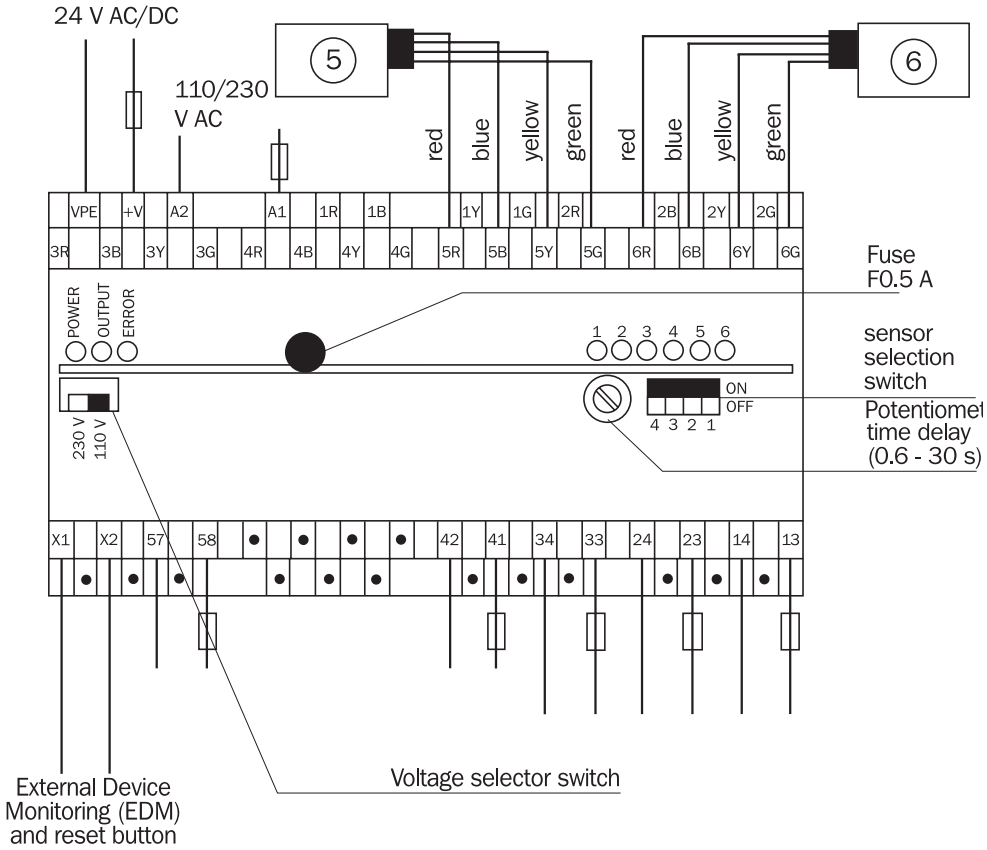
	RE 4000
Safety control category to EN 954	4
PDF Class to	PDF-S
Housing material	polycarbonate
Environmental protection to IEC 60 529	IP 20
Protection class	EN 50 178 and EN 61 140
Operating temperature	-10…55° C
Outputs	3 NO safety, 1 NC signal 1 safety contact delay (0.6 - 3 OS)
Number of sensors	minimum 2, maximum 6
Mechanical service life	10^6 switching operations
Usage category	AC-15 240 V 2 A, DC-13 24 V 1 A
Switching current/ switching voltage	AC: 4 A/250 V AC CON $\Phi = 1$ DC: 2 A/30 V DC
Max. switching capacity	1000 V A at COS $\Phi = 1$
Min. switching current/switching voltage	10 mA/10 V AC/DC
Short-circuit protection	AC: 5 A fast-action; DC: 3 A fast-action
Operating voltage	DC: ± 15% 24 V AC/DC PELV 110 V AC or 230 V AC AC: + 10% – 15% 24 V AC/DC PELV 110 V AC or 230 V AC
Connected load (max.)	AC: < 8 V A; DC: < 5 W
Rated withstanding voltage U_{imp}	4 kV
Conductor cross-section max.	2.5 mm^2
Shock resistance in compliance to IEC 68-2-77	30 g/11 ms
Vibration-proof to IEC 68-2-6	10…55 Hz, amplitude 0.35 mm ± 15%
Relay delay time to enable (max.)	50 ms
Response time	25 ms
Indicators	LED 1…6 (yellow) = safety door open LED “OUTPUT” (green) = safety contact 13/14, 23/24, 33/34 closed LED “ERROR” (red) flashes in case of error LED “POWER” (green): supply presence
Sensor and actuating element	
Housing material	plastic (ABS)
Protection class	IP 67
Operating temperature	-10…55° C
Storage temperature	-25…70° C
Shock-proof to IEC 68-2-27	30 g/11 ms
Vibration-proof to IEC 68-2-6	10…55 Hz, amplitude 0.35 mm ± 15%
Operating range	$S_{ON} \leq 5$ mm, $S_{OFF} \geq 15$ mm
Approach speed	≥ 17 mm/s
Cable length (max.)	overall resistance < 75 Ω

Product selection table

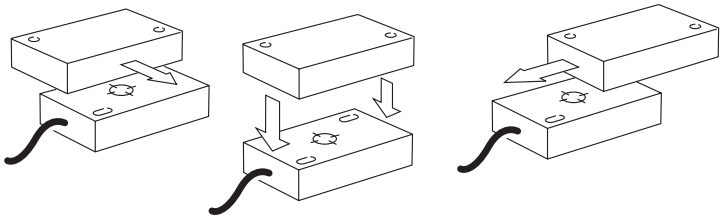
Model	Description	Part number
RE 4000-RB3	Safety Class IV x 6 sensors	6 025 083
RE 300- DA 03P	length of cable 3 m	6 025 080
RE 300 - DA 10P	length of cable 10 m	6 025 079
RE 300 -KA	return solo actuator	5 311 140

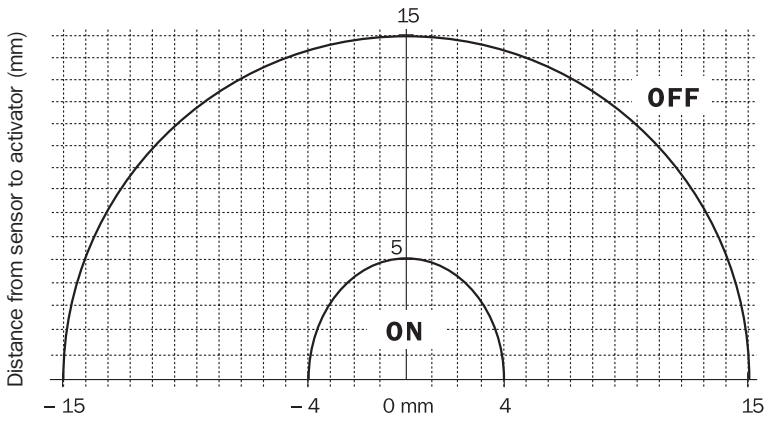
We recommend contacting Customer Service for product selection.

Electrical wiring

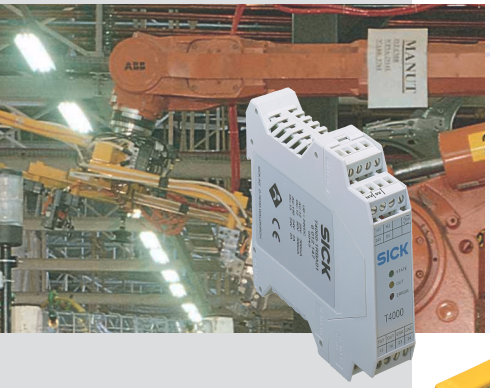


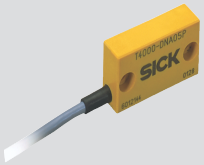
Operating field





Non-contact safety sensor T 4000





The T 4000 is a non-contact safety system, certified to Safety Category 3, and is based on Transponder technology. The system consists of 3 parts:

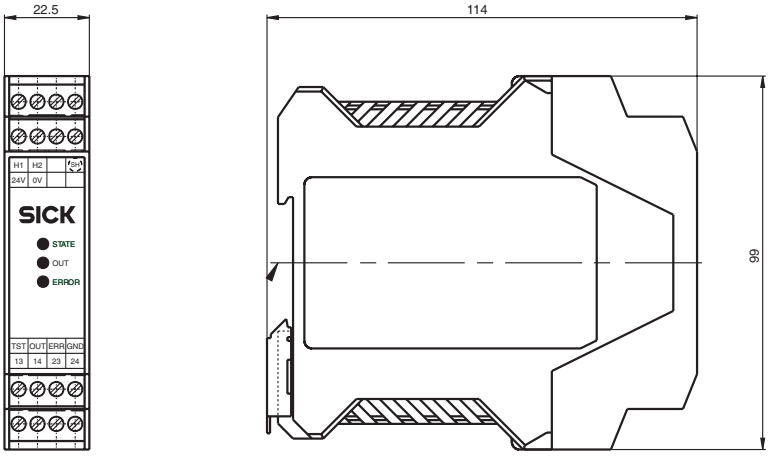
- Safety controller
- Sensor
- Actuator

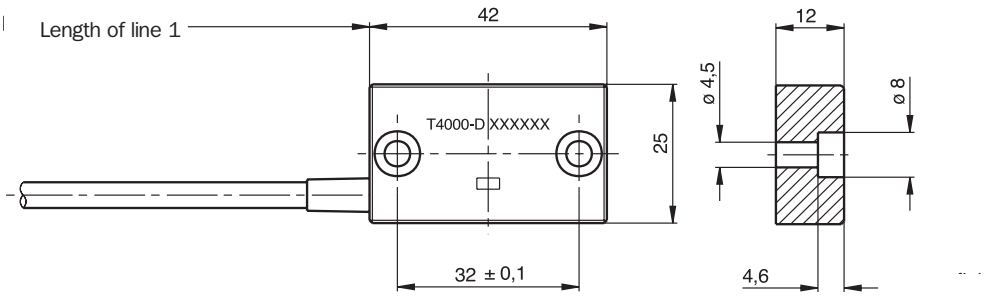
The T 4000 series coded electronic safety interlocks are ideal for monitoring door/gate access points. It is used mainly in applications where mechanical interlocks can't be installed because of guard misalignment, strong vibrations or high sanitary requirements (food industry).

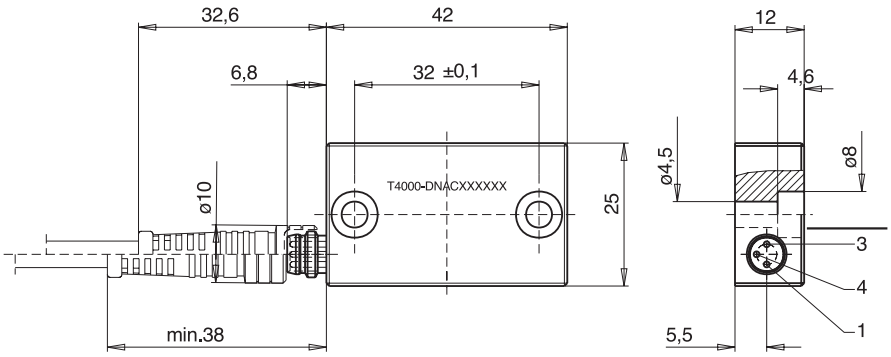
Using the electronic code entered in the actuator, the device learns the sensor (on the guard's fixed section) only one code at the time. When another T 4000 series actuator is installed nearby, this function prevents the system from enabling the outputs if the guard is not in the proper position. In case of actuator damage, it is possible, through a re-learning procedure (up to eight times), to enter a new electronic code of the new device.

The safety controller processes the signals from the sensor and will switch its two safety NOs by setting the semiconductor output (Enable) to the High condition. In case of an internal malfunction of the controller or of the field sensors, the device will default to a safe status by switching its outputs, and will signal the system failure (Error) through an additional diagnostic output. Due to its actuating (up to 5 mm) and deactivating (8 mm) capability, together with the ability to test the sensors without opening the guard, the T 4000 safety sensor is ideal for technologically demanding applications (automotive industry).

Drawings


22.5
114
99
H1
H2
24V
0V
SICK
STATE
OUT
ERROR
TST
OUT
ERR
GND
13
14
23
24


Length of line 1
42
12
T4000-D XXXXXX
25
ø 4,5
ø 8
32 ± 0,1
4,6


32,6
42
12
6,8
32 ±0,1
4,6
T4000-DNACXXXXXX
ø10
25
ø4,5
ø8
3
4
1
min.38
5,5

Technical specifications

Evaluation unit	T 4000			
Parameters	**Value**			**Unit**
	minimum	**typical**	**maximum**	
Housing material		Plastic PA6.6		
Dimensions		114.5 X 99 X 22.5		mm
Weight		0.25		Kg
Ambient temperature to U_B = 24 V DC	0	-	+ 55	°C
Storage temperature	-25	-	+70	°C
Enclosure		IP 20		
Enclosure rating		Enclosure rating III, degree of contamination 2		
Installation		35 mm top-hat rail to DIN 46277		
Number of sensors		1 sensor per evaluation unit		
Connection type		plug-in screw-type terminals		
Connection terminals	0.14	-	2.5	mm^2
Operating voltage U_B (stabilized, residual ripple < 5%)	21	24	27	V DC
Electrical consumption (with relay energized)		150		mA
Safety outputs		2 safety relays, each with one NO contact		
Switching voltage (relay outputs) 1)				
Switching current 0.1…60 V	1	-	300	mA
Switching current 10…24 V	1	-	4000	mA
Output fusing		6.3 A quick-action		
Utilization category EN 60947-5-2		AC-12 300 mA 60 V 50 Hz / DC-12 300 mA 60 V AC-140 2 A 30 V 50 HZ / DC-13 4 A 30 V		
Control category EN 954		3		
Classification to IEC/EN 60 947-5-3		PDF-M		
Rated insulation voltage U_i	-	-	63	V
Rated impulse withstanding voltage U_{imp}	-	-	1.5	kV
Resistance to vibration		in accordance with EN 60 947-5-2		
Mechanical switching operations (relays)		10×10^6		
Operating delay as of state change	-	-	180	ms
Risk period 2)	-	-	180	ms
Time delay before availability 3)			3	s
Dwell time	0.5	-	-	s
Alarm outputs (diagnostic ERR, enable OUT, semiconductor output, p-switching) 4)				
-output voltage	0.8 x U_B	-	U_B	V DC
-load rating	-	-	20	mA
Test input LOW	0	-	2	V DC
Test input HIGH	15	-	U^B	V DC
EMC protection requirements		to IEC 60947-5-3		
LED indicators	STATE LED green: normal mode blinking: teach-in operation OUT LED yellow: actuator detected ERROR LED red: test input activated internal circuitry error, invalid teach-in operation			

1) If the output relays have switched due to a current > 300 mA, the gold plated contacts are no longer capable of guiding currents (≤ 10 mA).

2) The internal failure detection time indicates the device delay in opening the output relay when a failure occurs. In case of output relay failure, the failure is detected when opening the safety circuit.

3) After entering the operating voltage, during the ready phase delay, the relay outputs are disconnected and the door signal contact is set to LOW potential.

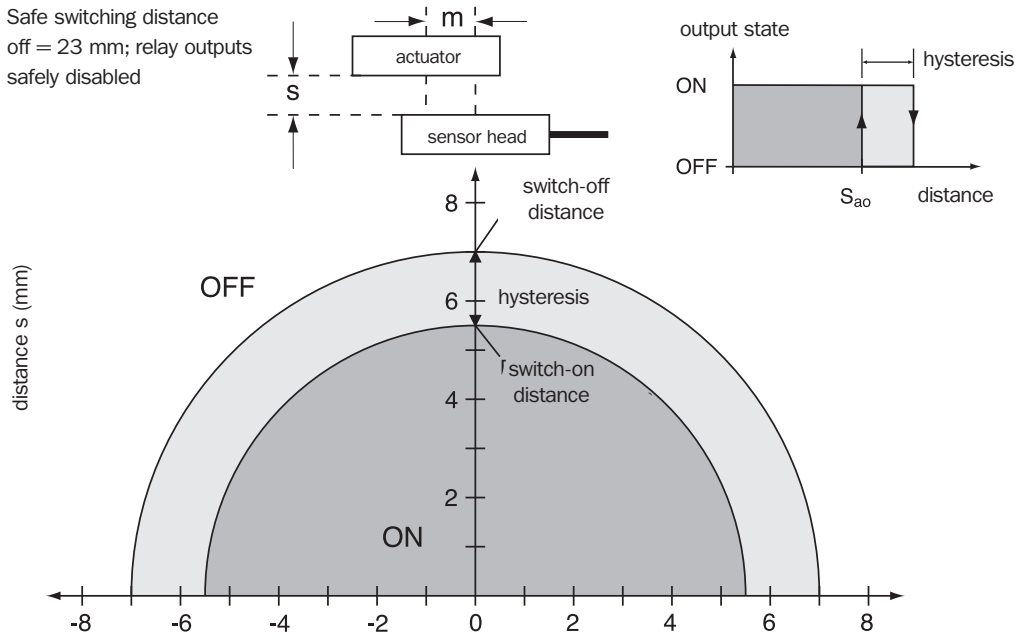
4) Not protected against short circuit.

Application example

Technical specifications

Sensors and actuators	T 4000		
	minimum	**typical**	**maximum**
Housing material	fortron, glass-reinforced thermoplastic material; fully encapsulated		
Dimensions	42 x 25 x 12 mm		
Weight (including 10 m cable)	0.3 Kg		
Operating temperature	- 25° C		+70° C
Protection class	IP 67		
Installation position	any		
Mode of operation	inductive		
Dynamic data transfer to evaluation unit	2 Kbit/s		
Operating range			
in case of center offset m=0			
-Switch-on distance S_{ao}	5 mm	6 mm	-
-Differential hysteresis	-	2 mm	-
-Safe switch-off distance S_{ar}			
in the case of center offset m=0 mm	-	-	23 mm
Power supply	via evaluation unit		
Connection	permanently sealed connection cable, with wire end ferrules or plug		
Line length	see selection table; other lengths on request		

Typical operating range



Product selection table

Actuator

Model		Part number
Actuator T4000-1 KBA		5 306 531

Sensor with integral cable

Read head	Cable length 5 m	10 m	15 m	Part number
T4000 DNA	05 P			6 012 144
T4000 DNA		10 P		6 012 145
T4000 DNA			15 P	6 012 146

Sensor with output to connector

Read head	Cable length 20 m	25 m	50 m	Plug	Part number
T4000 DNA				C	6 021 912

Cable for sensor with output to connector

Sensor	Cable length 20 m	25 m	50 m	Plug	Part number
T4000 DNA	20			C	6 021 913
T4000 DNA		25		C	6 021 914
T4000 DNA			50	C	6 021 915

Data processing unit

Relay control unit		Part number
Relays T4000-1 RBA 01		6 012 147

We recommend contacting Customer Service for product selection.

Non-contact safety sensor T 4000 Compact

The T 4000 Compact is a non-contact safety system, certified in Safety Category 3, based on Transponder technology. The system consists of 2 parts:

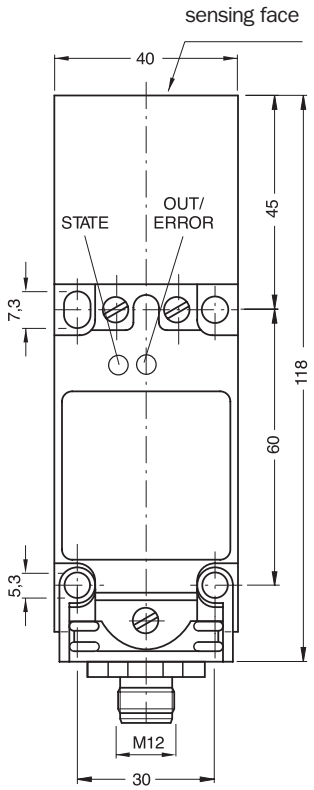
- Sensor
- Actuator

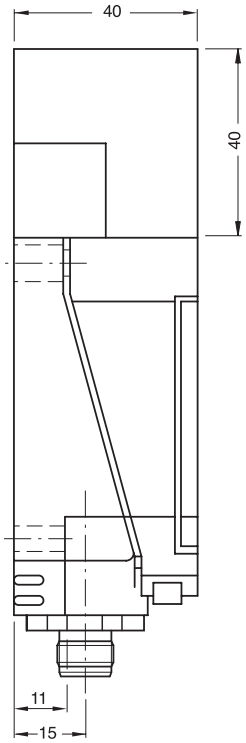
The T 4000 Compact is ideal for use in applications where mechanical interlocks can't be installed because of guard misalignment, strong vibrations or sanitary requirements (food industry).

Using an electronic code that has been entered in the actuator, the device learns the sensor (on the guard's fixed section) one code at a time. When another T 4000 Compact series actuator is installed nearby, this function prevents the system from enabling the outputs if the guard is not in the proper position. In case of actuator damage, is possible, through a re-learning procedure (up to 8), to enter a new electronic code for the new device.

The safety controller, integrated in the sensor, directly processes signals in the field, providing two safe semiconductor outputs (La, Lb) and one signal output (OUT). In case of device malfunction, the outputs will be set to the low status and an LED indicator will alert the operator of the device failure. Thanks to its actuating (up to 20 mm) and deactivating (23 mm) capability, together with the ability to test the sensors without opening the guard, the T 4000 Compact safety interlock is ideal for demanding applications (automotive industry).

Drawings


sensing face
40
STATE
OUT/
ERROR
45
118
60
7.3
5.3
M12
30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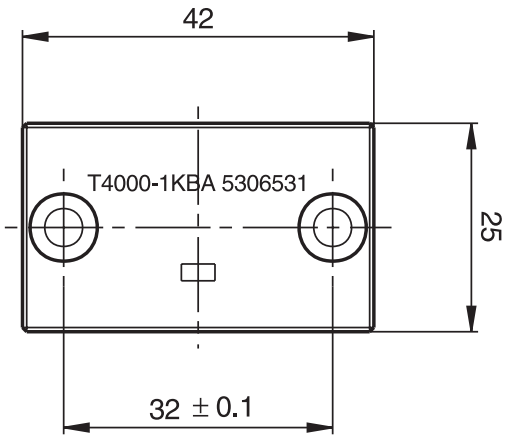
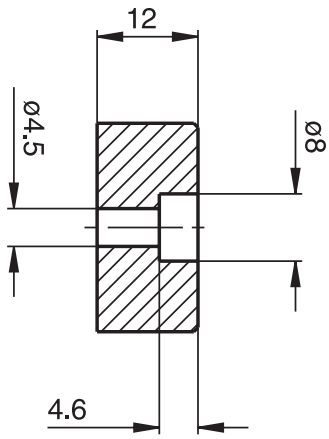
40
11
15


42
T4000-1KBA 5306531
25
32 ± 0.1


12
ø4.5
ø8
4.6

Technical specifications

	T 4000			
Parameter	**Value**			**Unit**
	minimum	**typical**	**maximum**	
Housing material		Plastic PBT V 0 GF 20		
Dimensions		118 x 40 x 40 mm		
Weight		0.4		kg
Ambient temperature to UB = 24 V DC	0	–	+55	°C
Storage temperature	-25	–	+70	°C
Enclosure		IP 67, protection class II, degree of contamination 2		
Installation position		optional		
Type of connection		M12 plug, 8-pin, shielded		
Operating voltage U_B (reverse voltage proof, stabilized, residual ripple < 5 %)	18	24	27	V DC
Current consumption		80		mA
Operating voltage for load U(+LA) / U(+LB)	18	–	27	V DC
Safety outputs LA and LB		LA / LB, 2 solid state outputs, p-switching, short-circuit proof electrically decoupled		
Output voltage U(LA) / U(LB) 1)				
HIGH	U(+LA) - 1,4	–	U(+LA)	
HIGH	U(+LB) - 1,4	–	U(+LB)	
V DC				
LOW U(LA) / U(LB)	0	–	1	
Switching current	1	–	400	mA
External fusing U(+LA) / U(+LB)		medium, solw blow		
Utilization category to EN 60947-5-2		DC-13 24 V 400 mA		
Classification to IEC/EN 60 947-5-3		PDF-S		
Door signal output OUT		solid state output, p-switching, short-circuit proof		
Output voltage	0,8 x UB	–	U_B	V DC
Load rating	–	–	20	mA
Control category according to EN 954		3		
Rated insulation voltage U_i	–	–	30	V
Rated impulse withstand voltage U_{imp}	–	–	1,5	kV
Resistance to vibration		according to EN 60 947-5-2		
Operating delay as of state change	–	–	180	ms
Risk period 2)	–	–	180	ms
Start-up delay time 3)	–	–	3	s
Dwell time 4)	0.5	–	–	s
EMC protection requirements		according to IEC 60947-5-3		
LED indicators	STATE LED green: normal mode blinking: teach-in operation OUT/ERROR LED yellow: actuator detected red: test input activated internal circuitry error invalid teach-in operation			

1) If the output relays have switched due to a current > 300 mA, the gold plated contacts are no longer capable of guiding currents (≤ 10 mA).

2) The internal failure detection time indicates the device delay in opening the output relay when a failure occurs. In case of output relay failure, the failure is detected when opening the safety circuit.

3) After entering the operating voltage, during the ready phase delay, the relay outputs are disconnected and the door signal contact is set to LOW potential.

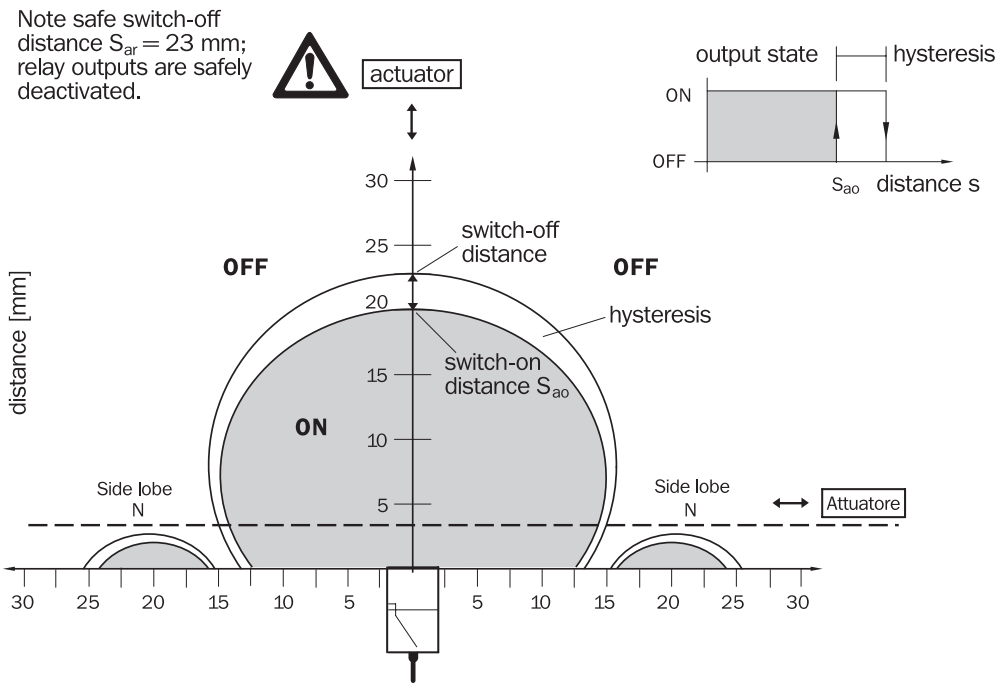
4) Not protected against short circuit.

Technical specifications for actuator

	T 4000			
Parameter	**Value**			**Unit**
	minimum	**typical**	**maximum**	
Housing material	Fortron, glass-reinforced thermoplastic material, fully encapsulated			
Dimensions	42 x 25 x 12 mm			
Weight	0.01			kg
Ambient temperature	–25	–	+70	°C
Enclosure	IP 67			
Installation position	sensing face opposite read head			
Power supply	inductive via read head			
Swell time remaining inside the operating range [1)]	0.5	–	–	s

[1)] The stay time is the time during which the actuator should be inside or outside the operating field.

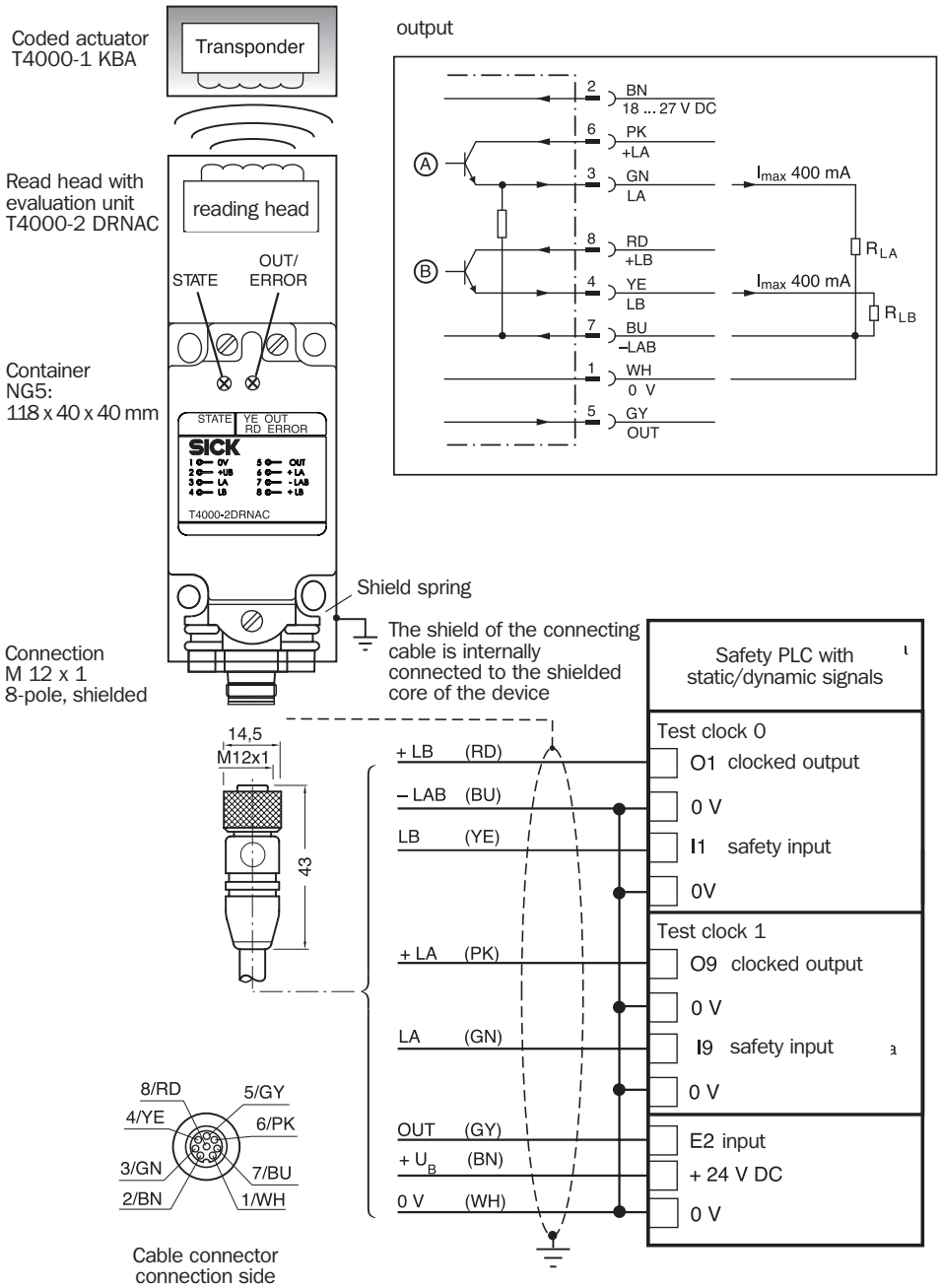
Application example



Direction of read head

- The sensitive side of the reading head can be rotated to 5 different positions. It is identified by the SICK logo and the circle corresponds to the center of the reading head.
- 1) Use a screwdriver to remove the reading head
- 2) Remove it from the housing and tilt it at 90° (arrow A). Position the sensitive side of the reading head as desired by rotating it in the direction of the B arrow.
- 3) Reassemble the reading head.

Connection and block diagram



Product selection table

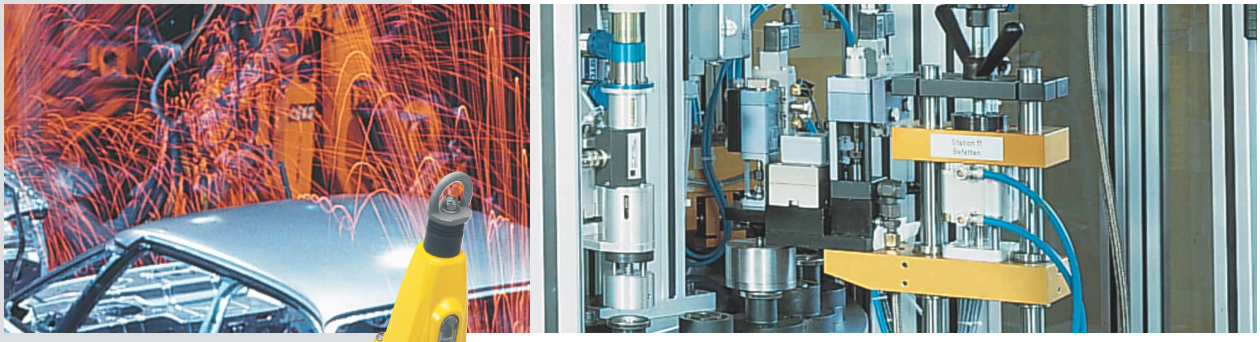
Actuator		Part number
T4000-1 KBA		5 306 531

Data processing unit		Part number
T4000-2 DRNAC		6 022 052

Female connector M12 - 8-pin straight	Cable length 5 m	10 m	15 m	30 m	Part number
T4000-2 DRNAC	5				6 020 993
T4000-2 DRNAC		10			6 022 152
T4000-2 DRNAC			15		6 022 153
T4000-2 DRNAC				30	6 022 242

We recommend contacting Customer Service for product selection.

Rope pull emergency stop i110 RP

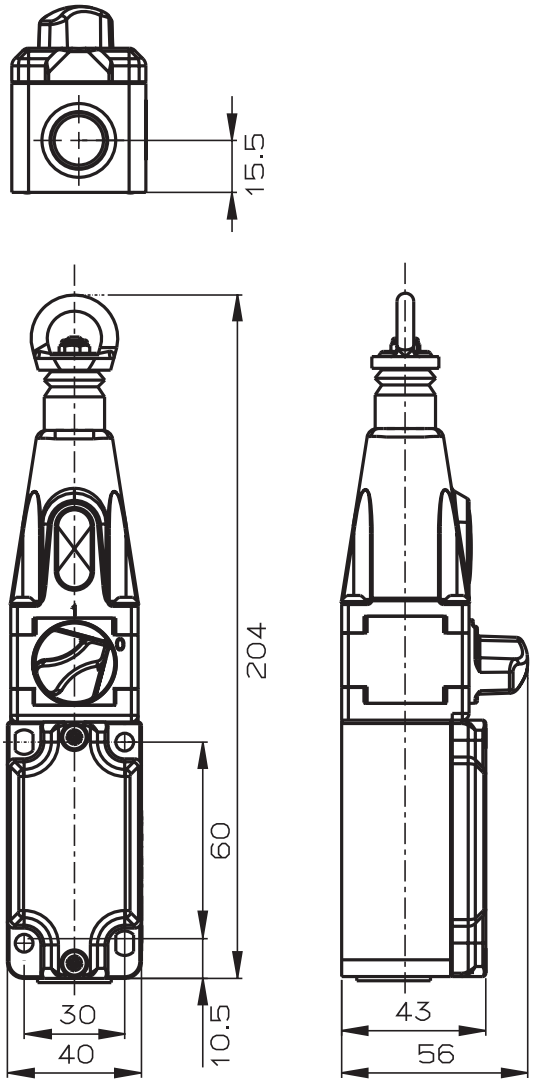


The i110 RP Rope Pull emergency stop switch saves critical time in emergencies by providing a means of shutting down the machinery at any point along the cable's length. The i110 RP series is in compliance with EN 481 requirements (Machinery safety - emergency stopping control devices). Such devices are designed to provide the operator with the option to activate an emergency stop in any area of the equipment, without having to move toward the control area or platform where the emergency panel is located.

This versatile emergency stop device can accommodate cables up to 30 m long, has an integrated manual reset function (blue knob) and cable tension indicator located at the center of the metal housing. The cable coupler and innovative tension system considerably reduces the assembly time during the installation phase, as compared to traditional stopping systems.

The i110 RP is designed to compensate for potential thermal expansion. Several models are available- 3 NC + 1 NO or 2 NC + 2 NO as well as a wide range of accessories. The i110 RP is ideal for use along conveyor lines or around the perimeter of large manufacturing machines, such as web process lines, robotic work cells and roll-forming equipment.

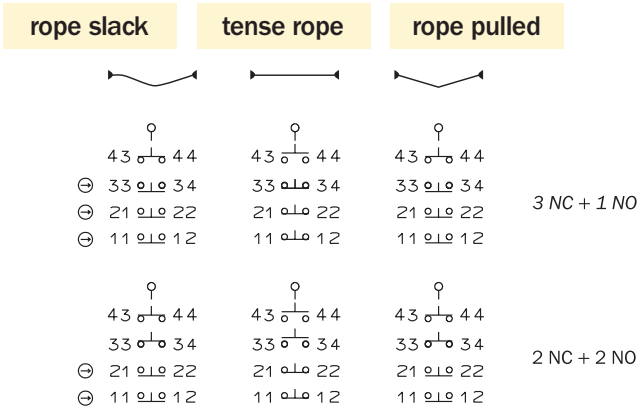
Drawings



Technical specifications

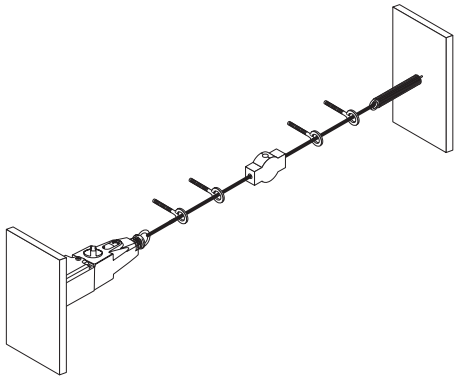
	i110 RP
Housing material	die-cast light alloy
Rope hooks	stainless steel
Environmental protection to IEC 60 529	IP 66
Mechanical service life	10^6 switching operations
Ambient temperature	-25…80° C
Mounting position	optional
Connection type	M 20
Actuating force (min.)	> 125 N (deflection 300 mm)
Frequency of use	1 cycle/second
Contact elements positively guided NC/NO contacts	3/1 or 2/2
Rated insulation voltage	Vi = 250 V
Utilization category to IEC 60 947-5-1	AC 15/AC: 2 A (250 V), 5 A (100 V) DC 13/DC: 0.40 (250 V), 2 A (24 V)
Switching voltage (min.)	5 V
Switching current (min.)at 5 V dc	5 mA
Wire cross-section	1 X 1.5 mm^2
Short-circuit protection	T6
Certifications	CE, cULus, TÜV

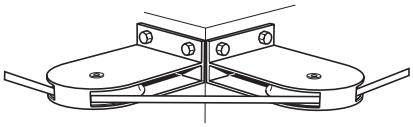
Switching elements



Installation notes

Place the safety interlock and the cable so that the cable can be activated from any direction to safely stop the machine. The cable activation should cover the entire work area. Before pressing the reset button, the entire length of the cable should be visible. Use the tension springs whenever the application requires a particularly long cable. Use the appropriate hooks in places where the cable needs to turn at an angle.





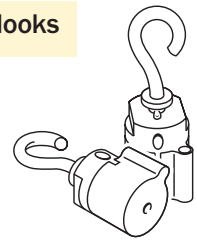
Product selection table

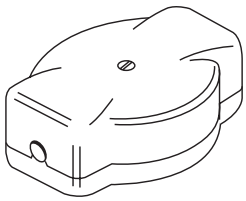
Model	Rope	Contacts		Connector M 20	Part number
		NC	NO		
i 110-	RP	3	1	3	6 025 076
i 100-	RP	2	2	3	6 025 077

We recommend contacting Customer Service for product selection.

Accessories

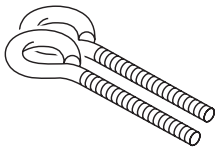
Hooks



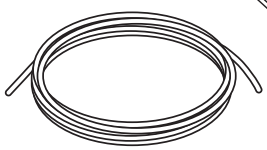


Tensioner

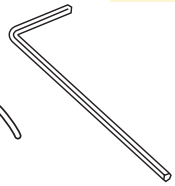
Eyebolts



Rope



Alley key



Cable sets

Model	Rope	Cable length 5 m	10 m	20 m	30 m	Part number
iE110-	P	05				5 311 136
iE110-	P		10			5 311 137
iE110-	P			20		5 311 138
iE110-	P				30	5 311 139

Each of the items listed above include cable, tensor, eyebolts, and hooks.

Replacement parts

Model number	Description	Part number
iE110 - PL 100	length of rope 100 m	5 310 814
iE110 - PTR	tensor, 2 cable terminals, socket head screw	5 309 034
iE110 - PL 30	rope 30 m	5 310 813
iE110 - PEB	eyelets (with nut and washers)	5 309 035

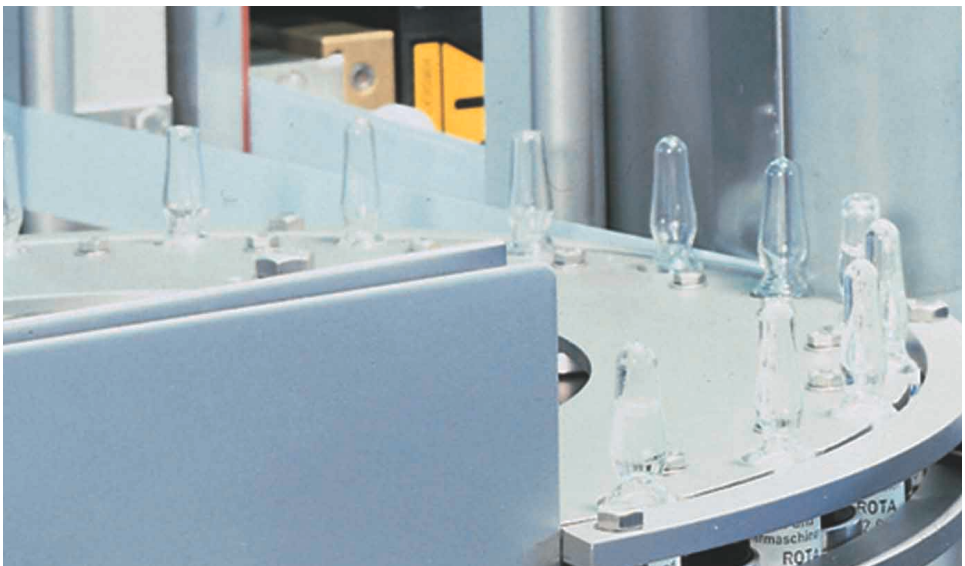
Enabling device E 100

The E 100 enabling device is a manual device intended for use by the operator in hazardous areas associated with machinery or installations. In “manual” mode, safety devices may be disabled under certain conditions.

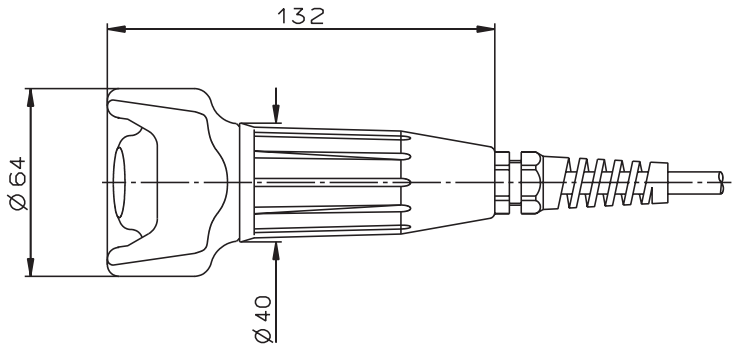
Using the activation button, authorized personnel can enter the hazardous area in order to carry out specific tasks (e.g., to verify the production sequence). In addition to the safety function, this device incorporates ergonomic properties, in order to make it easy to use.

The activation button is equipped with a plastic enclosure that provides a high protection rating (IP 67).

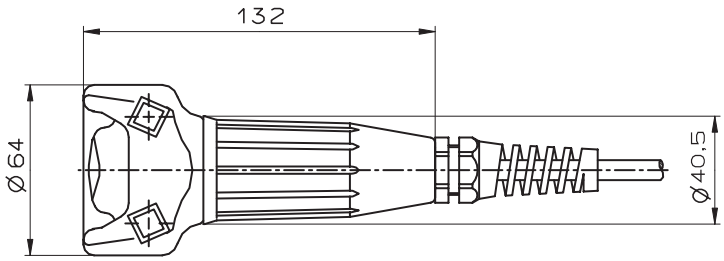
Models with three different types of cables are available: 5 m, 10 m (straight, flexible cable) and 5 m with spiral extensible cable.



Drawings



Version HA



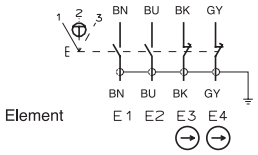
Version HB

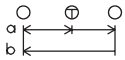
Technical specifications

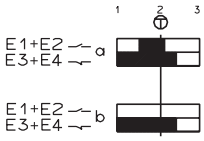
	E 100
Housing material	plastic
Environmental protection to IEC 529	IP 67/IP 65
Ambient temperature	-5…60° C
Switching elements	see product selection table
Switching principle	slow-action
Utilization category IEC 947-5-1	AC-15 U_e 230 V I_e 4 A /DC-13 U_e 24 V I_e 3 A
Connection	cable 8 x 0.34 mm^2
Fuse	F 6 A
Weight	1.1 kg c.a

Switching elements

2 NO
2 openings positive NC



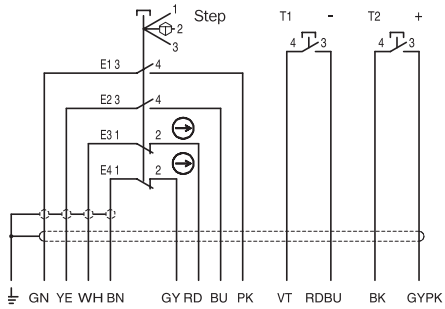


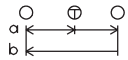


Forced openings NC

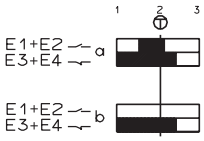
Push of qualification

Element
Contacts
Open
Closed





Push of qualification



Element
Contacts
Open
Closed

Operation

The SICK activation button operating sequence meets the EN 775 and VDI 2854 requirements for activation devices with three positions. The operating sequence is as follows:

Stage 1 Function OFF	actuating element not pressed
Stage 2: Supply function	actuating element pressed in central position
Stage 3: Function OFF	positive opening operation (the actuating element is pressed all the way down)

The device's internal mechanism is designed to not reactivate the machine motion during the transition from condition 3 to condition 2, therefore requiring the operator to completely release the button until condition 1 is reached, and then to press it again.

The exact operating sequence is illustrated in the switching diagrams.

Product selection table

Model	Type	Functionality to 3 positions	Connection	Contacts NC	Contacts NO	Type of cable Straight	Type of cable Spiral	Cable length 5m	Cable length 10m	Form	Part number
E 100-	A	2	A	2	2	S		05		A	6 012 141
E 100-	A	2	A	2	2	S			10	A	6 021 916
E 100-	A	2	A	2	2		W	05		A	6 021 917
E 100-	B	2	A	2	2	S		05		A	6 022 879
E 100-	B	2	A	2	2	S			10	A	6 022 880

We recommend contacting Customer Service for product selection.

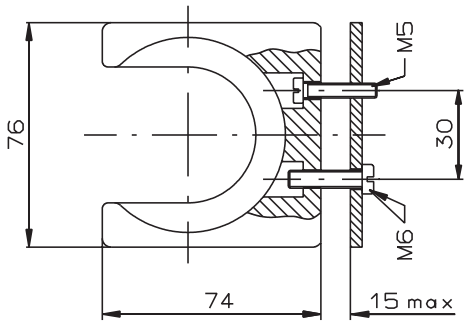
Applications

The safety enabling device is ideal for use in automated production lines that can operate in “manual” mode, in compliance with EN 775 VDI 2854. This operating mode should be determined using a key selector, as required by EN 60204 (DIN VDE 0113 T1).

In this mode, the safety guards are partially disabled. As a result, the operator working with the safety enabling device in the hazardous area, should be able to quickly identify a dangerous condition and to initiate the appropriate remedies.

Accessories

Fixed bracket
Part number 5 308 209



Power supply
PS 50W-24V and PS 95W-24V

Features

- Adjustable output voltage up to DC 24 - 28 V
- 115/230 V AC input
- State-of-the-art design
- IP 20 DIN rail mounted
- NEC Class 2 rated
- cULus, CE approvals
- Suitable for both standard and safety-related devices

Product selection table

Model	Description	Part number
PS50W-24V	Power supply 24 V DC - 2.1 A	7 028 789
PS95W-24V	Power supply 24 V DC - 3.9 A	7 028 790

Technical specifications

	PS 50W-24V	PS 95W-24V
Input parameters		
Input voltage range V AC (nominal)	100…240 V	100…120/220…240 V
Input voltage range V AC (continuous)	85…264 V	85…132/184…264 V
Input V AC frequency	43…67 Hz	47…63 Hz
Input voltage range V DC (see derating requirements)	85…375 V	220…375 V
Input rated current	< 1.0 A (100 V AC) < 0.6 A (196 V AC)	< 2.0 A (100 V AC) < 0.95 A (196 V AC)
Transient immunity over entire load range	In acc. VDE 0160/W2 (750 V/1.3 ms)	In acc. VDE 0160/W2 (750 V/1.3 ms)
Output parameters		
Output voltage	24…28 V DC	24…28 V DC
Output voltage preset	24.5 V DC ± 0.5%	24.5 V DC ± 0.5%
Ripple/noise at 20 MHz, 50 Ohm	< 50 m V_{pp}	< 50 m V_{pp}
Output voltage regulation accuracy	0.5% V_{out} static ± 2.0% V_{out} Dynamic	0.5% V_{out} static ± 1.5% V_{out} Dynamic
Output rated current	2.1 A (at 24 V DC) 1.8 A (at 28 V DC)	3.9 A (at 24 V DC) 3.2 A (at 28 V DC)
Hold up time	> 97 ms (196 V AC) > 17 ms (100 V AC)	> 20 ms (196 V AC, 24.5 V/3.9 A) > 20 ms (100 V AC, 24.5 V/3.9 A)
Current limitation	2.2…3.2 A (typical)	< 4.0 A (< 8 A)
General device parameters		
Operating temperature range (Tamb) - full load	-10…60°C	-10…60°C
Operating temperature range (Tamb) - derated	60…70°C	60…70°C
Storage temperature	-25…85°C	-25…85°C
Humidity	93%, 40°C, 14 days no condensed IEC 68-2-3	93%, 40°C, 14 days no condensed IEC 68-2-3
Connector cables		
Flexible cable	0.3…2.5 mm^2 / AWG 28-12	0.3…2.5 mm^2 / AWG 28-12
Solid cable	0.3…4 mm^2 / AWG 28-12	0.3…4 mm^2 / AWG 28-12
Stripping at wire end	6 mm	6 mm
Efficiency	88.5% (typical at 230 V AC)	90% (typical at 230 V AC, 3.9 A)
Degree of protection	IP 20 (DIN/IEC 60 529)	IP 20 (DIN/IEC 60 529)
MTBF	600,000 hours	500,000 hours
Dimensions	45 x 75 x 91 mm	73 x 75 x 103 mm
Weight	240 g	360 g
Applicable standards		
EN 60 950, IEC 60 950	Yes	Yes
EN 60 204-1, EN 50 178	Yes	Yes
EN 61 000-6-3/-4, EN 55 011, EN 55 022	Yes	Yes
EN 61 000-6-2	Yes	Yes
Third part approvals		
UL 508 Listing (US and Canada)	Multiple listing	Multiple listing
UL 60 950 Recognition (US and Canada)	Multiple listing	Multiple listing
NEC Class 2 according to UL 1310	Multiple listing	Multiple listing

NOTES

SICK is one of the world's leading manufacturers of safety systems, sensors, and automatic identification products for industrial applications. SICK holds more than 350 patents for its innovative products. Through its Industrial Sensors, Safety Systems, Automatic Identification, and Environmental and Process Analysis divisions, the company has operations in 65 countries. SICK North America is headquartered in Minneapolis, MN.

Products from SICK provide comprehensive safeguarding of both workers and machinery. As specialists in sensor technology, SICK develops and manufactures pioneering products that provide protection in hazardous zones, dangerous locations and for safeguarding access points. By providing services, which encompass all aspects of machine safety and security, SICK is setting new standards in safety technology.

Our wide range of sensors provides solutions to suit any application in the field of automation. Even under rugged ambient conditions, objects are reliably detected, counted and positioned regardless of their form, location and surface finish.

Whether the tasks involve identification, handling, classification or volume measurement, innovative automatic identification systems and laser measuring systems from SICK function reliably, even under rapid cycle times. Products from SICK conform to the latest standards and can be easily integrated in all industrial environments and external applications.

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PRODUCT CATALOG

SICK Automatic Identification Catalog

Laser-Based Bar Code Scanning • Vision-Based Bar Code Scanning
Laser Measurement Systems • Dimensioning Systems

SICK

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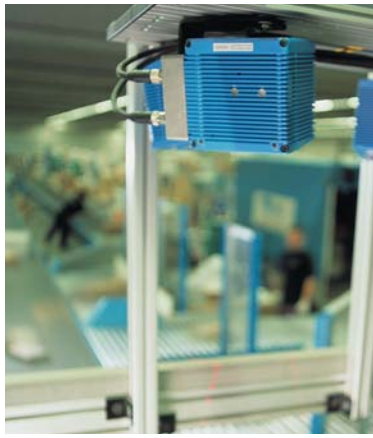
AUTOMATIC IDENTIFICATION SOLUTIONS





SICK

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SICK – Company Profile

Leadership

SICK is a global leader in factory and process automation solutions. We offer customers a wide range of products that provide solutions at every phase of production and automation. Automatic identification solutions, safety systems, and industrial sensors from SICK are used within diverse industries such as material handling, automotive, food & beverage, and packaging.

From automotive assembly lines to retail distribution centers and ports and harbors, products and services from SICK optimize production and logistics processes, help ensure worker safety, and provide consistent high quality.

Innovation

SICK continues to lead the way, leveraging a long history of innovation and rich tradition of quality industry solutions. Inventor and entrepreneur, Dr. Erwin Sick, founded the company in 1946. Soon after, he unveiled the industry's first print registration control device. A few years later, the company developed the industry's first safety light curtain, setting the standard for industrial safety applications. SICK also created the first bar code reader and measuring light curtain. These designs were first in an extensive line of innovations. Today, SICK holds more than 450 patents for its automatic identification solutions, safety systems, and industrial sensors.

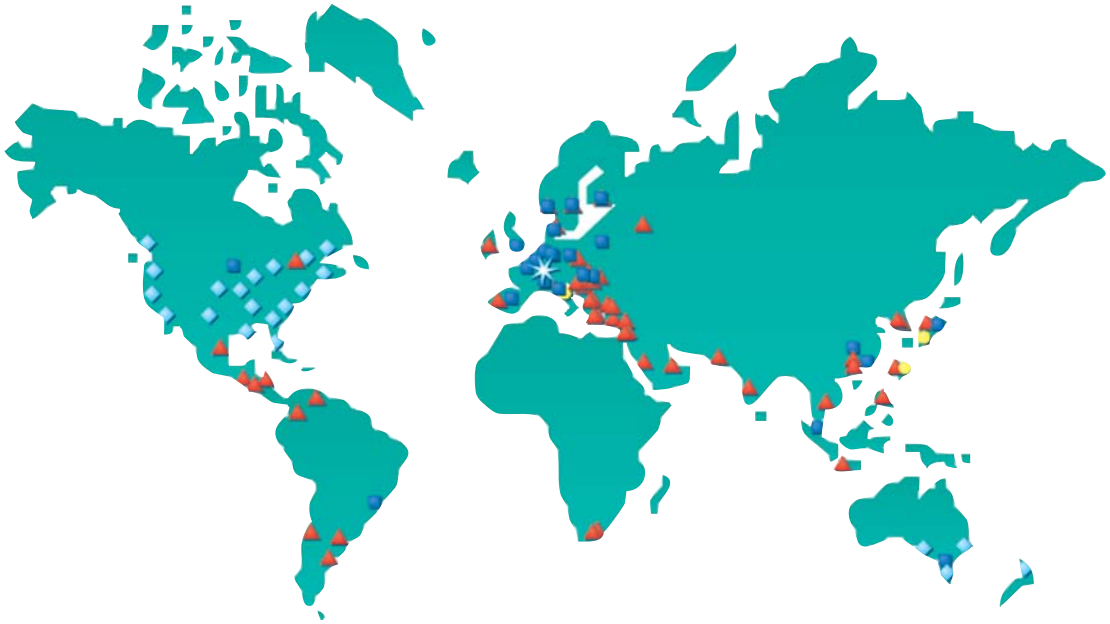
Dr. Erwin Sick

SICK in the US and in the World

SICK Worldwide

Founded by Erwin Sick in 1946 in Munich, Germany, the company now has a significant worldwide presence that includes 60 subsidiaries and agencies around the globe as well as production centers in Germany, the United States, Italy, Poland, Hungary, and Japan. Through its automatic identification solutions, safety systems, and industrial sensors, SICK currently employs more than 4,000 people worldwide.

Today, the company's headquarters, research and development centers– which are essential to our innovation-driven enterprise– as well as two main production plants, are located in Waldkirch and Reute, Germany. SICK Germany ranks amongst the best industrial employers in Europe.



SICK in the US and in the World

SICK North America

Established in 1976, the North American subsidiary of SICK is headquartered in Minneapolis, MN. With sales throughout the United States, Canada, and Mexico, SICK North America helps its customers achieve their goals: increased production rates, increased package flow, safe environments, and consistent high quality.

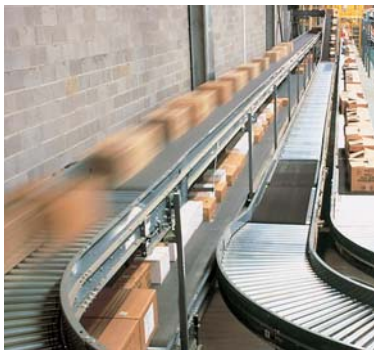
SICK designs and manufactures cost-effective products to achieve a high level of precision, reliability and versatility. SICK North America leverages its factory and process automation expertise into diverse industries such as material handling, automotive, food & beverage, and packaging and many others. With U.S. manufacturing and research and development facilities in Minnesota, Ohio, and Massachusetts, and sales offices around the country, SICK is positioned to provide a broad, innovative product portfolio and comprehensive services that our customers demand.

All of this translates to an unchallenged leadership in market share for automatic identification solutions, safety systems, and industrial sensors.

SICK North America - Divisions

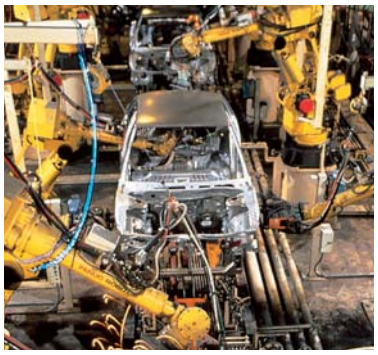
SICK Industrial Sensors

SICK's complete line of photoelectric, inductive, magnetic and capacitive sensors meet the growing efficiency of industrial processes. SICK has become a world leader in factory automation solutions by continually offering innovative product enhancements like reduced housing size and increased range, while maintaining the highest quality production process in the industry. The application possibilities of our comprehensive line of sensors are virtually endless.



SICK Safety Systems

Innovative products from SICK provide comprehensive safeguarding of both personnel and machinery. As specialists in sensor technology, SICK develops and manufactures pioneering products that provide protection in hazardous zones, dangerous locations and for safeguarding access points. By providing products and services which encompass all aspects of machine safety and security, SICK is setting a new standard in safety technology.



SICK North America - Divisions

SICK Automatic Identification

SICK develops innovative, high performance scanning and data capture solutions to meet the demanding requirements of the automatic identification industry. From bar code readers to complex vision systems, SICK has solutions for your applications. SICK offers an unmatched combination of technological expertise, a world-class customer support network and the broadest base of application experience in the industry.

SICK Stegmann

SICK Stegmann is a leading manufacturer of shaft encoders (also known as rotary sensors) and actuators for automation technology. The addition of these technologies to SICK's factory automation solutions has provided access to the growth market of drive technology. Continuous innovation combined with the highest levels of precision and quality enable SICK Stegmann to provide customers with encoder systems that are among the best in the world.

SICK | STEGMANN

SICK North America - Divisions

SICK Maihak

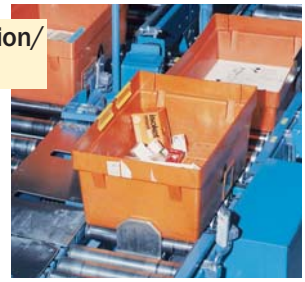
SICK Maihak offers in-situ and extractive analyzers for gas and liquid analysis and measurement instrumentation for dust, opacity, volume flow and level.

SICK Maihak has more than 50 years of combined technical experience serving the industries of power, cement, refining, petrochemical, chemical, pharmaceutical, waste incineration, water treatment, pulp and paper, steel, food and beverage, glass and other areas.

SICK | MAIHAK

Our Main Markets

Retail Distribution/ Warehouse

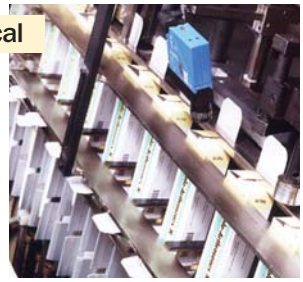


Airports

Ports/Harbors

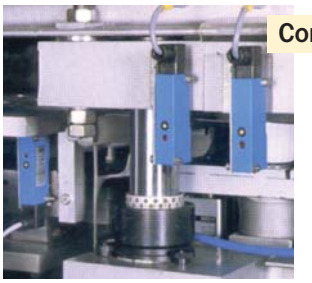
Postal/Parcel

Pharmaceutical



Automotive

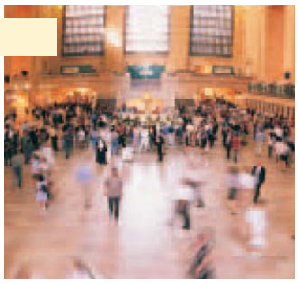
Packaging



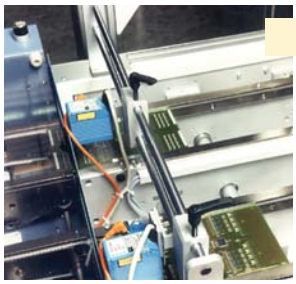
Consumer Goods

Our Main Markets

Security

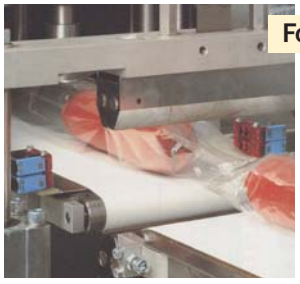


Electronics



Textile

Food & Beverage



Traffic Management

Machine Tool

Robotics

AGV

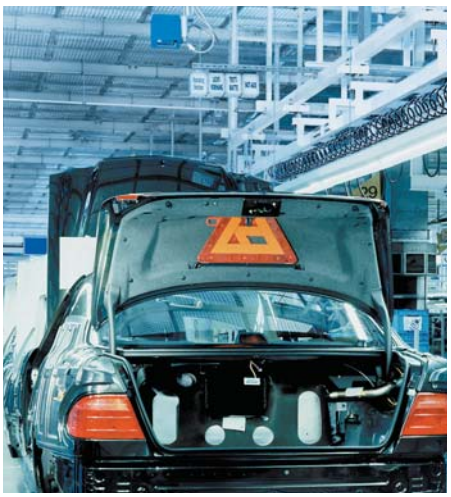
SICK Automatic Identification Solutions

Speed, accuracy, and reliability are the three primary demands placed on automatic identification solutions today. In every manufacturing, packaging, and logistics environment, automatic identification is playing an increasingly critical role in helping companies achieve their productivity and profit goals. The proper implementation of automatic identification solutions ensure the right components are added to an assembly, contents are packaged correctly, and cartons arrive quickly at their proper destination.

SICK's linear and 2D bar code scanning products, dimensioning systems, and laser measurement solutions address these and countless other identification requirements. As a worldwide leader in the manufacture of automatic identification hardware, SICK is committed to providing product solutions and services that ensure accuracy and maximize operational throughput to make any company more competitive.

SICK's product and service value is driven by three competitive factors: Technology, Support, and Experience. Today, SICK leads the industry with the most innovative scanning and dimensioning products. Each of its laser-based and vision-based solutions is designed for the highest performance and reliability and backed from selection to implementation by the industry's best sales and service engineers.

SICK's Automatic Identification solutions provide our customers with the lowest cost of ownership and greatly reduce our customers' risk factors.



Unmatched Value for Today's Most Demanding Operations

Technology

SICK products are designed and built using state-of-the-art manufacturing methods for the highest quality reliability. Extensive research and development efforts in all product lines have led to a constant flow of product innovations and manufacturing improvements since the company was founded. As a result, users expect the highest level of performance from SICK products. Each product provides a variety of convenience features, including common setup software and connectivity options to fit virtually any application. Advanced optical designs for optimal reading performance and intelligent maintenance features that minimize downtime have made SICK products the best value for any automatic identification project.

Support

SICK's application and service support capabilities are unmatched in the data collection business. As a result of continuous staff development and strategic acquisitions, SICK established the very best sales, service, and application support teams. That means the right solution is specified the first time, every time, without compromise. SICK support teams are committed to work with customers to guarantee total satisfaction from start to finish, regardless of project size.

Experience

Today's SICK organization is made up of a wide variety of talents from around the industry. As a result of recent external growth initiatives, SICK is proud to boast the most experienced sales and service capabilities. The perspectives of the world's leading automatic identification suppliers have been combined into a single organization that best understands the needs of its customers. With this experience and a commitment to excellence from product selection through implementation, SICK can be trusted to provide the best value for projects large and small.

Technology Features

CAN

CLV scanners can be quickly and easily networked using the SICK CAN Scanner Network. CAN networks are easily set up using CLV Setup Software and easy-to-connect network cabling. On a CAN network, a user can group multiple CLV scanners to form entities that communicate with a common host in pass-though or master slave modes. Scanners can also each be configured via the CAN network from any single scan point on the network to simplify commissioning of more complex networks.

SMART Technology

SMART Technology is used in CLV/x 43x-490 and ICR 8xx scanners to decode hard to read, partially hidden, or damaged bar codes. This capability ensures that even the hardest to read bar codes are read for the highest possible read rate performance. SMART is user selectable in CLV Setup Software.

Cloning

When used with a CDB or CDM Connectivity Device, the CMC Cloning Module makes exchanging CLV Scanners as easy as changing a light bulb. The CMC automatically downloads the pre-set scanner parameters when the new device is connected. There is no need for a laptop or PC to reconfigure a scanner, so downtime can be reduced to minutes without the need to reconfigure the scanner.

Connectivity

SICK offers two standard connectivity devices for its CLV and ICR models that simplify installation for any single or multi-scanner application. The CDB-xxx is a basic 24 V DC solution with optional cloning capability. It is the ideal low cost solution for stand-alone and CAN network applications. The CDM-xxx is a modular, 24 V DC connectivity device with optional 110 V AC power, CMC cloning, or an LCD display. The CDM-xxx is also available with optional Profibus, DeviceNet or Ethernet fieldbus communications modules to meet the needs of the most up-to-date communications protocols. Ask your sales representative which device is right for your application.

Profile Programming

In addition to conventional programming through the CLV Setup Software, all CLV 41x, 42x, 43x, 44x, and 45x Scanners can also be configured using a feature known as Profile Programming. This feature allows a user to scan a series of unique bar codes upon power up and automatically set all the scanner parameters for a specific application. The bar codes, which are generated out of the CLV Setup Software, represent the scanner's configuration (profile). This technique helps to greatly reduce downtime and service-related costs.

Quick Release Bracket (realign)

CLV Scanner accessories are designed with convenience in mind. A variety of mounting options are available, including the SICK Quick Release Bracket. The CLV Quick Release Bracket uses a single set-screw to ease scanner mounting and exchange. Simply remove the set-screw from an existing scanner mount and alignment is solidly maintained. The need to realign scanners is eliminated, minimizing downtime.

CLV Setup Software

SICK provides its Windows™-based CLV Setup Software with each of its scanner models at no charge. A single software application supports all CLV and ICR models to simplify configuration of a stand-alone scanner or a complex CAN network of scanners. Complete user selectable parameters include focus control, data filtering, real-time performance statistics, and scan rate control.

Technology Features

Dynamic Focus

Dynamic Focus is available on CLV 44x, 45x, 480 and 490 models. This unique focus control method allows a user to optimize the scanner's focal position based on trigger input for the best possible read rate performance over varying ranges. Trigger sources may include external switches, host commands, oscillating mirror, or timer input. Focus parameters are configurable using CLV Setup Software.

Automatic Focus Control

The CLV 490 and CLX 490 use an optical focus technique called Automatic Focus Control. Automatic Focus allows these scanners to determine the ideal focal point for scanning items over varying heights and at high speeds. The response is quick so that even on the fastest conveyor lines, these scanners read and transmit data rapidly. Focus parameters are further configurable using the CLV Setup Software.

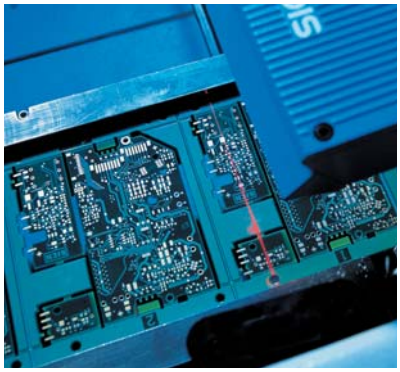
Raster Optics

A raster scan pattern is emitted from CLV Scanners with optional raster optics. Line scanners with a raster pattern produce a slightly larger read area by projecting multiple scan lines over a single code. Raster optics provide higher read rates on poorly printed codes and on codes passing the scanner in a picket fence orientation. Raster optics are available on the CLV 41x, 42x and 43x models.

Oscillating Mirror Optics

Scanners equipped with an optional oscillating mirror are able to scan a wider area than raster scanners and are capable of reading multiple codes passing the scanner in picket fence orientation. The scan line on an oscillating mirror scanner is swept in fixed intervals over the surface of the item to read over a wide area with a single scan line. Oscillation frequency is user selectable using SICK CLV Setup Software. Oscillating mirrors are available on the CLV 43x-490 models.

"Performance, Simplicity, Flexibility"



Laser Measurement Definitions

Measuring Accuracy Definitions

Resolution: The resolution of a measuring device is the smallest possible distance difference between two consecutive individual measurement values. The resolution can be reduced by using averaged values.

Systematic Error: Systematic error is the sum of all the deviations over a defined range and reflectivity, which cannot be reduced even using averaged values.

Standard Deviation: The standard deviation is calculated using the measured distance and reflectivity values on one particular target.

Time-of-flight Measurement Principle

The LMS and LD Sensors operate by measuring the time-of-flight of laser light pulses: a pulsed laser beam is emitted and reflected if it meets an object. The reflection is registered by the scanner's receiver. The time between transmission and reception of the impulse is directly proportional to the distance between the scanner and the object (time-of-flight).

The pulsed laser beam is deflected by an internal rotating mirror so that a fan-shaped scan is made of the surrounding area (laser radar). The contour of the target object is determined from the sequence of impulses received. The measurement data is available in real time for further evaluation via a serial interface.

Pixel-oriented Evaluation

Pixel-oriented evaluation is a filtering technique for suppressing airborne particles, and makes the system less sensitive to environmental factors. This filtering technique compares each measured value over the entire field of view to the previous number of measured values selected by the user. Erroneous measurements can be filtered out by repeatedly examining the reported spot (multiple scanning whose number depends on the setting selected).

Phase Shift Principle

The LMS 400 Sensor uses the phase shift (continuous wave) principle. The propagation time of the light and the wavelength result in a phase shift between the beam sent and the beam received. This phase difference is converted to a frequency. The LMS 400 Sensor determines the distance of the object based on this frequency.

Service and Support

Manufacturing and Design Excellence

Convenience features and added capabilities are only as good as the hardware they are designed to compliment. So, SICK designs, engineers, and manufactures its bar code scanning hardware to be the best in the industry.

Product reliability and longevity is no accident at SICK. More than nine percent of all sales and revenue is reinvested each year into research and development to make SICK Automatic Identification solutions the best on the market. It has more than 300 employees dedicated to research and development and in the past five years SICK has submitted more than 150 patent applications for product designs and Automatic Identification manufacturing procedures.

Rugged dependability is evidenced in the many solutions that SICK provides. Each is designed for the harshest environment. All CLV Scanners conform to strict international standards for emissions, temperature, shock, vibration, and moisture and all are classified to to IP 65 standards. Optional enclosures are even available for maximum scanner and connectivity protection in wash down applications.

SICK product performance and long-term dependability can be attributed to extensive component qualification and product testing prior to shipment. SICK employs state-of-the-art manufacturing practices and automated test fixtures to ensure that each product meets the strictest quality standards. At the component level, critical parts such as lasers and motors are evaluated for lifetime reliability. Subassembly level evaluations are then conducted to ensure that the buildup of products is documented fully. In fact, 100% of all electronic boards and all main sub assemblies are fully tested. Complete failure analysis is conducted and corrective actions taken so that no faulty component goes out the door. Finally, product level testing is completed on 100% of products prior to shipment. This virtually eliminates out-of-box failures and provides the data necessary to continually improve product quality.

From design engineering to manufacture and shipment, the strictest quality standards are enforced. The result…the most dependable bar code scanning solutions on the market.

Customer Service

Customer Service Representatives are centrally located at our headquarters in Minneapolis, MN and can assist you with the most common inquiries, including order status and delivery confirmation. They are also ready to assist you with any questions you have about our services and can connect you to technical support when you need help quickly.

Service and Support

Application Support

SICK Automatic Identification solutions are easy to use and maintain, but it is always reassuring to know that you have an expert available to assist with your applications whenever you need help. Our application support team is the best in the industry. With decades of combined experience, our team can assist you with basic to the most complex application inquiries. They can also determine solution feasibility and recommend exactly the right products for your application. The application support team is available for routine inquires from 8 AM to 6 PM Eastern Time.

Field Service

SICK Field Service Engineers are strategically located throughout North America so they may respond to your installation, maintenance and repair issues quickly. Each service engineer has years of experience dealing with the industry's most advanced conveying and controls systems and is an expert in the science of data collection. Our Field Service Engineers will ensure that your SICK hardware is installed and maintained properly for optimum performance throughout its product life and, should it ever require repair, we will respond quickly so your operations can continue to run smoothly. For emergency after hours service, a Field Service Engineer will be notified, via our after hours call center, to return your call quickly to address your service needs.

Repair Service

Experienced Repair Technicians in our Stoughton, MA facility service and test each product returned for repair to meet new product performance standards. Products under the original factory warranty or covered by an annual service contract receive priority attention and are typically returned within five business days from the time the item is received at SICK. Non-warranty products will be returned to the customer within 3-6 weeks. All repairs include a 90-day warranty. Our Repair Technicians can also recommend spare parts for your data collection systems that can help minimize downtime during routine maintenance and repair periods.

Training: Online and On-site

Get fast orientation and updates on all of SICK's scanner technologies. SICK offers regularly scheduled online training sessions so you can learn more about the performance and maintenance of your scanner hardware. You don't even have to leave your facility! Each quarter, SICK provides training via the Internet through its Online Meeting Center. SICK Product Specialists present basic product information and application training. It's fast and easy…and totally free. For more information, visit our web site at www.sickusa.com and click on the Online Meeting Center.

For more sophisticated scanning systems, SICK can visit your site to conduct application-specific training with your staff. The training includes an overview of the product and basic maintenance procedures. This level of training is ideal for systems in critical applications that include multiple scan stations and/or modular scanning systems. Custom training programs designed around your unique requirements are also available.

Spare Parts

SICK offers a full line of spare parts for your critical application. Contact your Sales Representative or an Application Specialist to find out which spares are recommended for your application. In most cases, having the right spare equipment will keep your operation running smoothly and minimize downtime.

Service and Support

Upgrade Assistance

Your applications run optimally when you have the latest available technology, so SICK makes it easy for you to upgrade to new technologies. New technologies are easier to install, easier to maintain and are usually more affordable than your existing hardware. Whenever you upgrade to new scanning or dimensioning hardware from existing SICK technologies or competitor technologies, SICK will provide you with free expert application support to determine the best possible solution for your application. Contact your Sales Representative or the Application Support Team for upgrade information and to inquire about special program offers.

Site Surveys

For customers implementing fully integrated or modular Omni Scanning Systems (i.e. CLX 490, OPS xxx), we recommend a site survey prior to the installation of hardware. The site survey allows a SICK service or application specialist to evaluate the site where we will install each scanning station. Scanner placement and frame design is optimized using the data gathered from the site survey to expedite installation and commissioning.

Manuals/Product Literature

SICK's manuals provide complete product operating specifications and instructions for setup and maintenance. If you install and maintain hardware yourself, these manuals are key to keeping your systems running smoothly and without interruption. You can stay up to date on SICK's latest product offerings by downloading product literature from our web site at www.sickusa.com, or by contacting a local Sales Representative or Authorized Distributor.

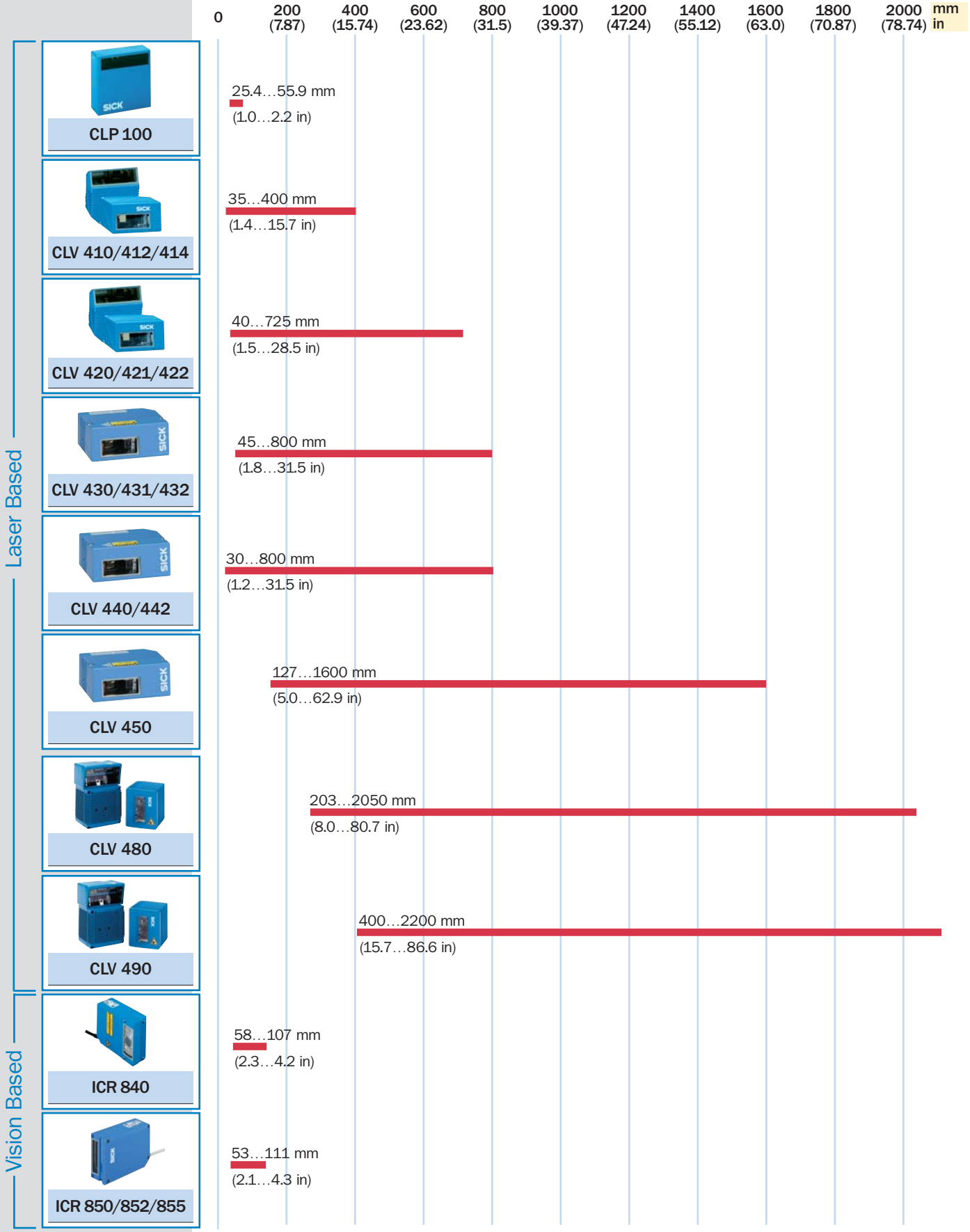
Warranty

SICK offers a full 12-month warranty on all its products. The warranty covers hardware and any SICK peripheral devices used in your application. The standard warranty includes expedited equipment repair (typical 5-day turnaround on bar code scanners) and 24-hour phone support for your application and maintenance questions.

Contact us...

1-800-325-SICK (7425)

Introduction



	Scan Options	Focus Type	Decoding Method	Host Data Interface	Page
CLP 100	CCD	Fixed Focus	Standard	RS 232	22
CLV 410/412/414	Line, Raster	Fixed Focus	Standard	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	28
CLV 420/421/422	Line, Raster	Fixed Focus	Standard	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	34
CLV 430/431/432	Line, Raster, Oscillating Mirror	Fixed Focus	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	40
CLV 440/442	Line, Oscillating Mirror	Dynamic Focus Control	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	46
CLV 450	Line, Oscillating Mirror	Dynamic Focus Control	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	52
CLV 480	Line, Oscillating Mirror	Dynamic Focus Control	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	58
CLV 490	Line, Oscillating Mirror	Automatic Focus, Dynamic Focus Control	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	64
ICR 840	CMOS, Area Array	Fixed Focus	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	70
ICR 850/852/855	CCD, Line	Fixed Focus	Standard, SMART	RS 232, RS 422/485, Ethernet TCP/IP, DeviceNet Profibus, Ethernet IP	76

CLP 100
Fixed Position Scanner

Features

- Outstanding reading performance at short distances
- Short capture time due to high scanning frequency
- Scanning and decoding frequency of 500 Hz
- Optimized focus distance at 1.38 in (35 mm)
- Front or side scanning models

The CLP 100 Bar Code Scanner can solve many simple bar code identification tasks - convenient for any situation and any application.

The task is to identify bar codes at short reading distances, while having little or no distance variation and with limited space for mounting a bar code "sensor." Additionally, this scanning solution has to fit into a limited budget.

These are ideal requirements for the use of the CLP 100 - a fixed mount bar code scanner, which is based on CCD-Technology.

The CLP 100 offers all the features required to solve simple identification tasks in OEM applications. Due to its small housing size and the straight or lateral oriented reading window, this scanner can be integrated into nearly all mounting situations.

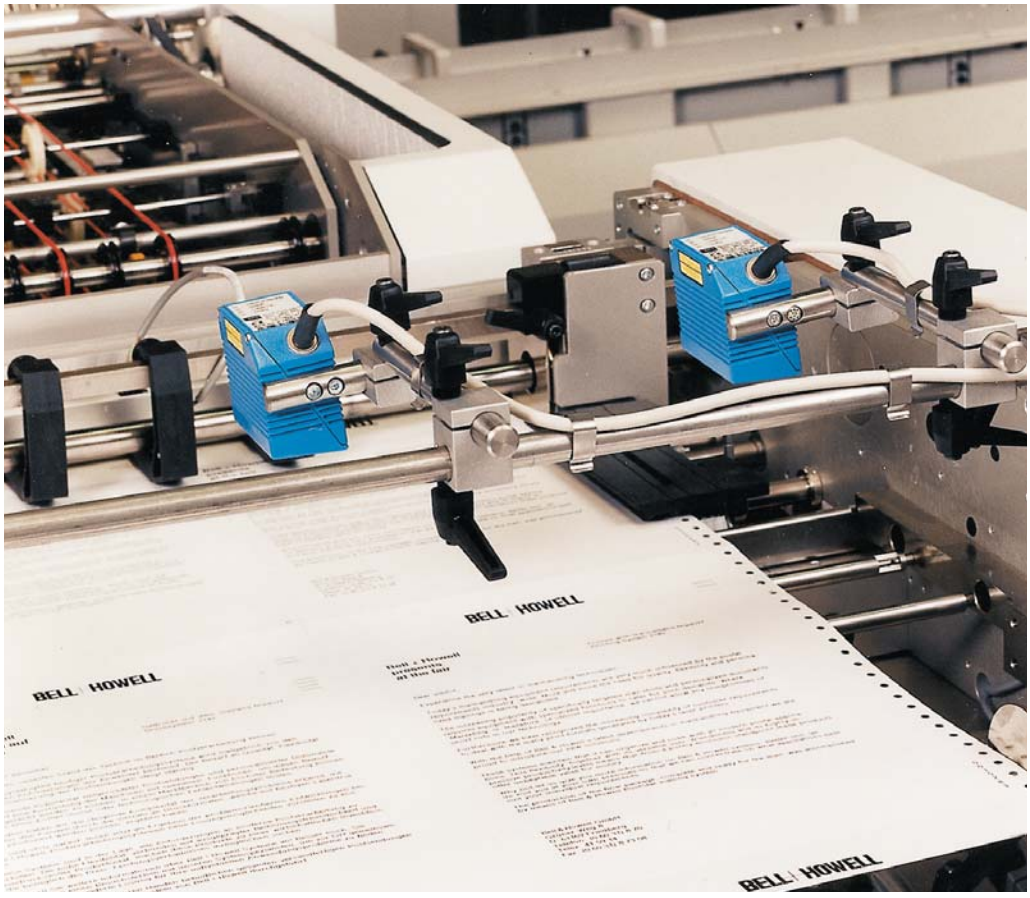
The high scanning rate of 500 Hz is the base for solving high speed applications. This is also true for reading high density bar codes with a minimal resolution as small as 0.005 inches (0.125 mm).

The extremely high-performing decoder is integrated in this miniature bar code scanner and transmits ASCII data via RS 232 interface to the assigned host computer.

The configuration of the CLP 100 is adaptable to various customer needs. This is supported by a Windows™-based setup software or by the use of the Host Command language - fast and user-friendly.

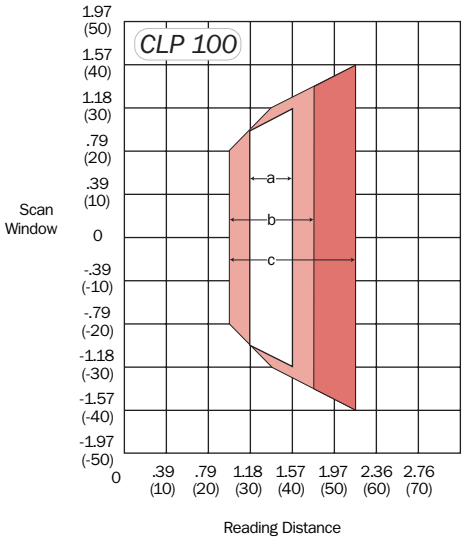
Comparison Table

	CLP 100 Standard Density
Reading Range	1.0…2.2 in (25.4…55.9 mm)
Scan Frequency	500 Hz
Cloning	
Fixed Focus	■
Dynamic Focus	
Auto Focus	
Standard Decoding	■
SMART Decoding	
Line Scanner	CCD Line
Raster Scanner	
Oscillating Mirror Scanner	
Front Emitting	■
Side Emitting	■
Plastic Window	
Low Contrast	



Reading Ranges

Dimensions in inches (mm)



Code Resolution

- a: 0.006 in (0.15 mm)
- b: .008 in (0.2 mm), .01 in (0.25 mm)
- c: .014 in (0.35 mm), .02 in (0.5 mm), .04 in (1.0 mm)

Technical Specifications

	CLP 100
Scanning Characteristics	
Scanning Method	CCD
Scanning Frequency	500 Hz
Light Source	Visible red light (630 nm)
Reading Distance	1.0…2.2 in (25.4…55.9 mm)
Resolution	0.005…0.040 in (0.125…1.0 mm)
Bar Code Types	
Bar Code Symbology	Code 39, Interleaved 2/5, Code 128, EAN, Codabar, Interleaved 2/5 B
Readability	10 bar codes per reading gate
Auto Discrimination	6 different symbologies per scan or reading gate
Communications / I/O / Indicators	
Host Interface	RS 232, variable data output format
Baud Rate	1,200…19,200 (software selectable)
Data Format	Data bits, stop bits, parity (software selectable)
LED Indicators	CCD on, reading gate on, good read, no read
Switching Inputs	1 x NPN, maximum 30 V DC
Switching Outputs	1 x NPN, maximum 50 mA
Trigger Methods	Sensor input (I/O interface)/Serial (host interface)
Mechanical/Electrical	
Supply Voltage	Operating voltage 5 V DC ± 5%
Current Consumption	350 mA
Weight	Approx. 7 oz (200 g)
Housing	Metal
Enclosure Rating	IP 40
Connectivity	Open cable, 9-pin D-Sub connector
Environmental	
Ambient Operating Temperature	32…104°F (0…40°C)
Storage Temperature	-4…158°F (-20…70°C)
EMV	To IEC 801
Maximum Relative Humidity	30%…85%, non-condensing
Programming	Windows™-based CLP Setup Software

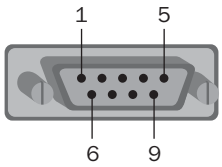
Models and Part Numbers

	CLP 100 Open Cable End	CLP 100 9-Pin Connector
Front Emitting Scanner		
Model	CLP 100-0110	CLP 100-0010
Part Number	1 018 333	1 018 331
Side Emitting Scanner		
Model	CLP 100-2110	CLP 100-2010
Part Number	1 018 334	1 018 332

NOTE: Accessories information is located on page 86.

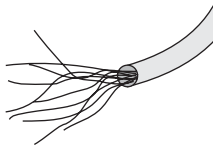
Pinouts

9-pin connector



Pin	Signal
1	Sensor
2	RxD (RS 232), Host
3	TxD (RS 232), Host
4	Result “GO/NG”
5	GND
6	Not assigned
7	RxD (RS 232, TTL), Terminal
8	TxD (RS 232, TTL), Terminal
9	DC +5 V

Open cable end

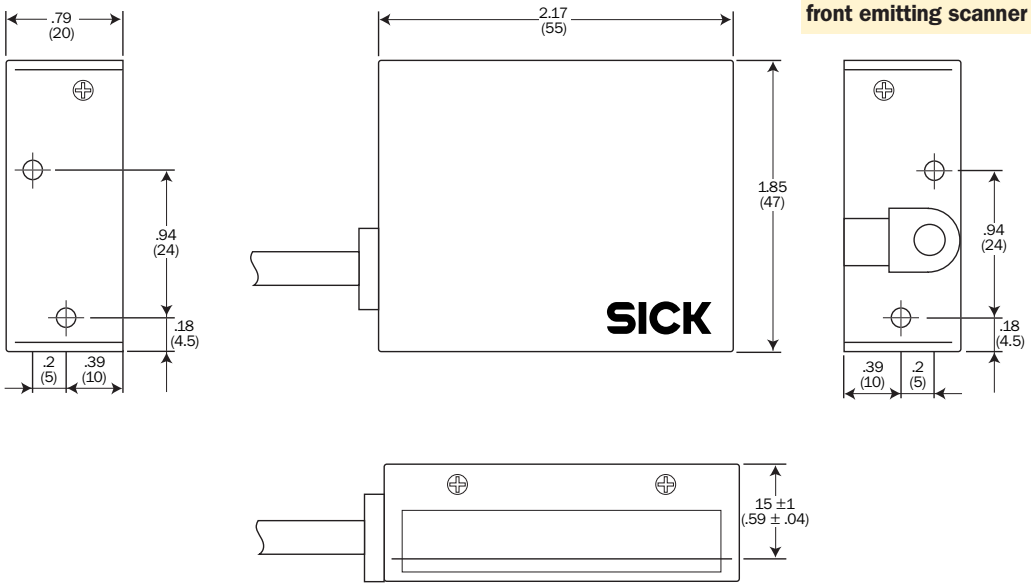


Color	Signal
Pink	Sensor
Brown	RxD (RS 232), Host
Gray	TxD (RS 232), Host
White	Result “GO/NG”
Black	GND
-	Not assigned
Yellow	RxD (RS 232, TTL), Terminal
Orange	TxD (RS 232, TTL), Terminal
Red	DC +5 V
Blue	RTS
Green	CTS

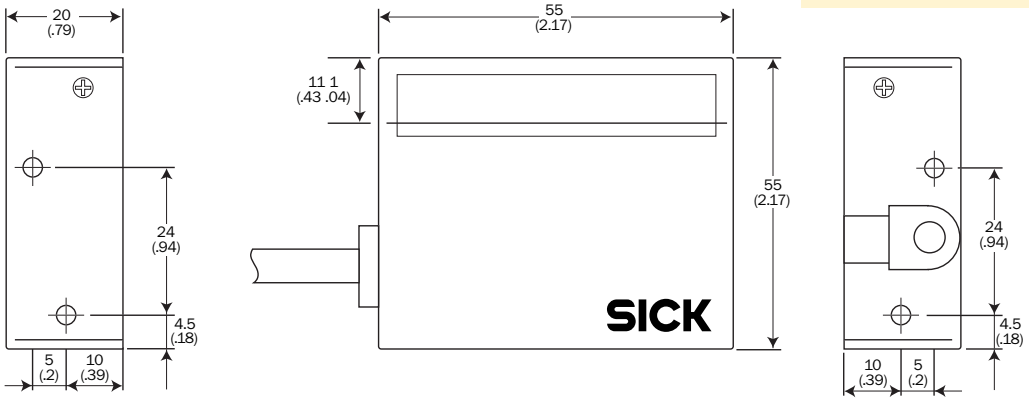
Drawings

Dimensions in inches (mm)

CLP 100
front emitting scanner



CLP 100
side emitting scanner



CLV 410/412/414
Fixed Position Scanner

Features

- Profile programming – Auto setup
- Match code capability
- Automatic triggering
- Front and side emitting housing
- Integrated scanner and decoder
- Real-time diagnostics

The CLV 41x Series Bar Code Scanners' compact design makes it ideal for limited space applications. Its high-performance scan rate, real-time decoding, and integrated decoder make it an excellent solution in applications where high throughput is needed.

The CLV 41x Series has a user-selectable scan rate of 200 to 800 Hz at a reading range of 2 to 16 inches. All parameters of the CLV 41x, including minimum reading distance, bar code resolution, scan frequency, bar code label specifications and data format, are selectable via our Windows™-based CLV Setup Software. This user-friendly, unique, stand-alone software program guides the user through complete scanner configuration.

In addition to conventional programming through the CLV Setup Software, all CLV 41x Scanners can also be configured using a feature known as Profile Programming. This feature allows a user to scan a series of unique bar codes upon power up and automatically set all scanner parameters for a specific application. The bar codes, which are generated out of the CLV Setup Software, represent the scanner's configuration (profile). This technique helps to greatly reduce downtime and service-related costs - you will be up and running with no need for a PC.

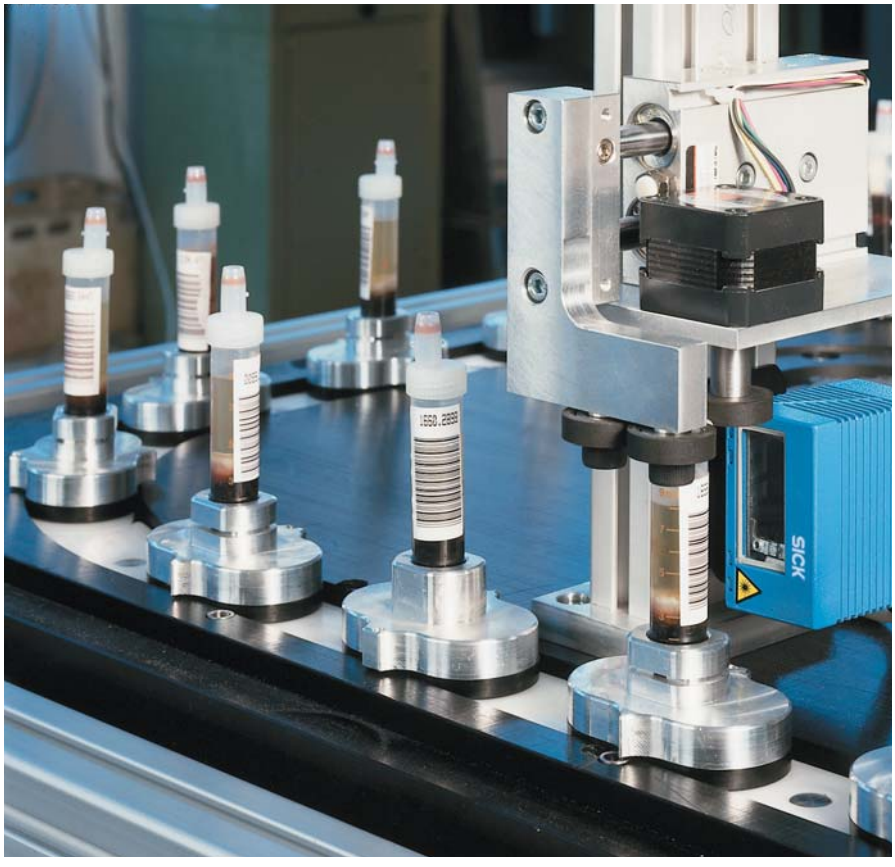
In addition, SICK's Automatic Triggering technology allows the scanner to automatically sense a package to activate the bar code reading process. Its rugged zinc die cast housing, precision optics, and powerful electronics create a highly reliable system for industrial applications.

The CLV 41x Series is ideal for medical instrumentation, test fixtures, packaging machines, and small conveyor applications.

Comparison Table

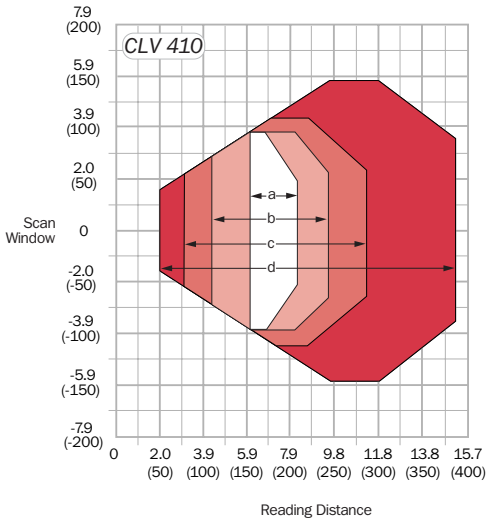
	CLV 410 Standard	CLV 412 High Density	CLV 414 Close Range
Reading Range	2.0…15.7 in (50…400 mm)	1.4…3.7 in (35…95 mm)	1.6…3.9 in (40…100 mm)
Scan Frequency	200…800 Hz (software selectable)	200…800 Hz (software selectable)	200…800 Hz (software selectable)
Cloning			
Fixed Focus	■	■	■
Dynamic Focus			
Auto Focus			
Standard Decoding	■	■	■
SMART Decoding			
Line Scanner	■	■	■
Raster Scanner	■	■	■
Oscillating Mirror Scanner			
Front Emitting	■	■	■
Side Emitting	■	■	■
Plastic Window	■	■	■
Low Contrast	■	■	■
Plastic Window	■ *		■ *
Low Contrast	■ *		■ *

* Not available in all configurations.



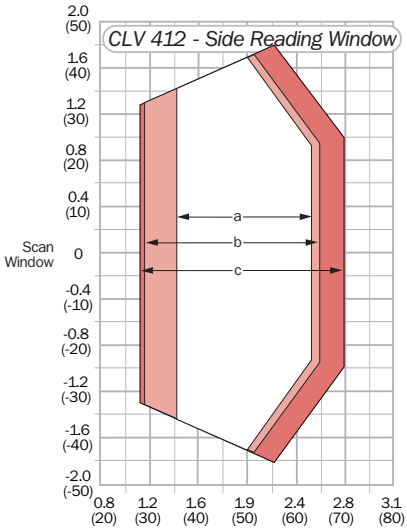
Reading Ranges

Dimensions in inches (mm)



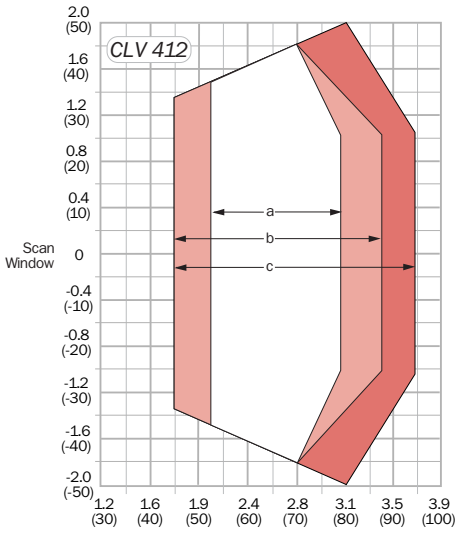
Code Resolution
- a: 0.008 in (0.20 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)
- d: 0.040 in (1.0 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 0.71 in (18 mm) toward the reading window

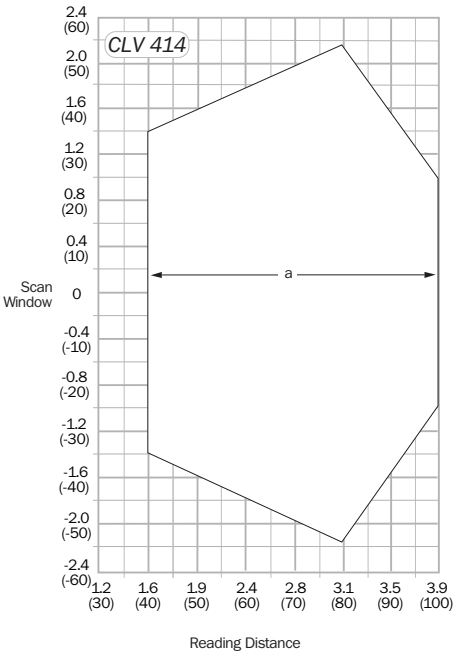


Code Resolution
- a: 0.004 in (0.10 mm)
- b: 0.006 in (0.15 mm)
- c: 0.008 in (0.20 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 0.71 in (18 mm) toward the reading window



Code Resolution
- a: 0.004 in (0.10 mm)
- b: 0.006 in (0.15 mm)
- c: 0.008 in (0.20 mm)



Code Resolution
- a: 0.008 in (0.20 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 0.71 in (18 mm) toward the reading window

Technical Specifications

	CLV 410	CLV 412	CLV 414
Scanning Characteristics			
Scanning Method	8-sided polygon mirror wheel		
Aperture Angle			
Line/raster scanner	60°		
Side emitting scanner	50°		
Scanning Frequency	200…800 Hz (software selectable)		
Light Source	Visible laser diode (670 nm); CDRH Class II		
Reading Distance	2.0…15.7 in (50…400 mm)	1.4…3.7 in (35…95 mm)	1.6…3.9 in (40…100 mm)
Resolution	0.008…0.040 in (0.2…1.0 mm)	0.004…0.008 in (0.1…0.2 mm)	0.008…0.020 in (0.2…0.5 mm)
Bar Code Types			
Bar Code Symbology	Code 39, Interleaved 2/5, Industrial 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128, Pharmacode		
Readability	1…3 bar codes per scan		
Auto Discrimination	1…50 bar codes per reading gate		
Communications / I/O / Indicators			
Host Interface	RS 232 and RS 422/485, variable data output format		
Baud Rate	300…57,600 (software selectable)		
Data Format	Data bits, stop bits, parity (software selectable)		
Network Configuration	Pass-through; master/slave; RS 485 network		
LED Indicators	Device ready, result, laser on, data		
Switching Inputs	2 x PNP, opto-decoupled, maximum 30 V DC		
Switching Outputs	3 x PNP, maximum 100 mA / 24 V DC; Output 1, Output 2, Output 3		
Trigger Methods	Sensor input (I/O interface) / Serial (Host interface) / Free running / Reflector polling (automatic)		
Mechanical/Electrical			
Supply Voltage	Operating voltage 5…30 V DC		
Current Consumption	125 mA at 24 V DC / 3.0 W		
Dimensions			
Line/raster scanner	2.3 x 2.5 x 1.4 in (59 x 62.7 x 35.2 mm)		
Side emitting scanner	2.8 x 2.5 x 1.4 in (72 x 62.7 x 35.2 mm)		
Weight	Approx. 8.75 oz (250 g)		
Housing / Enclosure Rating	Die cast zinc / IP 54		
Connectivity	15-pin male D-Sub high density cable, 3 ft (0.9 m) cable length		
Environmental			
Ambient Operating Temperature	32…104°F (0…40°C)		
Storage Temperature	-4…158°F (-20…70°C)		
Vibration	To IEC 68-2-6 test FC		
Shock	To IEC 68-2-27 test EA		
EMV	To IEC 801		
Maximum Relative Humidity	90%, non-condensing		
Programming	Windows™-based CLV Setup Software		

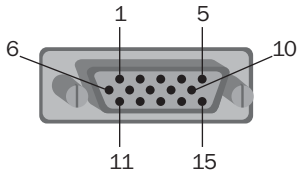
Models and Part Numbers

	CLV 410	CLV 412	CLV 414
Front Emitting Line Scanner			
Model	CLV 410-0010	CLV 412-0010	CLV 414-0010
Part Number	1 015 421	1 017 527	1 017 368
Front Emitting Raster Scanner			
Model	CLV 410-1010	CLV 412-1010	CLV 414-1010
Part Number	1 015 427	1 017 528	1 016 767
Side Emitting Line Scanner			
Model	CLV 410-2010	CLV 412-2010	CLV 414-2010
Part Number	1 017 534	1 017 538	1 017 396
Side Emitting Raster Scanner			
Model	CLV 410-3010	CLV 412-3010	CLV 414-3010
Part Number	1 017 536	1 017 540	1 016 831

NOTE: Accessories information is located on pages 86 - 87.

Pinouts

15-pin connector



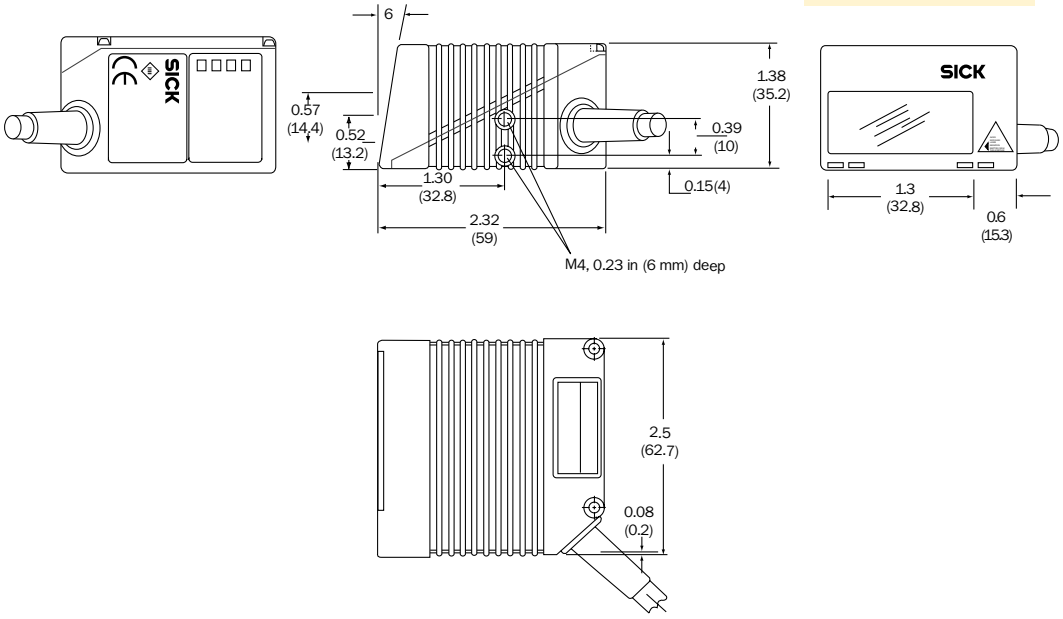
Pin	Signal	Function
1	DC 4.5…30 V	Supply voltage
2	Sensor 2[1)]	Switching input teach-in (match code 1)
3	Sensor 3[2)]	Switching output (to PLC)
4	Term RS 422	Termination for data interface 1
5	GND	Ground
6	RD+ (RS 422/485)	Data interface 1 (receiver)
7	RD- (RS 422/485)	Data interface 1 (receiver)
8	TD+ (RS 422/485)	Data interface 1 (transmitter)
9	TD- (RS 422/485)	Data interface 1 (transmitter)
10	RxD (RS 232)	Data interface 2 (receiver)
11	TxD (RS 232)	Data interface 2 (transmitter)
12	Result 1[2)]	Switching output (to PLC)
13	Result 2[2)]	Switching output (to PLC)
14	Sensor 1[3)]	Switching input for ext. reading pulse
15	Sensor GND	Common ground (all inputs)
-	-	Shield

1) 24 V DC input for Teach Mode
2) 24 V DC output
3) External sensor input (24 V DC at 100 mA) for trigger

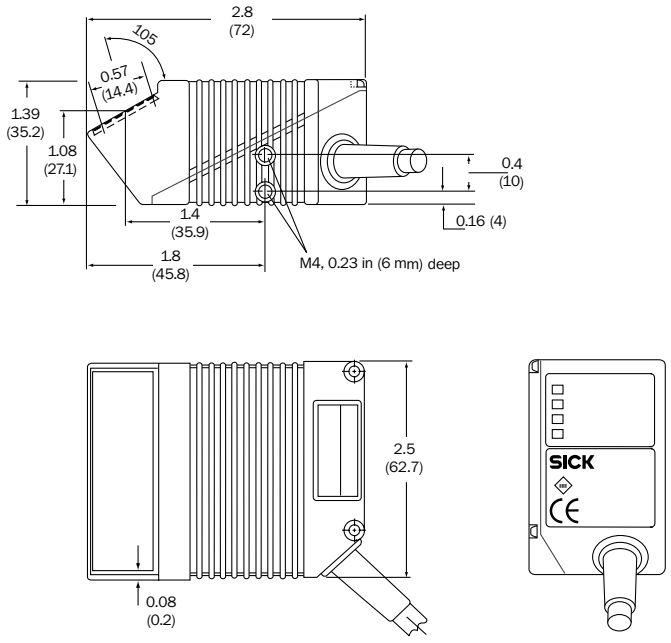
Drawings

Dimensions in inches (mm)

CLV 410/412/414
front emitting scanner



CLV 410/412/414
side emitting scanner



CLV 420/421/422
Fixed Position Scanner

Features

- High speed (1200 Hz)
- Integrated CAN bus
- Cloning module capabilities
- Extremely large depth of field (2…29 in)
- Automatic Triggering
- Profile programming – Auto setup
- Real-time decoding and diagnostics
- Extended communications
- Optional display

The CLV 42x Series fits in the palm of your hand, and at 400 to 1200 scans per second, with a 27-inch depth of field, it is the most powerful bar code scanner of its size. Its rugged zinc die cast housing, precision optics, and powerful electronics create a highly reliable system for industrial applications. Its high-performance scan rate, real-time decoding, and integrated decoder make it an excellent solution in applications where high throughput is needed.

The CLV 42x is equipped with an integrated CAN bus interface which allows you to seamlessly and easily connect multiple scanners together in a single high-speed network. This allows for easy setup, reduced cabling, and lowered system cost due to reduced hardware.

The CLV 42x Bar Code Scanner has multiple programming options for the most flexibility on the market. You can use the Windows™-based CLV Setup Software package included with the bar code scanner, our Profile Programming functionality which allows for extremely quick swap out without the use of a PC on the plant floor, or our exclusive cloning capabilities that are available with the CDM connectivity device. Application-specific parameters are automatically copied to a new scanner once it is connected to a connection device with a CMC Cloning Module.

All parameters, including minimum reading distance, bar code resolution, scan frequency, bar code label specifications, and data format are software selectable to optimize the performance of the scanner for your specific application.

The CLV 42x is ideal for material handling, packaging, document handling and electronics applications.

Comparison Table

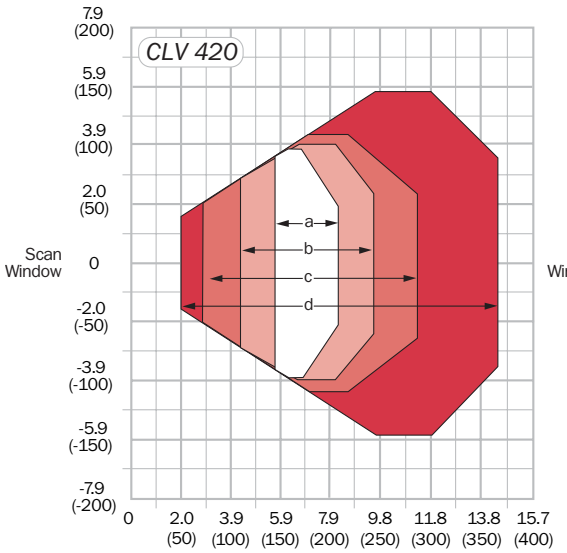
	CLV 420 Standard	CLV 421 Standard (Long Range)	CLV 422 High Density
Reading Range	2.0…14.0 in (50…365 mm)	2.0…28.5 in (50…725 mm)	1.5…8.0 in (40…200 mm)
Scan Frequency	400…1200 Hz (software selectable)	400…1200 Hz (software selectable)	400…1200 Hz (software selectable)
Cloning*	■	■	■
Fixed Focus	■	■	■
Dynamic Focus			
Auto Focus			
Standard Decoding	■	■	■
SMART Decoding			
Line Scanner	■	■	■
Raster Scanner	■	■	■
Oscillating Mirror Scanner			
Front Emitting	■	■	■
Side Emitting	■	■	■
Plastic Window	■ **		■ **
Low Contrast			

* Requires use of CDM 420 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

** Not available in all configurations.

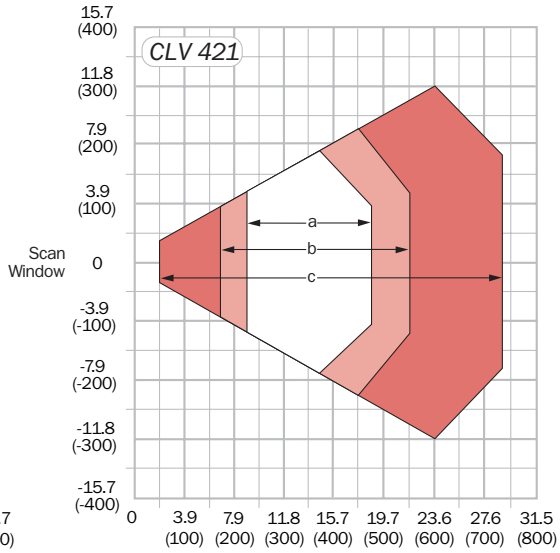
Reading Ranges

Dimensions in inches (mm)



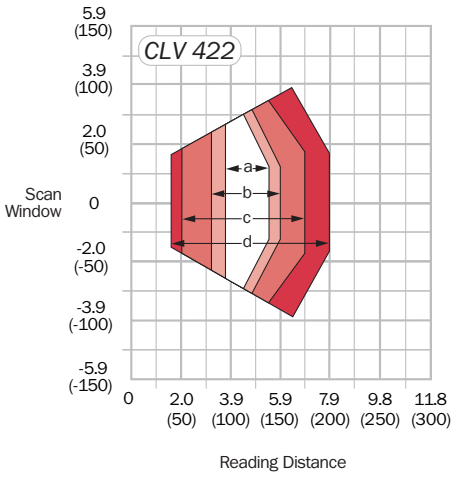
Code Resolution
- a: 0.008 in (0.20 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)
- d: 0.040 in (1.0 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 0.71 in (18 mm) toward the reading window



Code Resolution
- a: 0.013 in (0.35 mm)
- b: 0.020 in (0.50 mm)
- c: 0.040 in (1.0 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 0.71 in (18 mm) toward the reading window



Code Resolution
- a: 0.006 in (0.15 mm)
- b: 0.008 in (0.20 mm)
- c: 0.013 in (0.35 mm)
- d: 0.020 in (0.50 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 0.71 in (18 mm) toward the reading window

Technical Specifications

	CLV 420	CLV 421	CLV 422
Scanning Characteristics			
Scanning Method	8-sided polygon mirror wheel		
Aperture Angle	50°		
Scanning Frequency	400…1200 Hz (software selectable)		
Light Source	Visible laser diode (670 nm); CDRH Class II		
Reading Distance	2.0…14 in (50…365 mm)	2.0…28.5 in (50…725 mm)	1.5…8.0 in (40…200 mm)
Resolution	0.008…0.040 in (0.2…1.0 mm)	0.014…0.04 in (0.35…1.0 mm)	0.006…0.02 in (0.15…0.5 mm)
Bar Code Types			
Bar Code Symbology	Code 39, Interleaved 2/5, Industrial 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128, Pharmacode		
Readability	1…3 bar codes per scan line		
Auto Discrimination	1…10 bar codes per reading gate		
Communications / I/O / Indicators			
Host Interface	RS 232 and RS 422/485, variable data output (software selectable)		
Baud Rate	300…57,600 (software selectable)		
Data Format	Data bits, stop bits, parity (software selectable)		
Network Configuration	Pass-through; master/slave; RS 485 network, CAN Bus, CAN scanner, CANopen		
LED Indicators	Device ready, result, laser on, data		
Switching Inputs	2 x PNP, opto-decoupled, maximum 30 V DC		
Switching Outputs	2 x PNP, maximum 100 mA / 24 V DC; Output 1, Output 2		
Trigger Methods	Sensor input (I/O interface) / Serial (Host interface) / Free running / Reflector polling (automatic)		
Mechanical/Electrical			
Supply Voltage	Operating voltage 10…30 V DC		
Current Consumption	145 mA at 24 V DC / 3.5 W		
Dimensions			
Line/raster scanner	2.3 x 2.5 x 1.4 in (59 x 62.7 x 35.2 mm)		
Side emitting scanner	2.8 x 2.5 x 1.4 in (72 x 62.7 x 35.2 mm)		
Weight	Approx. 8.75 oz (250 g) including cable		
Housing / Enclosure Rating	Die cast zinc / IP 65		
Connectivity	15-pin male D-Sub high density cable, 3 ft (0.9 m) cable length		
Environmental			
Ambient Operating Temperature	32…104°F (0…40°C)		
Storage Temperature	-4…158°F (-20…70°C)		
Vibration	To IEC 60-2-6 test FC		
Shock	To IEC 60-2-27 test EA		
EMV	To IEC 801		
Maximum Relative Humidity	90%, non-condensing		
Programming	Windows™-based CLV Setup Software		

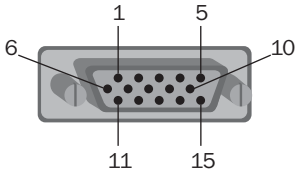
Models and Part Numbers

	CLV 420	CLV 421	CLV 422
Front Emitting Line Scanner			
Model	CLV 420-0010	CLV 421-0010	CLV 422-0010
Part Number	1 022 031	1 022 547	1 022 548
Front Emitting Raster Scanner			
Model	CLV 420-1010	CLV 421-1010	CLV 422-1010
Part Number	1 022 032	1 022 616	1 022 619
Side Emitting Line Scanner			
Model	CLV 420-2010	CLV 421-2010	CLV 422-2010
Part Number	1 022 033	1 022 617	1 022 620
Side Emitting Raster Scanner			
Model	CLV 420-3010	CLV 421-3010	CLV 422-3010
Part Number	1 022 034	1 022 618	1 022 621

NOTE: Accessories information is located on pages 87 - 88.

Pinouts

15-pin connector

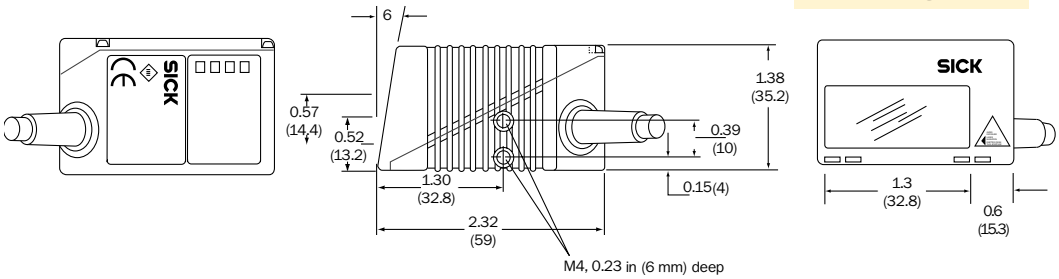


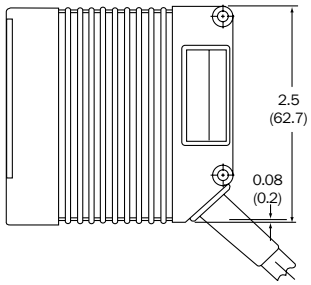
Pin	Signal	Function
1	10…30 V	Power supply
2	RxD (Terminal)	Terminal interface (receiver)
3	TxD (Terminal)	Terminal interface (transmitter)
4	Sensor 2	Switching input, variable function
5	GND	Ground
6	RD+ (RS 422/485)	Host interface (receiver)
7	RD- (RS 422/485)	Host interface (receiver)
	RxD (RS 232)	-
8	TD+ (RS 422/485)	Host interface (transmitter)
9	TD- (RS 422/485)	Host interface (transmitter)
	TxD (RS 232)	-
10	CAN H	CAN Bus (IN/OUT)
11	CAN L	CAN Bus (IN/OUT)
12	Result 1	Switching output, variable function
13	Result 2	Switching output, variable function
14	Sensor 1	Switching input for ext. reading pulse
15	Sensor GND	Common ground (all inputs)
-	-	Shield

Drawings

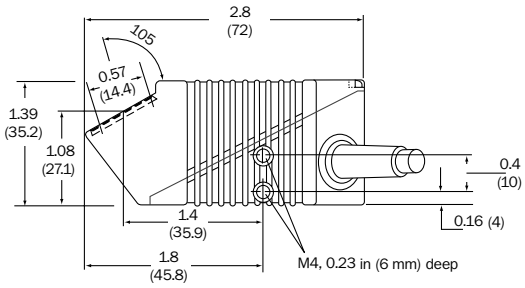
Dimensions in inches (mm)

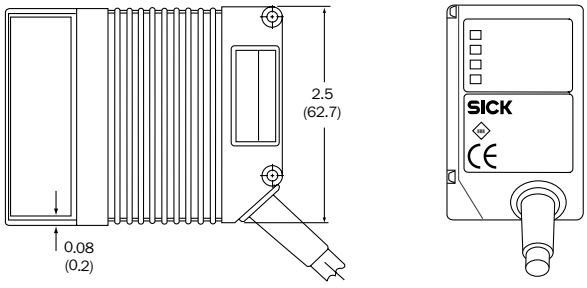
CLV 420/421/422
front emitting scanner





CLV 420/421/422
side emitting scanner





CLV 430/431/432
Fixed Position Scanner

Features

- SMART Technology
- Compact design
- Cloning module capabilities
- Integrated CAN bus network
- Optional display
- Profile Programming – Auto setup
- Automatic Triggering
- Extended communications

The compact size of the CLV 43x Series allows it to fit into any application, even ones in tight spaces. The strong performance characteristics of this scanner are not limited by its size; SMART Technology (SICK's Modular Advanced Recognition Technology) enables the scanner to read bar codes that could not be read by other scanners. The CLV 43x processes complete bar code images before decoding. This translates into a much higher percentage of successful reads, even with bar codes presented at high tilt angles, or bar codes damaged by tearing, smearing or splotches.

The CLV 43x has a user-selectable scan rate of 300 to 800 Hz at a reading range of 2 to 32 inches. All parameters of the CLV 43x, including bar code resolution, scan frequency, bar code label specifications and data format, are selectable via included Windows™-based CLV Setup Software.

Other setup options are our integrated Profile Programming, which simplifies scanner setup without the need of a PC and our external CMC Cloning Module, which allows for all application-specific parameters to be automatically copied to a new scanner. Either of these options results in extremely fast setup or seamless swap out.

The CLV 43x Series also has integrated CAN bus networking. This enables you to easily connect up to 32 scanners in a single high-speed network for easy setup, reduced cabling, and lowered system cost due to reduced hardware. The CLV 43x is designed to save you time and money.

The CLV 43x is especially suited to applications such as material handling, print and apply verification, product label verification, automated medical instrumentation, automotive assembly, electronic circuit board identification, and packaging.

Comparison Table

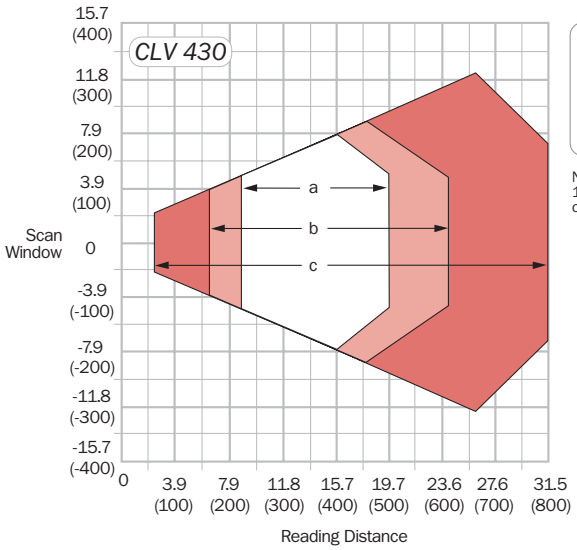
	CLV 430 Standard	CLV 431 Standard	CLV 432 Standard (Close Range)
Reading Range	2.0…31.5 in (51…800 mm)	3.5…16.7 in (89…424 mm)	2.0…10.0 in (51…254 mm)
Scan Frequency	300…800 Hz (software selectable)	300…800 Hz (software selectable)	300…800 Hz (software selectable)
Cloning*	■	■	■
Fixed Focus	■	■	■
Dynamic Focus			
Auto Focus			
Standard Decoding	■	■	■
SMART Decoding	■	■	■
Line Scanner	■	■	■
Raster Scanner	■	■	■
Oscillating Mirror Scanner	■	■	■
Front Emitting	■	■	■
Side Emitting		■	■
Plastic Window	■ **	■ **	■ **
Low Contrast	■ **		■ **

* Requires use of CDM 420 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

** Not available in all configurations.

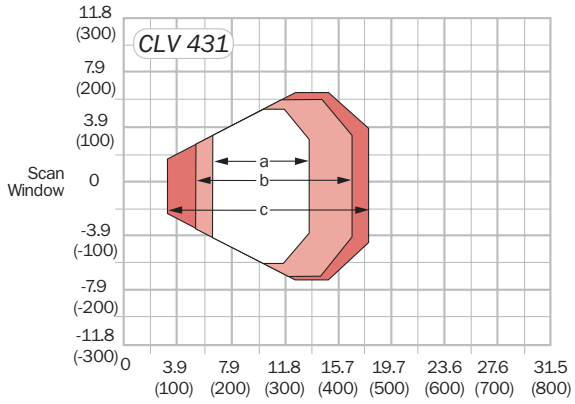
Reading Ranges

Dimensions in inches (mm)



Code Resolution
- a: 0.013 in (0.35 mm)
- b: 0.02 in (0.50 mm)
- c: 0.040 in (1.0 mm)

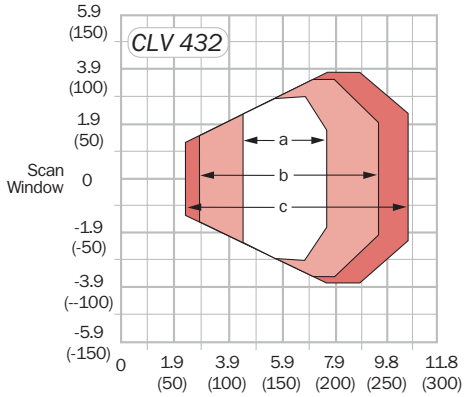
NOTE: Raster Height: The raster height is 15 mm [0.60 in (8 lines)] at a reading distance of 200 mm (7.87 in)



Code Resolution
- a: 0.010 in (0.25 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 20 mm (0.79 in) toward the reading window

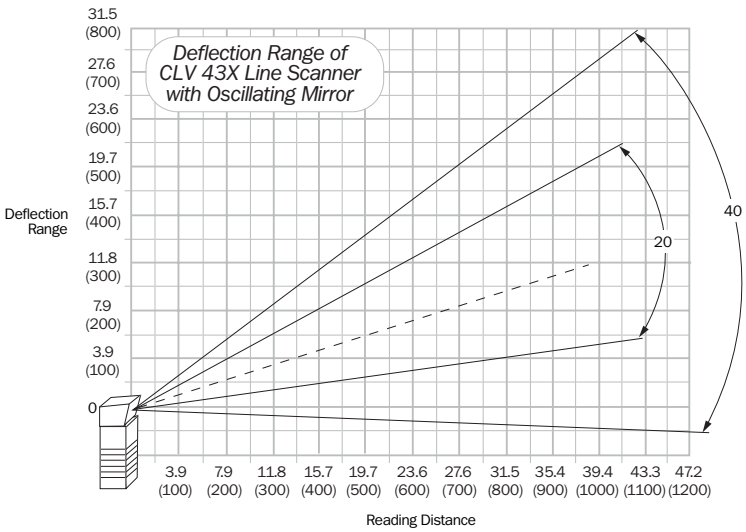
NOTE: Raster Height: The raster height is 15 mm [0.60 in (8 lines)] at a reading distance of 200 mm (7.87 in)



Code Resolution
- a: 0.008 in (0.20 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

NOTE: Side Emitting Scanner: The entire reading field is shifted 20 mm (0.79 in) toward the reading window

NOTE: Raster Height: The raster height is 15 mm [0.60 in (8 lines)] at a reading distance of 200 mm (7.87 in)



Technical Specifications

	CLV 430	CLV 431	CLV 432
Scanning Characteristics			
Scanning Method	8-sided polygon mirror wheel		
Aperture Angle	50°		
Scanning Frequency	300…800 Hz (software selectable)		
Light Source	Visible laser diode (670 nm); CDRH Class II		
Reading Distance	2.0…31.5 in (51…800 mm)	3.5…16.7 in (89…424 mm)	2.0…10.0 in (51…254 mm)
Resolution	0.008…0.040 in (0.2…1.0 mm)		
Bar Code Types			
Bar Code Symbology	Code 39, Interleaved 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128, Pharmacode		
Readability	1 to 20 bar codes per scan (standard decoder); 1 to 6 (SMART)		
Auto Discrimination	1…50 bar codes per reading gate		
Communications / I/O / Indicators			
Host Interface	RS 232 and RS 422/485, variable data output format (software selectable)		
Baud Rate	300…57,600 (software selectable)		
Data Format	Data bits, stop bits, parity (software selectable)		
Network Configuration	Pass-through; master/slave; RS 485 network; CAN scanner, CANopen		
LED Indicators	Device ready, result, sensor, data		
Switching Inputs	2 x PNP, opto-decoupled, maximum 30 V DC		
Switching Outputs	2 x PNP, maximum 100 mA / 24 V DC		
Trigger Methods	Sensor input (I/O interface) / Serial (Host interface) / Free running / Reflector polling (automatic)		
Mechanical/Electrical			
Supply Voltage	Operating voltage 10…30 V DC		
Current Consumption			
Line/raster scanner	166 mA at 24 V DC / 4 W		
Osc mirror scanner	258 mA at 24 V DC / 6.2 W		
Dimensions			
Line/raster scanner	3.5 x 2.4 x 1.4 in (90 x 60 x 35.7 mm)		
Osc mirror scanner	3.9 x 3.6 x 1.5 in (99.8 x 92.2 x 37.8 mm)		
Weight	Approx. 14.7 oz (420 g)		
Housing / Enclosure Rating	Die cast zinc / IP 65		
Connectivity	15-pin male D-Sub high density connector		
Environmental			
Ambient Operating Temperature	32…104°F (0…40°C)		
Storage Temperature	-4…158°F (-20…70°C)		
Vibration	To IEC 68-2-6 test FC		
Shock	To IEC 68-2-27 test EA		
EMV	To IEC 801		
Maximum Relative Humidity	90%, non-condensing		
Programming	Windows™-based CLV Setup Software		

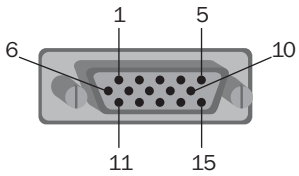
Models and Part Numbers

	CLV 430	CLV 431	CLV 432
Front Emitting Line Scanner			
Model	CLV 430-0010	CLV 431-0010	CLV 432-0010
Part Number	1 017 585	1 017 622	1 017 623
Front Emitting Raster Scanner			
Model	CLV 430-1010	CLV 431-1010	CLV 432-1010
Part Number	1 016 705	1 016 679	1 016 680
Side Emitting Line Scanner			
Model	-	CLV 431-2010	CLV 432-2010
Part Number	-	1 016 746	1 016 748
Side Emitting Raster Scanner			
Model	-	CLV 431-3010	CLV 432-3010
Part Number	-	1 016 747	1 016 749
Oscillating Mirror Scanner			
Model	CLV 430-6010	CLV 431-6010	CLV 432-6010
Part Number	1 017 981	1 017 982	1 017 983

NOTE: Accessories information is located on pages 88 - 89.

Pinouts

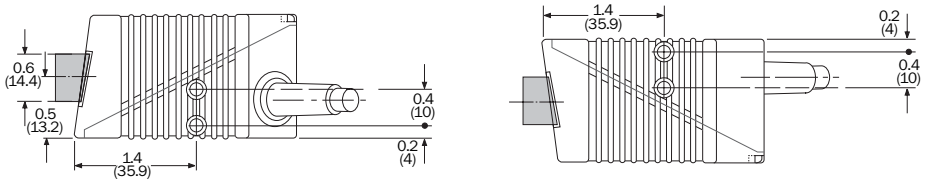
15-pin connector



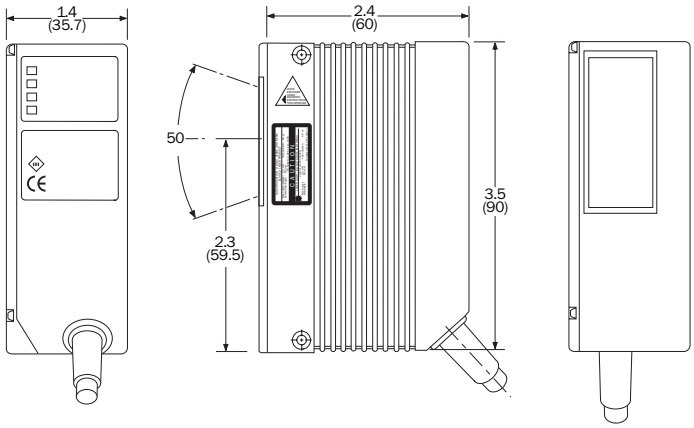
Pin	Signal	Function
1	10…30 V	Supply voltage
2	RxD (Terminal)	Data interface 2 (receiver)
3	TxD (Terminal)	Data interface 2 (transmitter)
4	Sensor 2	Switching input, variable function
5	GND	Ground
6	RD+ (RS 422/485)	Data interface 1 (receiver)
7	RD- (RS 422/485)	Data interface 1 (receiver)
	RxD (RS 232)	-
8	TD+ (RS 422/485)	Data interface 1 (transmitter)
9	TD- (RS 422/485)	Data interface 1 (transmitter)
	TxD (RS 232)	-
10	CAN H	CAN Bus (IN/OUT)
11	CAN L	CAN Bus (IN/OUT)
12	Result 1	Switching output, variable function
13	Result 2	Switching output, variable function
14	Sensor 1	Switching input for ext. reading pulse
15	Sensor GND	Common ground (all inputs)
-	-	Shield

Drawings

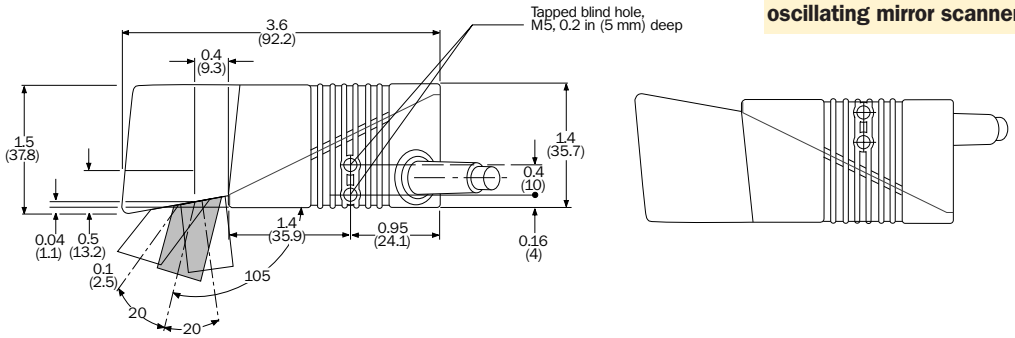
Dimensions in inches (mm)

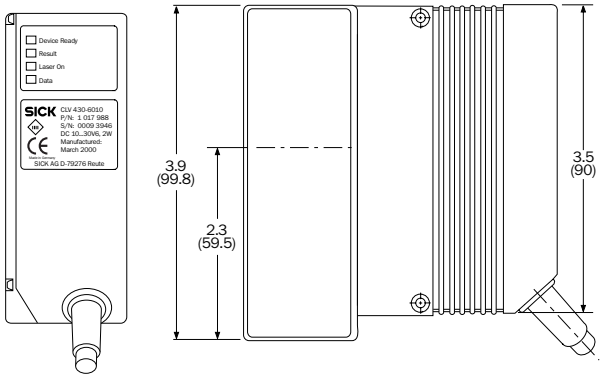


CLV 430/431/432
front emitting scanner



CLV 430/431/432
oscillating mirror scanner





CLV 440/442
Fixed Position Scanner

Features

- Dynamic Focus Control
- SMART Technology
- Cloning module capabilities
- Integrated CAN bus network
- Optional display
- Compact design
- Extended communications
- Profile programming – Auto setup

The CLV 44x Series Bar Code Scanner has Dynamic Focus Control which accommodates a large depth of field by dynamically adjusting its focus position to the object distance, making the CLV 44x ideal for decoding bar codes on objects of different heights.

The strong performance characteristics of the CLV 44x Series is not limited by its size. SMART Technology (SICK's Modular Advanced Recognition Technology) enables the scanner to read bar codes that could not be read by other scanners. This translates to a much higher percentage of successful reads, even with damaged or high tilt angle bar codes.

The CLV 44x has a user-selectable scan rate of 300 to 800 Hz at a reading range of 1.2 to 32 inches (30 to 800 mm). All parameters of the CLV 44x are selectable via included Windows™-based CLV Setup Software.

Other setup options are our integrated Profile Programming, which allows for scanner setup without the need of a PC and our external CMC Cloning Module, which allows for all application-specific parameters to be automatically copied to a new scanner. Either of these options results in extremely fast setup or seamless swap out.

The CLV 44x also has integrated CAN bus networking. This enables you to easily connect up to 32 scanners in a single high-speed network, allowing for easy setup, reduced cabling, and lowered system cost due to reduced hardware.

The CLV 44x is especially suited for material handling, print and apply verification, product label verification, automated medical instrumentation, automotive assembly, electronic circuit board identification, and packaging applications.

Comparison Table

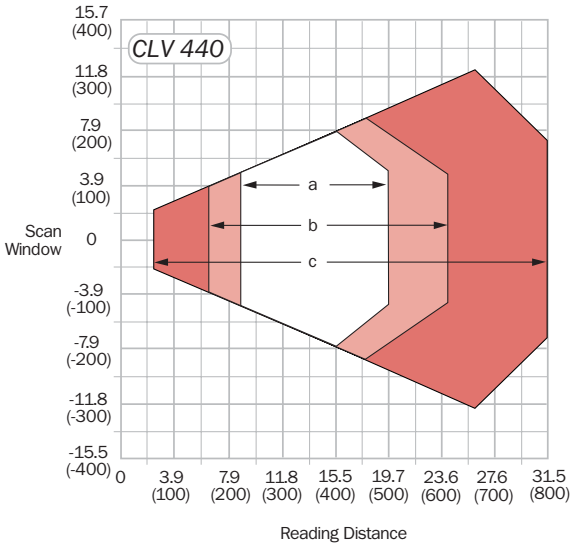
	CLV 440 Standard	CLV 442 High Density
Reading Range	2.0…31.5 in (51…800 mm)	1.2…13.4 in (30…340 mm)
Scan Frequency	300…800 Hz (software selectable)	300…800 Hz (software selectable)
Cloning*	■	■
Fixed Focus		
Dynamic Focus	■	■
Auto Focus		
Standard Decoding	■	■
SMART Decoding	■	■
Line Scanner	■	■
Raster Scanner		
Oscillating Mirror Scanner	■	■
Front Emitting	■	■
Side Emitting		
Plastic Window		
Low Contrast	■ **	

* Requires use of CDM 420 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

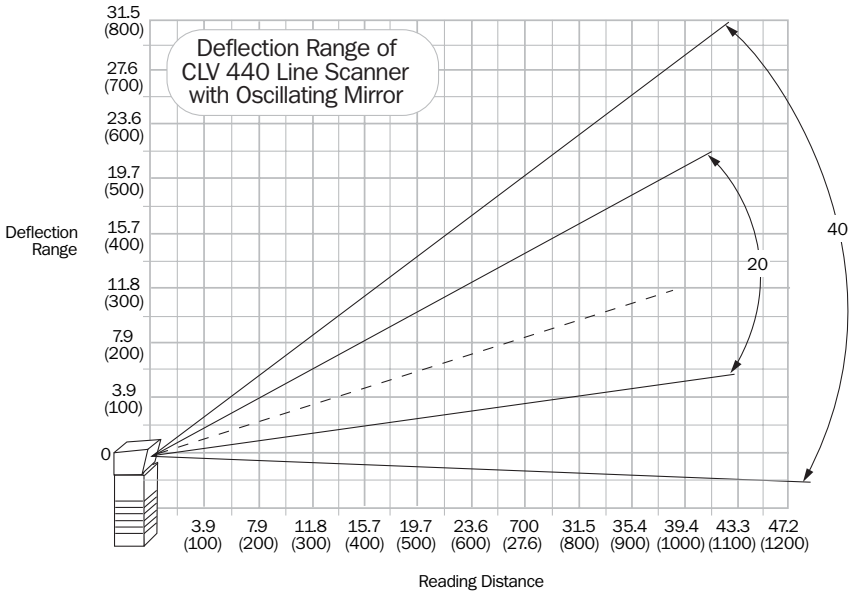
** Not available in all configurations.

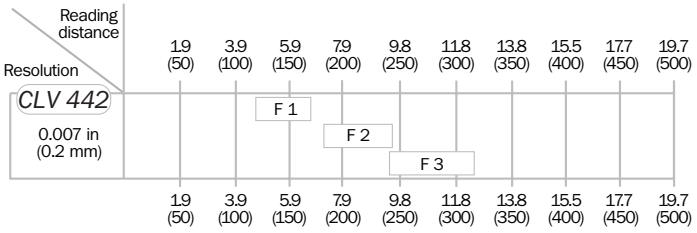
Reading Ranges

Dimensions in inches (mm)



Code Resolution
- a: 0.013 in (0.35 mm)
- b: 0.02 in (0.50 mm)
- c: 0.040 in (1.0 mm)





Focus Position
- F 1: 5.5 in (140 mm)
- F 2: 8.5 in (215 mm)
- F 3: 11.0 in (280 mm)

Technical Specifications

	CLV 440	CLV 442
Scanning Characteristics		
Scanning Method	8-sided polygon mirror wheel	
Aperture Angle	Maximum 50°	
Scanning Frequency	300…800 Hz (software selectable)	
Light Source	Visible laser diode (670 nm); CDRH Class II	
Reading Distance	2.0…31.5 in (51…800 mm)	1.2…13.4 in (30…340 mm)
Resolution	0.008…0.040 in (0.2…1.0 mm)	0.005…0.013 in (0.15…0.35 mm)
Bar Code Types		
Bar Code Symbology	Code 39, Interleaved 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128, Pharmacode	
Readability	1…20 bar codes per scan (standard decoder), 1…6 (SMART)	
Auto Discrimination	1…50 bar codes per reading gate	
Communications / I/O / Indicators		
Host Interface	RS 232 and RS 422/485, variable data output format (software selectable)	
Baud Rate	300…57,600 (software selectable)	
Data Format	Data bits, stop bits, parity (software selectable)	
Network Configuration	Pass-through; master/slave; RS 485 network; CAN scanner, CANopen	
LED Indicators	Device ready, result, laser on, data	
Switching Inputs	2 x PNP, opto-decoupled, maximum 30 V DC	
Switching Outputs	2 x PNP, maximum 100 mA / 24 V DC; variable pulse duration (10…990 ms)	
Trigger Methods	Sensor input (I/O interface) / Serial (Host interface) / Free running / Reflector polling (automatic)	
Mechanical/Electrical		
Supply Voltage	Operating voltage 10…30 V DC	
Current Consumption		
Line/raster scanner	208 mA at 24 V DC / 5.0 W	
Osc mirror scanner	258 mA at 24 V DC / 6.2 W	
Dimensions		
Line/raster scanner	3.5 x 2.4 x 1.4 in (90 x 60 x 35.7 mm)	
Osc mirror scanner	3.9 x 3.6 x 1.5 in (99.8 x 92.2 x 37.8 mm)	
Weight	Approx. 1.0 lb (480 g)	
Housing / Enclosure Rating	Die cast zinc / IP 65	
Connectivity	15-pin male D-Sub high density connector	
Environmental		
Ambient Operating Temperature	32…104°F (0…40°C)	
Storage Temperature	-4…158°F (-20…70°C)	
Vibration	To IEC 68-2-6 test FC	
Shock	To IEC 68-2-27 test EA	
EMV	To IEC 801	
Maximum Relative Humidity	90%, non-condensing	
Programming	Windows™-based CLV Setup Software	

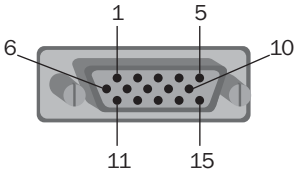
Models and Part Numbers

	CLV 440	CLV 442
Front Emitting Line Scanner		
Model	CLV 440-0010	CLV 442-0010
Part Number	1 017 588	1 017 595
Oscillating Mirror Scanner		
Model	CLV 440-6010	-
Part Number	1 017 984	-

NOTE: Accessories information is located on page 90.

Pinouts

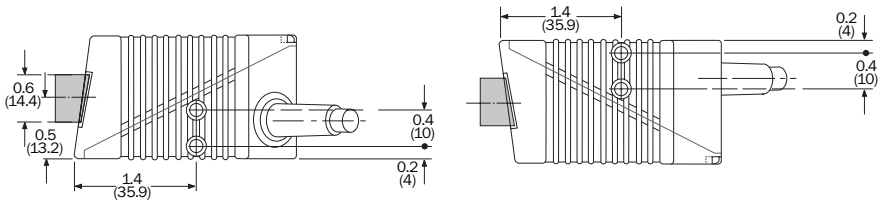
15-pin connector



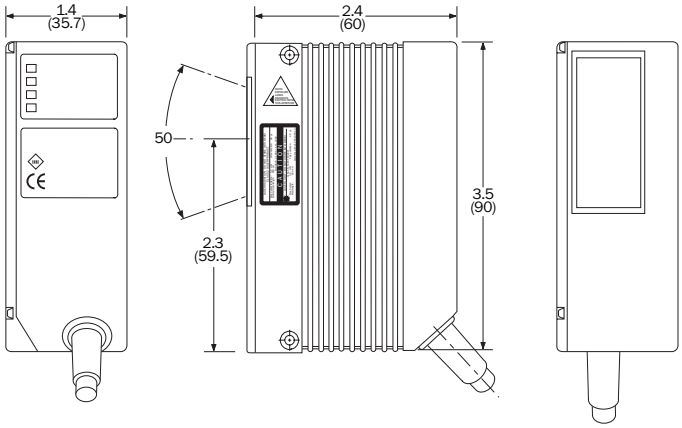
Pin	Signal	Function
1	10…30 V	Supply voltage
2	RxD (Terminal)	Data interface 2 (receiver)
3	TxD (Terminal)	Data interface 2 (transmitter)
4	Sensor 2	Switching input, variable function
5	GND	Ground
6	RD+ (RS 422/485)	Data interface 1 (receiver)
7	RD- (RS 422/485)	Data interface 1 (receiver)
	RxD (RS 232)	-
8	TD+ (RS 422/485)	Data interface 1 (transmitter)
9	TD- (RS 422/485)	Data interface 1 (transmitter)
	TxD (RS 232)	-
10	CAN H	CAN Bus (IN/OUT)
11	CAN L	CAN Bus (IN/OUT)
12	Result 1	Switching output, variable function
13	Result 2	Switching output, variable function
14	Sensor 1	Switching input for ext. reading pulse
15	Sensor GND	Common ground (all inputs)
-	-	Shield

Drawings

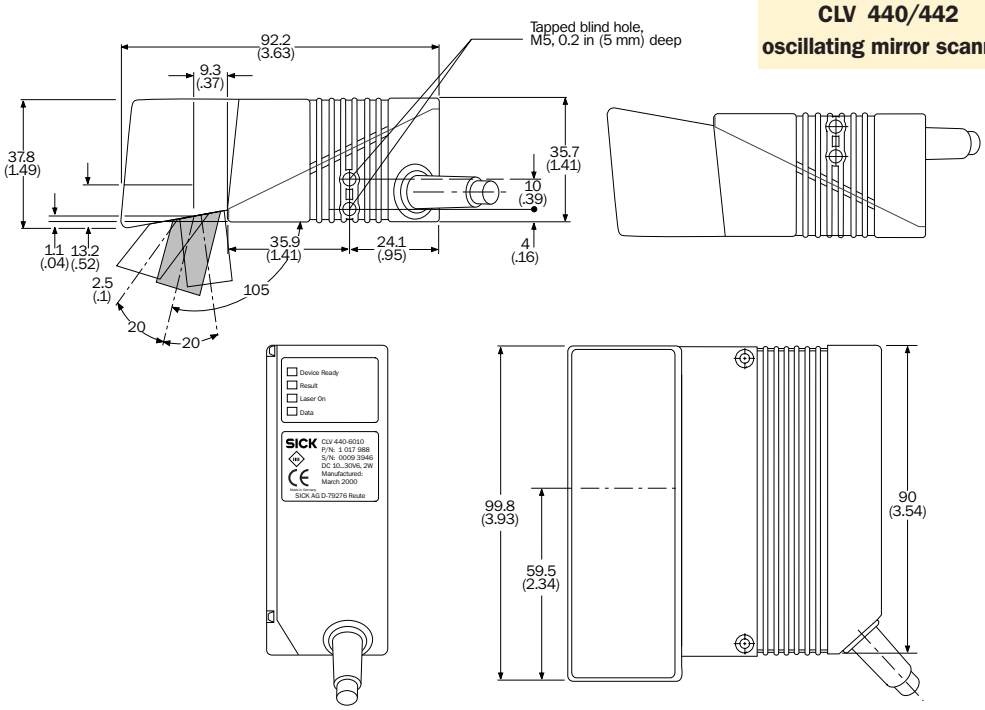
Dimensions in inches (mm)



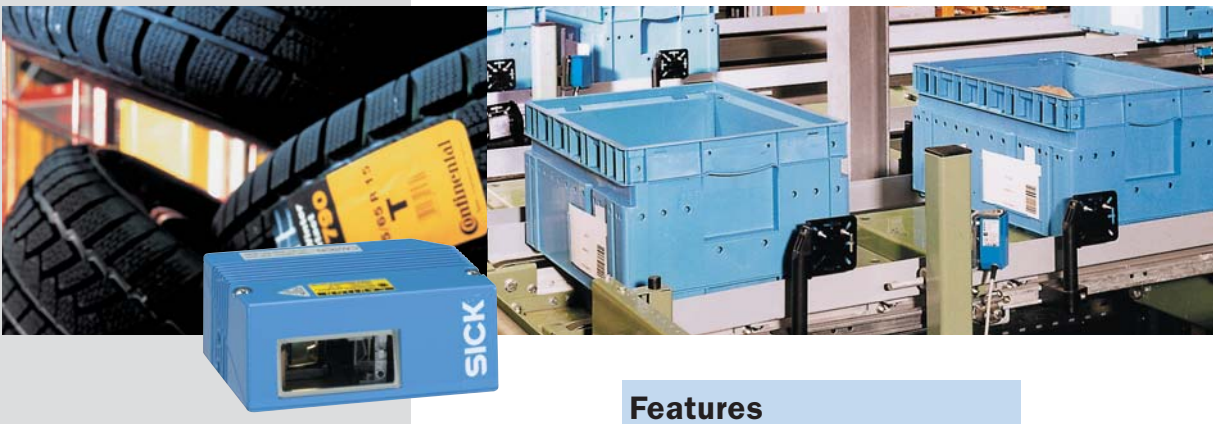
CLV 440/442
front emitting



CLV 440/442
oscillating mirror scanner



CLV 450
Fixed Position Scanner



Features

- Dynamic Focus Control
- SMART Technology
- Integrated CAN bus network
- Extremely large depth of field
- Cloning module capabilities
- High speed (1000 Hz)
- Optional display
- Extended communications

The CLV 45x is a powerful product in an extremely small package. With a reading range from 6 to 62 inches and a user-selectable scan rate from 400 to 1000 Hz, it is easily the most powerful scanner in its class. Our patented SMART Technology (SICK's Modular Advanced Recognition Technology) enables the CLV 45x to read damaged, tilted, partially hidden or dirty bar codes. It can read bar codes other scanners can not.

Dynamic Focus Control allows the CLV 45x to accommodate a large depth of field by dynamically adjusting its focus position to the object distance. This makes the CLV 45x a perfect choice for applications where bar codes will be affixed to objects of varying heights.

The CLV 45x also has integrated CAN bus networking. This enables you to easily connect up to 32 scanners in a single high-speed network, allowing for easy setup, reduced cabling, and lowered system cost due to reduced hardware.

Also available for the CLV 45x is the CMC Cloning Module in conjunction with our CDx Series of connection devices. The CMC will store all the setup parameters of the connected bar code scanner in external memory. Application-specific parameters are automatically copied to a new device if a bar code scanner should need replacement. An optional display provides for immediate visualization of read results and diagnostic data without the need of a PC. Not only is the CLV 45x flexible and effective, its accessories are as well.

The CLV 45x is ideally suited for applications in the packaging, material handling, automotive, and distribution industries.

Comparison Table

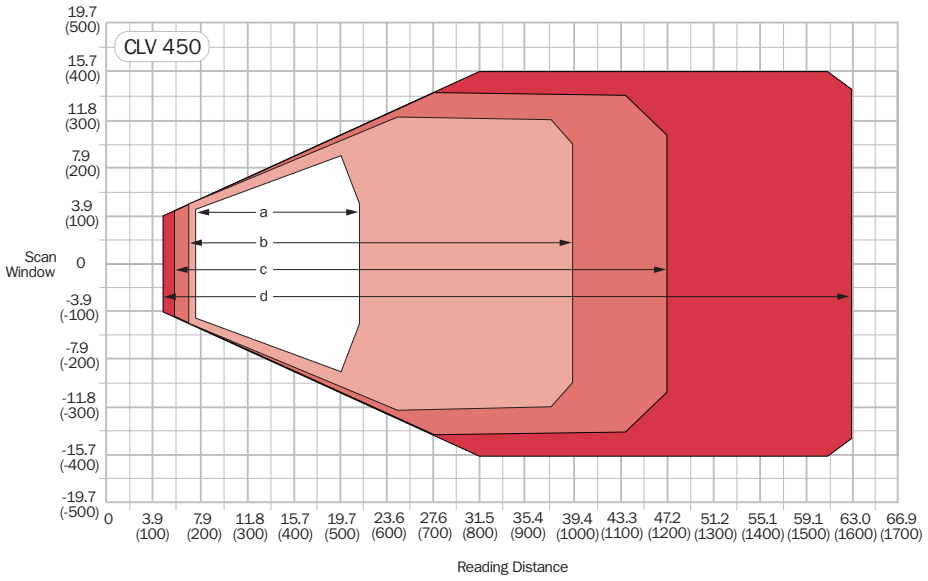
	CLV 450 Standard
Reading Range	6.2…62.9 in (160…1600 mm)
Scan Frequency	400…1000 Hz (software selectable)
Cloning*	■
Fixed Focus	
Dynamic Focus	■
Auto Focus	
Standard Decoding	■
SMART Decoding	■
Line Scanner	■
Raster Scanner	
Oscillating Mirror Scanner	■
Front Emitting	■
Side Emitting	
Plastic Window	■ **
Low Contrast	

* Requires use of CDM 420 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

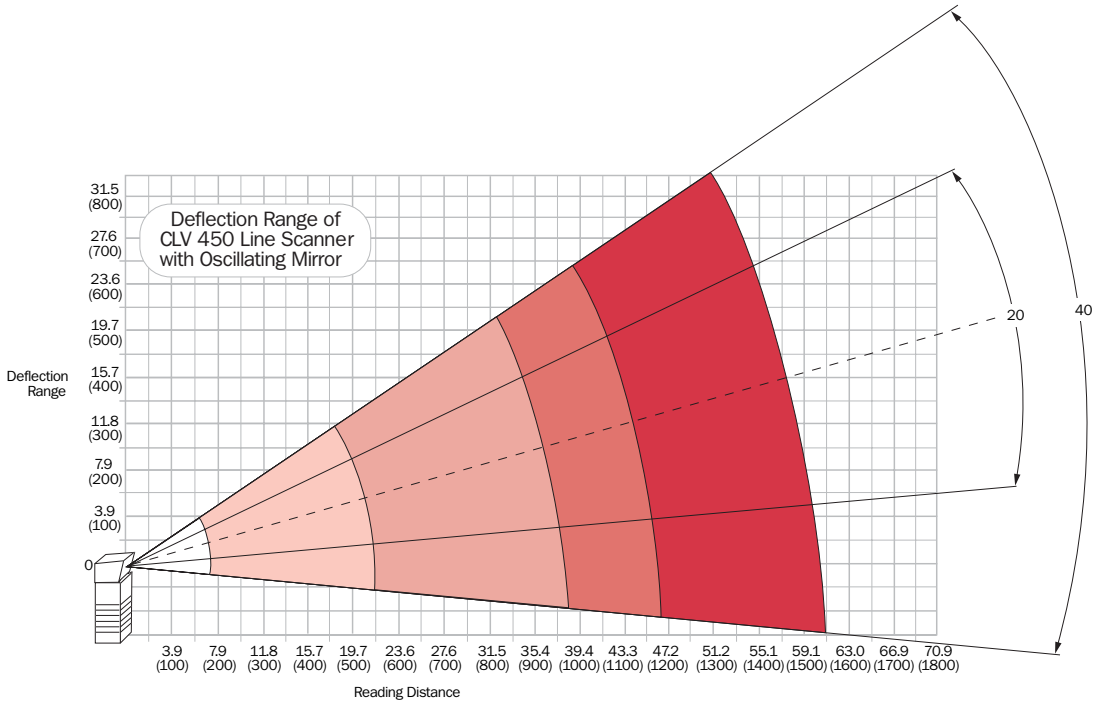
** Not available in all configurations.

Reading Ranges

Dimensions in inches (mm)



Code Resolution
- a: 0.010 in (0.25 mm)
- b: 0.014 in (0.35 mm)
- c: 0.020 in (0.50 mm)
- d: 0.040 in (1.00 mm)



Technical Specifications

	CLV 450
Scanning Characteristics	
Scanning Method	8-sided polygon mirror wheel
Aperture Angle	Maximum 50°
Scanning Frequency	400…1000 Hz (software selectable)
Light Source	Visible laser diode (650 nm); CDRH Class II
Reading Distance	6.2…62.9 in (160…1600 mm)
Resolution	0.010…0.040 in (0.25…1.0 mm)
Bar Code Types	
Bar Code Symbology	Code 39, Interleaved 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128, Pharmacode
Readability	1 to 20 bar codes per scan (standard decoder); 1 to 6 (SMART)
Auto Discrimination	1…50 bar codes per reading gate
Communications / I/O / Indicators	
Host Interface	RS 232 and RS 422/485, variable data output format (software selectable)
Baud Rate	300…57,600 (software selectable)
Data Format	Data bits, stop bits, parity (software selectable)
Network Configuration	Pass-through; master/slave; RS 485 network; CAN scanner, CANopen
LED Indicators	Device ready, result, laser on, data
Switching Inputs	2 x PNP, opto-decoupled, maximum 30 V DC
Switching Outputs	2 x PNP, maximum 100 mA
Trigger Methods	Sensor input (I/O interface) / Serial (Host interface) / Free running / Reflector polling (automatic)
Mechanical/Electrical	
Supply Voltage	Operating voltage 10…30 V DC
Current Consumption	
Line scanner	250 mA at 24 V DC / 6.0 W
Osc mirror scanner	300 mA at 24 V DC / 7. 2W
Dimensions	
Line scanner	3.5 x 2.4 x 1.4 in (90 x 60 x 35.7 mm)
Side mirror scanner	3.9 x 3.6 x 1.5 in (99.8 x 92.2 x 37.8 mm)
Weight	Approx. 18.6 oz (530 g)
Housing / Enclosure Rating	Die cast zinc / IP 65
Connectivity	15-pin male D-Sub high density connector
Environmental	
Ambient Operating Temperature	32…104°F (0…40°C)
Storage Temperature	-4…158°F (-20…70°C)
Vibration	To IEC 68-2-6 test FC
Shock	To IEC 68-2-27 test EA
EMV	To IEC 801
Maximum Relative Humidity	90%, non-condensing
Programming	Windows™-based CLV Setup Software

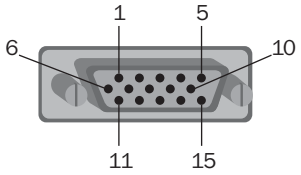
Models and Part Numbers

	CLV 450
Front Emitting Line Scanner	
Model	CLV 450-0010
Part Number	1 018 556
Oscillating Mirror Scanner	
Model	CLV 450-6010
Part Number	1 019 218

NOTE: Accessories information is located on page 91.

Pinouts

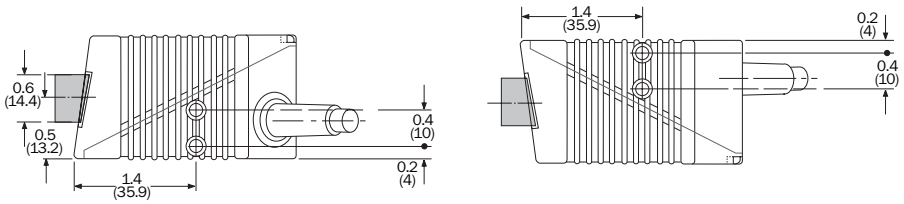
15-pin connector



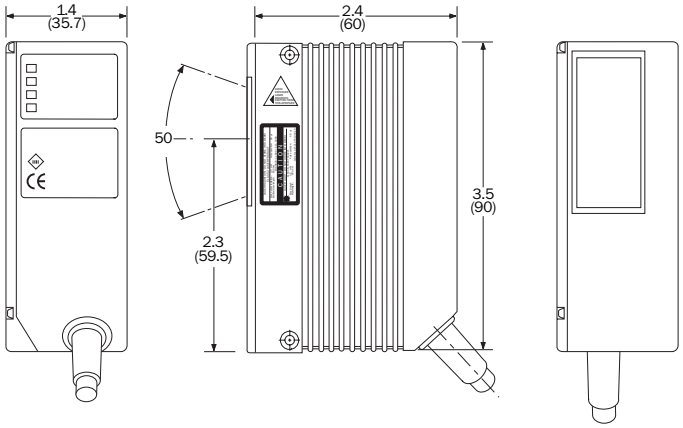
Pin	Signal	Function
1	10…30 V	Supply voltage
2	RxD (Terminal)	Data interface 2 (receiver)
3	TxD (Terminal)	Data interface 2 (transmitter)
4	Sensor 2	Switching input, variable function
5	GND	Ground
6	RD+ (RS 422/485)	Data interface 1 (receiver)
7	RD- (RS 422/485)	Data interface 1 (receiver)
	RxD (RS 232)	-
8	TD+ (RS 422/485)	Data interface 1 (transmitter)
9	TD- (RS 422/485)	Data interface 1 (transmitter)
	TxD (RS 232)	-
10	CAN H	CAN Bus (IN/OUT)
11	CAN L	CAN Bus (IN/OUT)
12	Result 1	Switching output, variable function
13	Result 2	Switching output, variable function
14	Sensor 1	Switching input for ext. reading pulse
15	Sensor GND	Common ground (all inputs)
-	-	Shield

Drawings

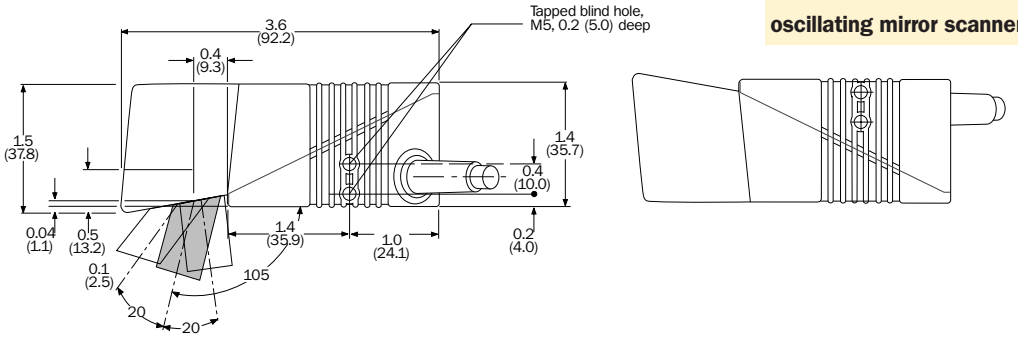
Dimensions in inches (mm)

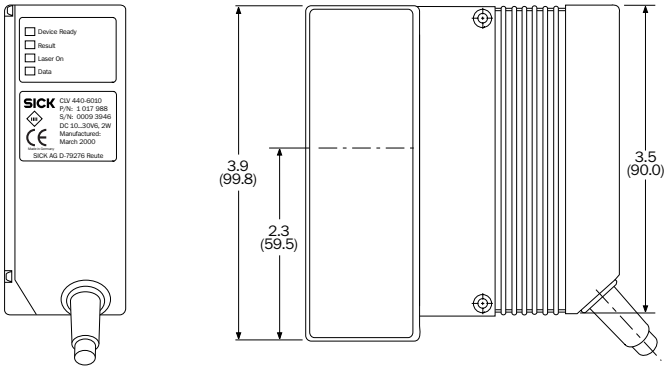


CLV 450
front emitting scanner



CLV 450
oscillating mirror scanner





CLV 480
Fixed Position Scanner

Features

- Extremely large depth of field
- Dynamic Focus Control
- Designed for high tilt angles (45°)
- SMART Technology
- Integrated CAN bus network
- Optional heater
- Cloning module capabilities
- Optional display
- Extended communications

The CLV 480 Bar Code Scanner from SICK delivers maximum, tilt-independent read rates with minimum code height. If you have pallet applications, parcel handling, heater applications or applications with large objects/depths of field, the CLV 480 is ready to work for you.

The CLV 480 has Dynamic Focus Control; a function that provides optimum read rates at maximum depths of field. The scanner dynamically adjusts its focus position to the object distance. This makes the CLV 480 a perfect choice for applications where bar codes will be affixed to objects of varying heights.

The CLV 480 is able to provide ultra-reliable code recognition thanks to SMART Technology. SMART, SICK's Modular Advanced Recognition Technology, allows the scanner to easily read bar code labels that are tilted, damaged or partially hidden from the scanner's view.

The CLV 480's integrated CAN bus networking enables you to easily connect up to 32 scanners in a single high-speed network. This allows for easy setup, reduced cabling and lowered system cost due to reduced hardware.

The CLV 480 is available with an optional heater for applications in temperatures as low as -31°F (-35°C). It has a software-selectable scan rate from 600 to 1200 Hz and a reading range of 10 to 81 inches. Due to its advanced optics, it's also ideal for low-contrast applications, like those found on corrugate boxes. The CLV 480 is ready to solve your problems!

The CLV 480 is ideally suited for material handling, manufacturing, automotive, pallet handling, and forklift applications.

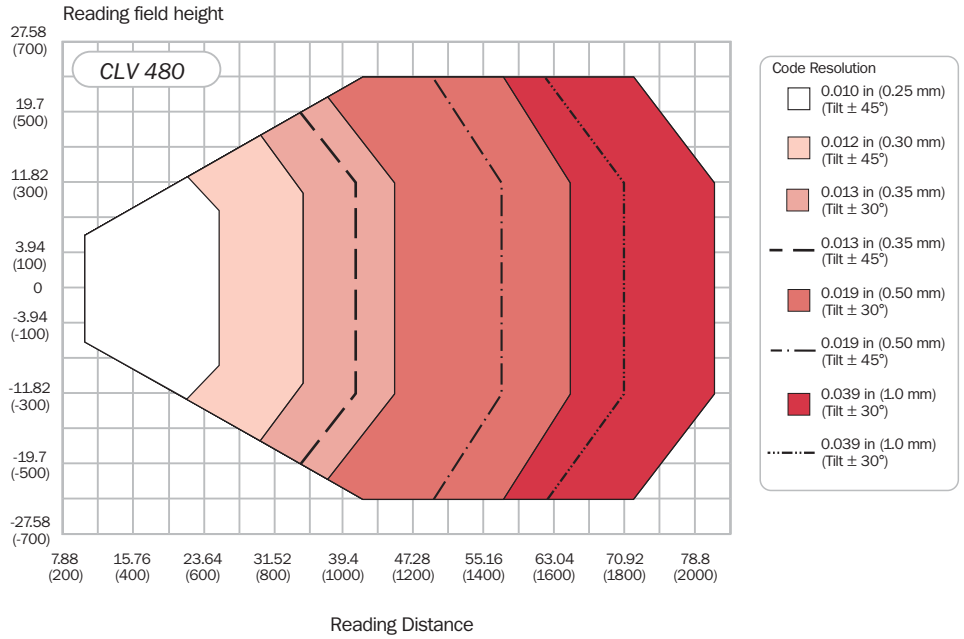
Comparison Table

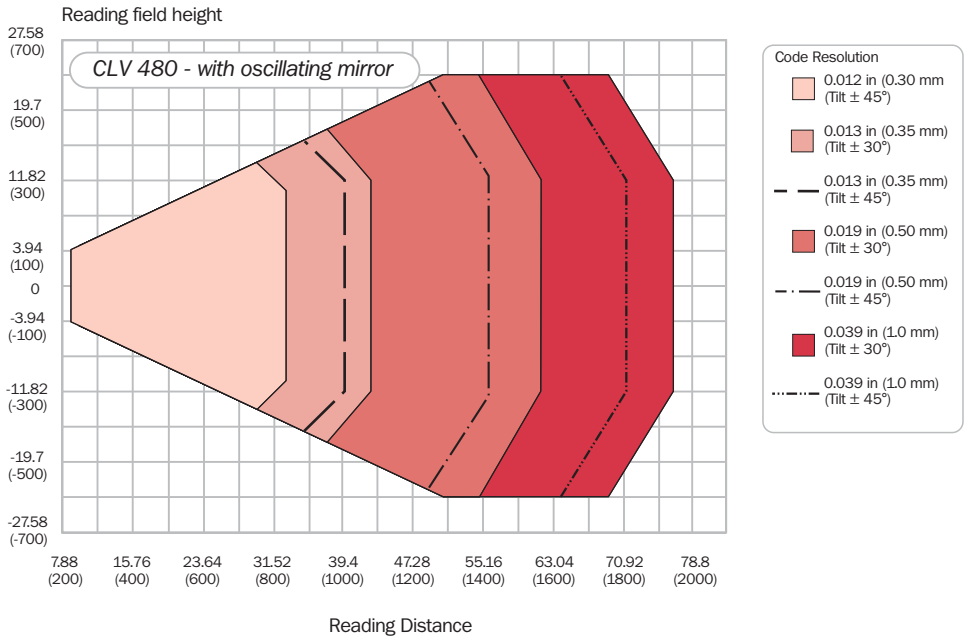
	CLV 480 Standard
Reading Range	10.2…80.7 in (259…2050 mm)
Scan Frequency	600…1200 Hz
Cloning	■ *
Fixed Focus	
Dynamic Focus	■
Auto Focus	
Standard Decoding	■
SMART Decoding	■
Line Scanner	■
Raster Scanner	
Oscillating Mirror Scanner	■
Front Emitting	■
Side Emitting	
Plastic Window	
Low Contrast	
Heater	■

* Requires use of CDM 490 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

Reading Ranges

Dimensions in inches (mm)





Technical Specifications

	CLV 480
Scanning Characteristics	
Scanning Method	8-sided polygon mirror
Aperture Angle	
Line/Raster Scanner	Maximum 60°
Osc Mirror Scanner	Maximum 50°
Scanning Frequency	600…1200 Hz (software selectable)
Light Source	Visible laser diode (650 nm); CDRH Class II
Reading Distance	10.2…80.7 in (259.1…2049.8 mm)
Resolution	0.098…0.039 in (2.5…0.99 mm)
Bar Code Types	
Bar Code Symbology	Code 39, Interleaved 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128
Readability	1…12 bar codes per scan (standard decoder); 1…5 (SMART)
Auto Discrimination	1…50 bar codes per reading gate
Communications / I/O / Indicators	
Host Interface	RS 232 or RS 422/485 variable data output (software selectable)
Baud Rate	300…57,600 (software selectable)
Data Format	Data bits, stop bits, parity (software selectable)
Network Configuration	Pass-through; master/slave/RS 485 network, CAN scanner, CANopen
LED Indicators	Device ready, result, sensor, data
Switching Inputs	6 x PNP, opto-decoupled/maximum 30 V DC
Switching Outputs	4 x PNP, maximum 100 mA/24 V DC
Trigger Methods	Sensor input (I/O interface)/Serial (host interface)/Free running
Mechanical/Electrical	
Supply Voltage	Operating voltage 18…30 V DC
Current Consumption	395 mA at 24 V DC/typical 9.5 W; maximum 16.0 W
Dimensions	
Line/Raster Scanner	4.6 x 4.6 x 3.7 in (117 x 117 x 94 mm);
Osc Mirror Scanner	7.2 x 5.02 x 3.7 in (183 x 127.5 x 94 mm)
Weight	Approx. 3.3 lb (1.5 kg); with osc mirror: approx. 4.9 lb (2.2 kg)
Housing	Die cast aluminum
Enclosure Rating	IP 65
Connectivity	2 15-pin D-Sub high density connectors (1 male/1 female)
Environmental	
Ambient Operating Temperature	32…104°F (0…40°C), with heating -31…95°F (-35…35°C)
Storage Temperature	-4…158°F (-20…70°C)
Vibration	To IEC 68-2-6 test FC
Shock	To IEC 68-2-27 test EA
EMV	To IEC 801
Maximum Relative Humidity	90%, non-condensing
Programming	Windows™-based CLV Setup Software

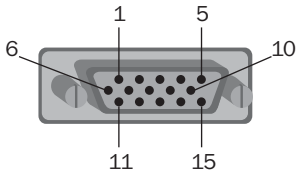
Models and Part Numbers

	CLV 480	CLV 480 (with heater)
Front Emitting Line Scanner		
Model	CLV 480-0010	CLV 480-0011
Part Number	1 024 065	1 024 067
Oscillating Mirror Scanner		
Model	CLV 480-1010	CLV 480-1011
Part Number	1 024 066	1 024 068

NOTE: Accessories information is located on pages 92 - 93.

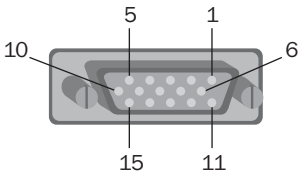
Pinouts

15-pin male D Sub HD
"Host/Term" plug



Pin	Signal	Function
1	Vs	Supply voltage
2	RxD (RS 232), Terminal	Terminal Interface (receiver)
3	TxD (RS 232), Terminal	Terminal Interface (transmitter)
4	Term (RS 422/485)	Termination host interface
5	GND	Ground
6	RD+ (RS 422/485), Host	Host interface (receiver +)
7	RD- (RS 422/485), Host RxD (RS 232), Host	Host interface (receiver -)
8	TD+ (RS 422/485), Host	Host interface (transmitter +)
9	TD- (RS 422/485), Host TxD (RS 232), Host	Host interface (transmitter -)
10	CAN H	CAN interface 1 (IN/OUT)
11	n.c.	-
12	CAN2 H	CAN interface 2 (IN/OUT)
13	CAN2 L	CAN Interface 2 (IN/OUT)
14	n.c.	-
15	CANL	CAN interface 1 (IN/OUT)
Housing	-	Shield

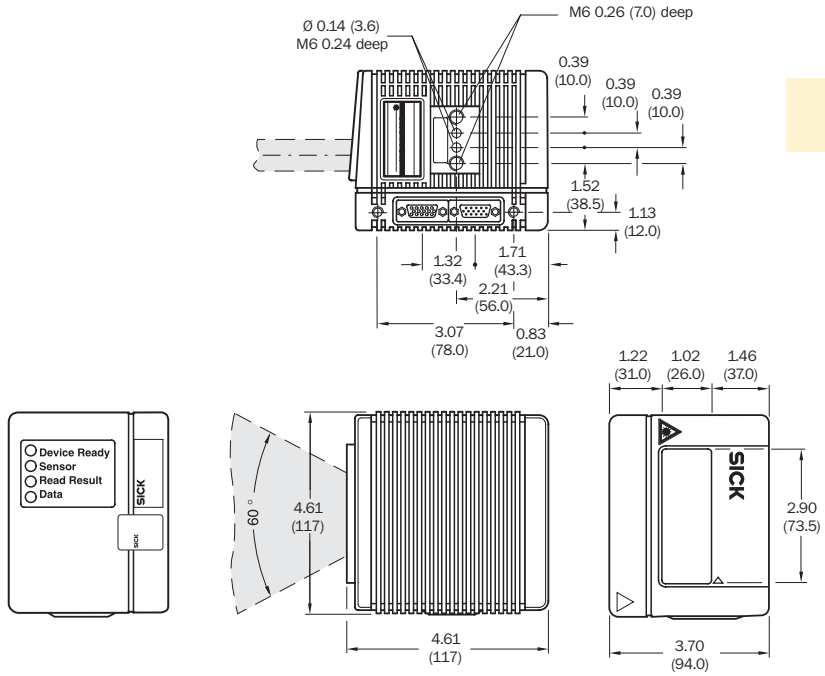
15-pin female D Sub HD
"I/O" Socket



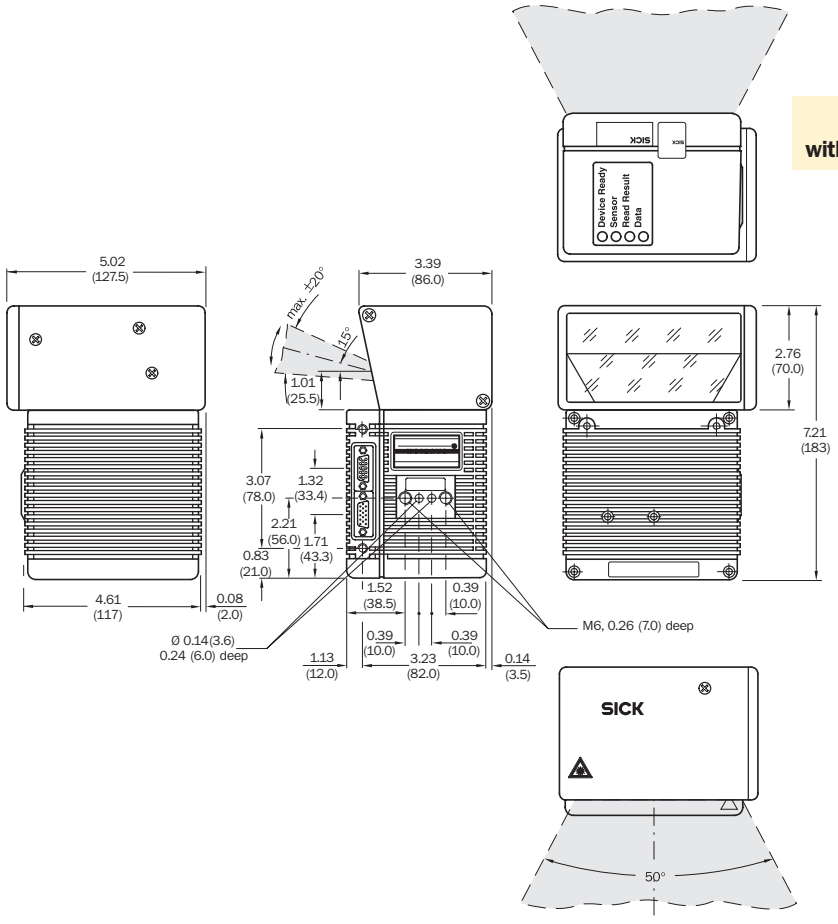
Pin	Signal	Function
1	Vs	Supply voltage
2	IN 1	Switching input (trigger for focus control)
3	Sensor	Switching input (external reading pulse)
4	Result 1	Switching output, variable function
5	GND	Ground
6	IN 0	Switching input (trigger for focus control)
7	IN 2	Switching input (trigger for focus control)
8	Result 2	Switching output, variable function
9	IN GND	Common ground for all inputs
10	Result 3	Switching output, variable function
11	IN 3	Switching input, variable function
12	IN 4	Switching input, variable function
13	12C SDA	12C Bus (for external parameter memory)
14	12C SCL	12C Bus (for external parameter memory)
15	Result 4	Switching output, variable function
Housing	-	Shield

Drawings

Dimensions in inches (mm)



CLV 480
line scanner



CLV 480
with oscillating mirror

CLV 490
Fixed Position Scanner

Features

- Patented Automatic Focus Control
- High speed (1200 Hz)
- SMART Technology
- Designed for high tilt angles (45°)
- Cloning module capabilities
- Optional heater
- Integrated CAN bus network
- Extended communications
- Optional display
- Large depth of field (62 inches)

The CLV 490 Bar Code Scanner from SICK delivers maximum, tilt-independent read rates with minimum code height. It is able to provide ultra-reliable code recognition thanks to SICK's SMART Technology. SMART allows the scanner to easily read bar code labels that are presented at high tilt angles, or are dirty or damaged.

The CLV 490 has real-time, patented Automatic Focus Control, a function that provides optimum read rates at maximum depths of field. The scanner automatically focuses according to the distance to the object. No additional components are necessary to detect the object distance, resulting in easy setup and reduced system cost.

With a reading range of 20 to 82 inches and dimensions of 4.6 x 4.6 x 3.7 inches, the CLV 490 is the most powerful scanner of its size on the market. It is especially suited to applications where space is at a premium.

Also available for the CLV 490 is the CMC Cloning Module for use in conjunction with our CDx Series of connection devices. The CMC will store all the setup parameters of the connected bar code scanner in external memory. Application-specific parameters are automatically copied to a new device if a bar code scanner should need replacement.

The CLV 490's integrated CAN bus networking enables you to easily connect up to 32 scanners in a single high-speed network. This allows for easy setup, reduced cabling and lowered system cost due to reduced hardware.

The CLV 490 is ideally suited for material handling, manufacturing, automotive, pallet handling, and forklift applications.

Comparison Table

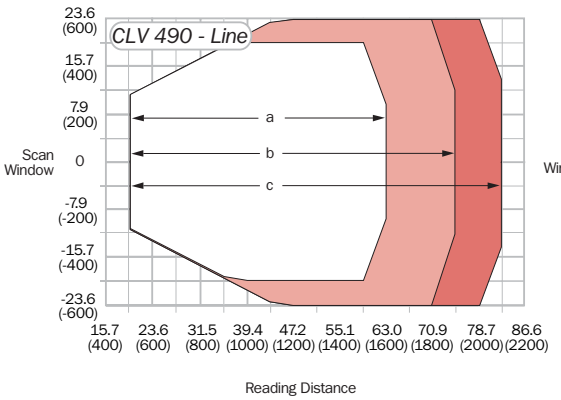
	CLV 490 Standard	CLV 490 Low Density	CLV 490 High Range
Reading Range	19.7…82.7 in (500…2100 mm)	19.7…86.6 in (500…2200 mm)	15.7…63.0 in (400…1600 mm)
Scan Frequency	600…1200 Hz (software selectable)	600…1200 Hz (software selectable)	600…1200 Hz (software selectable)
Cloning*	■	■	■
Fixed Focus			
Dynamic Focus	■	■	■
Auto Focus	■	■	■
Standard Decoding	■	■	■
SMART Decoding	■	■	■
Line Scanner	■	■	■
Raster Scanner			
Oscillating Mirror Scanner	■	■	■
Front Emitting	■	■	■
Side Emitting			
Plastic Window	■ **		
Low Contrast			
Heater	■	■	■

* Requires use of CDM 490 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

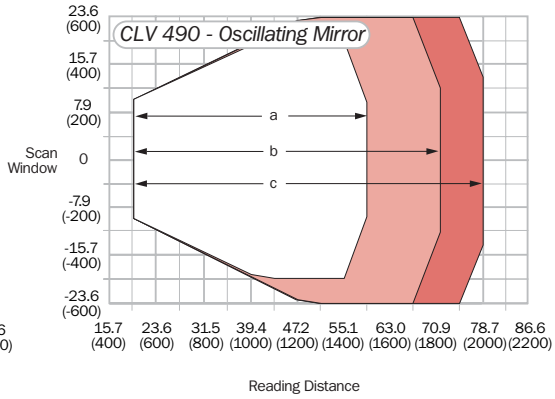
** Not available in all configurations.

Reading Ranges

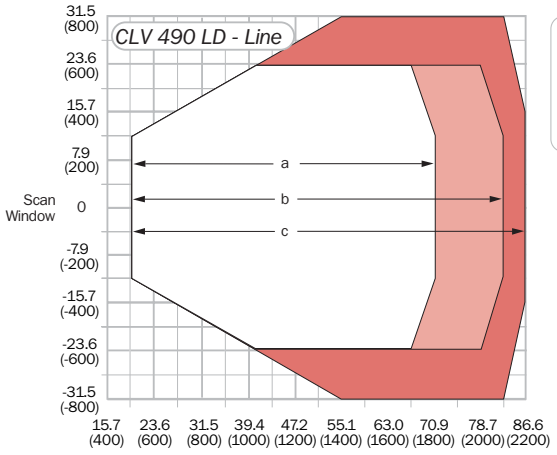
Dimensions in inches (mm)



Code Resolution
- a: 0.011 in (0.30 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

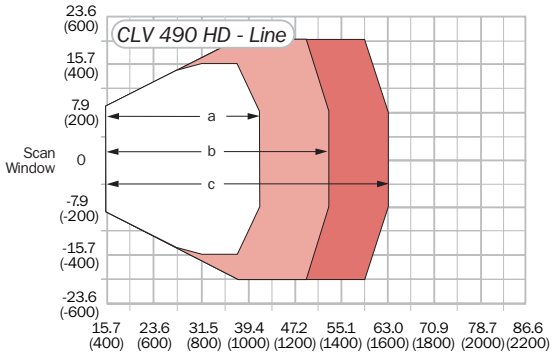


Code Resolution
- a: 0.011 in (0.30 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)



Tilt
- a: -45…+45
- b: -30…+30
- c: -15…+15

Code resolution:
0.020 in (0.5 mm)



Code Resolution
- a: 0.008 in (0.20 mm)
- b: 0.010 in (0.25 mm)
- c: 0.011 in (0.30 mm)

Technical Specifications

	CLV 490	CLV 490 LD	CLV 490 HD
Scanning Characteristics			
Scanning Method	8-sided polygon mirror wheel		
Aperture Angle			
Line/Raster Scanner	Maximum 60°		
Osc Mirror scanner	Maximum 50°		
Scanning Frequency	600…1200 Hz (software selectable)		
Light Source	Visible laser diode (650 nm); CDRH Class II		
Reading Distance	19.7…82.7 in (500…2100 mm)	19.7…86.6 in (500…2200 mm)	15.7…63.0 in (400…1600 mm)
Resolution	0.012…0.078 in (0.30…2.0 mm)	0.014…0.047 in (0.35…1.2 mm)	0.008…0.016 in (0.2…0.4 mm)
Bar Code Types			
Bar Code Symbology	Code 39, Interleaved 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128		
Readability	1…12 bar codes per scan (standard decoder); 1…5 (SMART)		
Auto Discrimination	1…50 bar codes per reading gate		
Communications / I/O / Indicators			
Host Interface	RS 232 and RS 422/485, variable data output (software selectable)		
Baud Rate	300…57,600 (software selectable)		
Data Format	Data bits, stop bits, parity (software selectable)		
Network Configuration	Pass-through; master/slave; RS 485 network; CAN scanner, CANopen		
LED Indicators	Device ready, result, sensor, data		
Switching Inputs	6 x PNP, opto-decoupled, maximum 30 V DC		
Switching Outputs	4 x PNP, maximum 100 mA / 24 V DC		
Trigger Methods	Sensor input (I/O interface) / Serial (Host interface) / Free running		
Mechanical/Electrical			
Supply Voltage	Operating voltage 18…30 V DC		
Current Consumption	395 mA at 24 V DC / typical 9.0 W; maximum 13.0 W		
Dimensions			
Line/raster scanner	4.6 x 4.6 x 3.7 in (117 x 117 x 94 mm)		
Osc mirror scanner	7.2 x 5.02 x 3.7 in (183 x 127.5 x 94 mm)		
Weight	Approx. 3.3 lb (1.5 kg); with osc mirror: approx. 4.9 lb (2.2 kg)		
Housing / Enclosure Rating	Die cast aluminum / IP 65		
Connectivity	2 15-pin D-Sub high density connectors (1 female / 1 male)		
Environmental			
Ambient Operating Temperature	32…104°F (0…40°C)		
Storage Temperature	-4…158°F (-20…70°C)		
Vibration	To IEC 68-2-6 test FC		
Shock	To IEC 68-2-27 test EA		
EMV	To IEC 801		
Maximum Relative Humidity	90%, non-condensing		
Programming	Windows™-based CLV Setup Software		

Models and Part Numbers

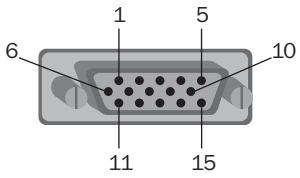
	CLV 490	CLV 490 HD	CLV 490 LD
Front Emitting Line Scanner			
Model	CLV 490-0010	CLV 490-2010	CLV 490-6010
Part Number	1 016 958	1 019 311	1 018 872
Oscillating Mirror Scanner			
Model	CLV 490-1010	CLV 490-3010	CLV 490-7010
Part Number	1 016 959	1 019 313	1 019 094

	CLV 490 (with heater)	CLV 490 HD (with heater)	CLV 490 LD (with heater)
Front Emitting Line Scanner			
Model	CLV 490-6011	CLV 490-2011	CLV 490-0011
Part Number	1 019 095	1 019 312	1 016 960
Oscillating Mirror Scanner			
Model	CLV 490-7011	CLV 490-3011	CLV 490-1011
Part Number	1 019 096	1 019 314	1 016 961

NOTE: Accessories information is located on pages 93 - 94.

Pinouts

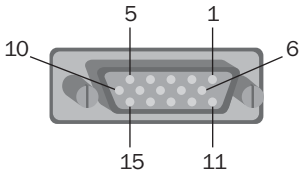
Term/Host Port
15-pin male connector



Pin	Signal	Function
1[1)]	V_S	Supply voltage
2	RxD (RS 232), Terminal	Terminal interface (receiver)
3	TxD (RS 232), Terminal	Terminal interface (transmitter)
4	Term (RS 422/485)	Termination host interface
5	GND	Ground
6	RD+ (RS 422/485), Host	Host interface (receiver+)
7	RD– (RS 422/485), Host RxD (RS 232), Host	Host interface (receiver–)
8	TD+ (RS 422/485), Host	Host interface (transmitter+)
9	TD– (RS 422/485), Host TxD (RS 232), Host	Host interface (transmitter–)
10	CAN H	CAN interface 1 (IN/OUT)
11	Reserved	-
12	CAN2 H	CAN interface 2 (IN/OUT)
13	CAN2 L	CAN interface 2 (IN/OUT)
14	Reserved	-
15	CAN L	CAN interface 1 (IN/OUT)
Housing	-	Shield

1) Pin 1 is jumpered with Pin 1 of the "I/O" connection in the CLV

Term/Host Port
15-pin female connector



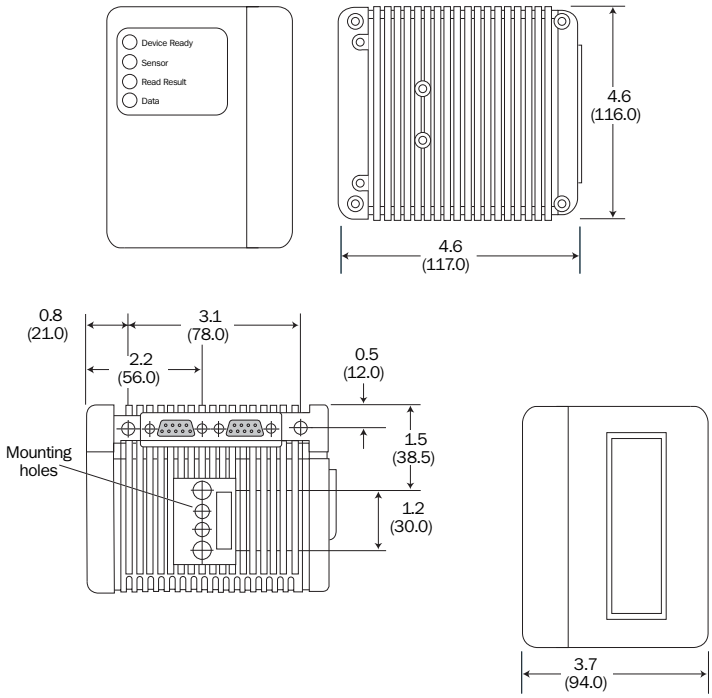
Pin	Signal	Function
1[1)]	V_S	Supply voltage
2	IN 1	Switching input (trigger for focus control)
3	Sensor	Switching input (external reading pulse)
4	Result 1	Switching output, variable function
5	GND	Ground
6	IN 0	Switching input (trigger for focus control)
7	IN 2	Switching input (trigger for focus control)
8	Result 2	Switching output, variable function
9	INGND	Common ground for all inputs
10	Result 3	Switching output, variable function
11	IN 3	Switching input, variable function
12	IN 4	Switching input, variable function
13	I2C SDA	I2C Bus (for external parameter memory)
14	I2C SCL	I2C Bus (for external parameter memory)
15	Result 4	Switching output, variable function
Housing	-	Shield

1) Pin 1 is jumpered with Pin 1 of the "I/O" connection in the CLV

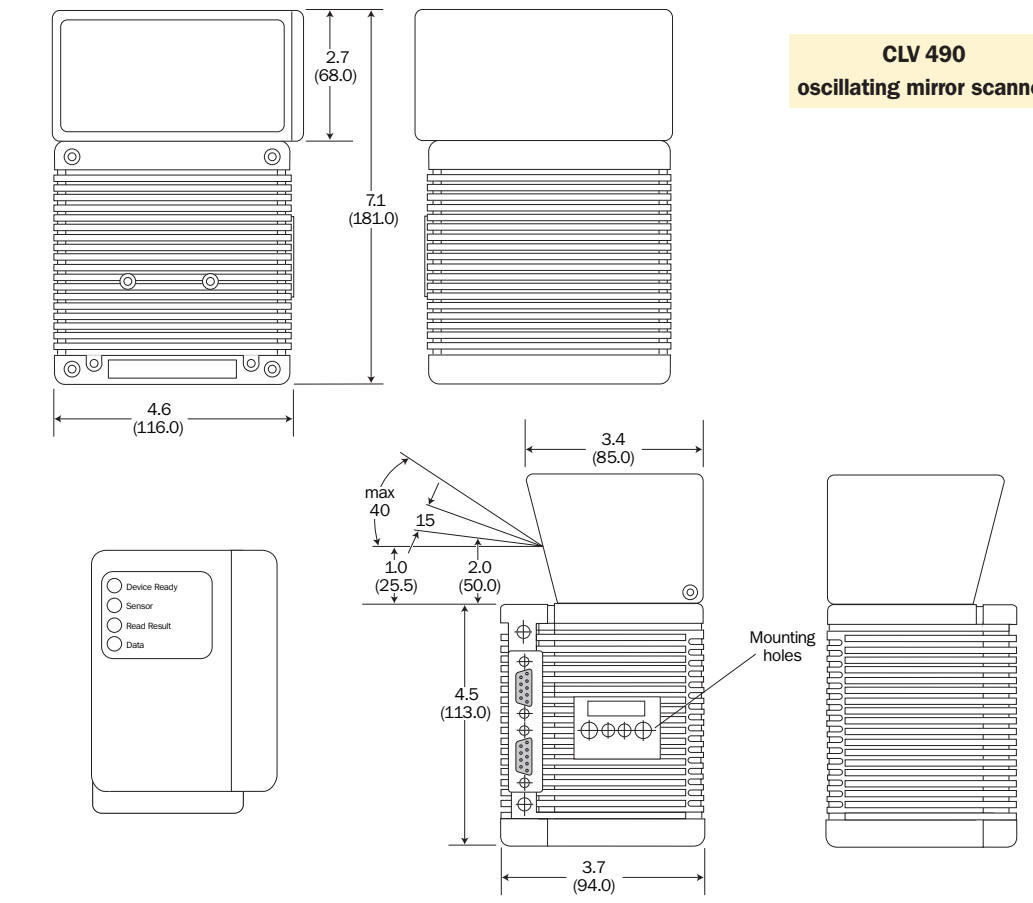
Drawings

Dimensions in inches (mm)

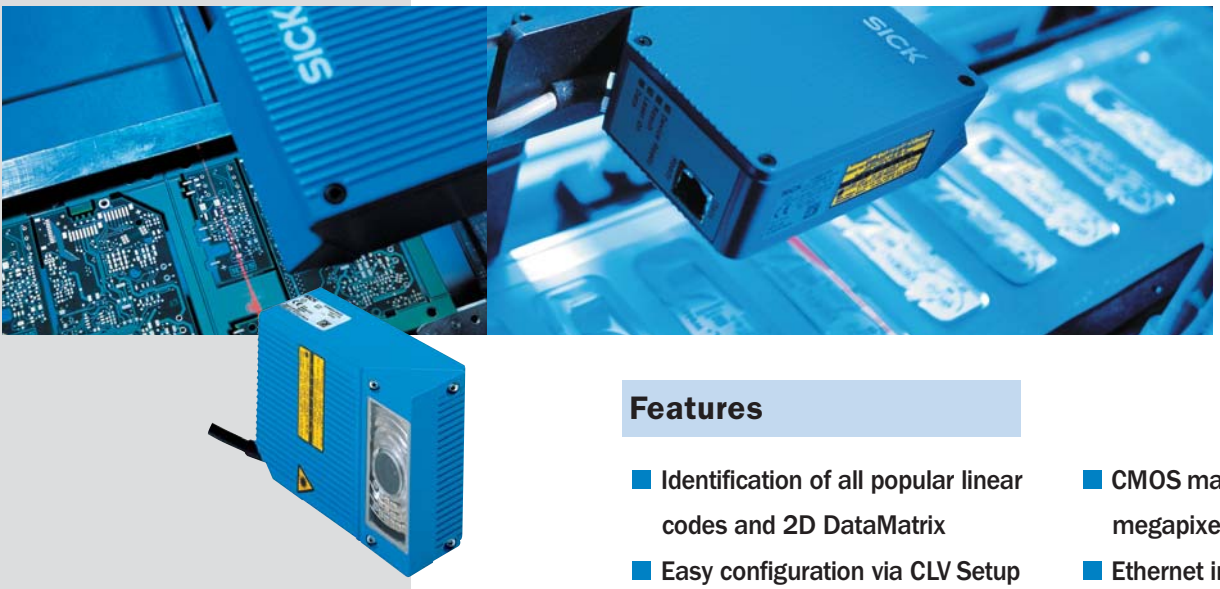
CLV 490
line scanner



CLV 490
oscillating mirror scanner



ICR 840
Fixed Position Scanner



Features

- Identification of all popular linear codes and 2D DataMatrix
- Easy configuration via CLV Setup Software
- Easy visualization of image and diagnostic data
- Omni directional reading of linear codes
- CMOS matrix sensor with 1.3 megapixels
- Ethernet interface for data and image transfer
- Integrated LED illumination
- Applications:
  - Automotive parts
  - Electrical circuit board
  - Package labels

The ICR 840 Series from SICK provides a fully integrated vision-based scanner which includes the 1280 x 1024 pixel camera, image processing, and integrated lighting in a single compact package.

The sensor technology of the ICR 840 is based upon a state-of-the-art 1.3 megapixel CMOS sensor capable of reading one- and two-dimensional codes. Features include the ability to increase the image refresh rate by adjusting the field of view. For example, if the adjustment is set to VGA resolution (640 X 480 pixels), the image refresh rate increases from 25 Hz to 60 Hz.

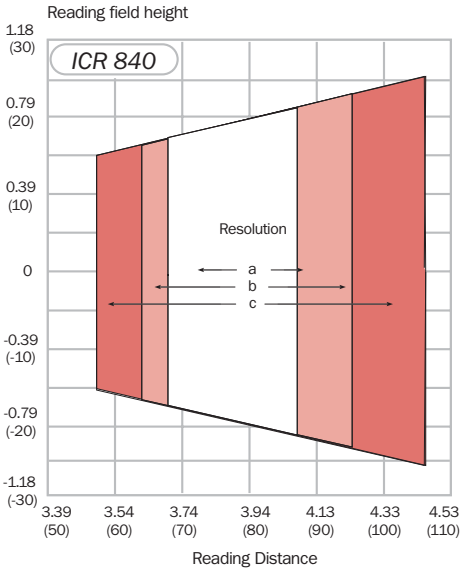
Due to special decoding functions, the ICR 840 is specially customized for reading direct part marked codes. The integrated computing performance provides short response times and the configurable LED illumination allows for outstanding performance reading a number of direct part marking methods. Whether it is laser PCB marking, laser marking on metal, dot-peening or label printed 2D codes, the ICR 840 is an excellent choice for your 2D and linear bar code reading applications.

Comparison Table

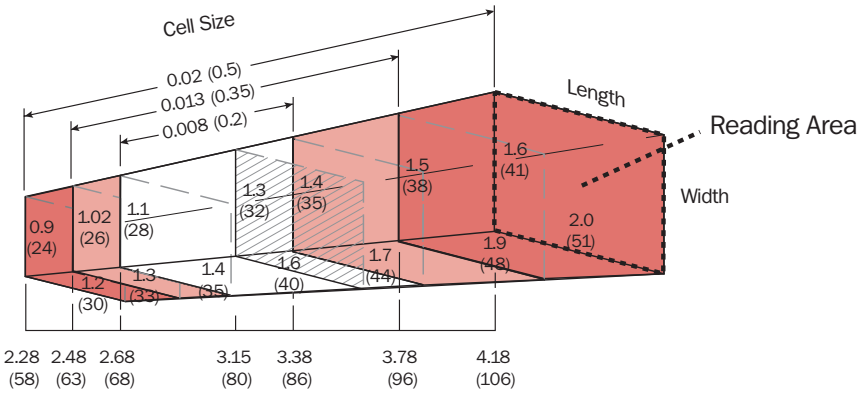
	ICR 840 Standard	ICR 840 High Density
Reading Distance Focal Position	4.5 in (115 mm)	1.9 in (50 mm)
Minimum Cell Size	0.01 in (0.25 mm)	0.004 in (0.1 mm)
DOF at Cell Size		
0.1 mm		0.24 in (6 mm)
0.2 mm		0.5 in (12 mm)
0.25 mm	0.78 in (20 mm)	
Field of View at Minimum Distance	1.7 x 2.2 in (44 x 55 mm)	0.7 x 0.8 in (17 x 21 mm)
Field of View at Maximum Distance	2.0 x 2.4 in (50 x 62 mm)	0.8 x 1.0 in (20 x 25 mm)

Reading Ranges

Dimensions in inches (mm)



Code Resolution
- a: 0.008 in (0.2 mm)
- b: 0.013 in (0.35 mm)
- c: 0.019 in (0.5 mm)



Reading Distance

Technical Specifications

	ICR 840
Scanning Characteristics	
Scanning Method	CMOS
Scanning Frequency	25 Hz @ SXGA (1280 x 1024), 60 Hz @ VGA (640 x 480)
Light Source/Illumination	Visible red light (617 ± 15 nm)
LED	Class I pursuant to EN 60825-1
MTBF of LEDs	20,000 h
Reading Distance	3.15 in (80 mm)
Reading Area	1.58 x 1.27 in (40 x 32 mm), depending on reading distance
Depth of Field	Up to 50 mm
Resolution	0.006…0.078 in (0.15…2 mm)
Bar Code Types	
Bar Code Symbology	Code 39, Code 128, Codabar, EAN, EAN 128, UPC, Interleaved 2/5
Readability	1…50 bar codes per scan
Auto Discrimination	1…50 bar codes per reading gate
Bar Code Length	Max. 50 characters (max. 4,000 characters across all codes per reading interval)
2D Code Types	DataMatrix ECC200
2D Code Length	To ISO/IEC 16022
Communications / I/O / Indicators	
LED Interface	4 x LED (status indicator)
Host Interface	RS 232 or RS 422/485, variable data output format
Baud Rate	300…57,600
“CAN” Data Interface	CANopen protocol, CAN Scanner Network
“CAN” Data Transfer Rate	10 kBit/s to 1 Mbit/s
“Ethernet” Data Interface	10 Mbit/s, TCP/IP, FTP
“Aux” Data Interface	RS 232, 9,600 bd, 8 data bits, no parity, 1 stop bit, fixed output format
Switching Inputs	2 (“Sensor 1,” “Sensor 2”)
Switching Outputs	2 (“Result 1,” “Result 2”); Result 1: low-side switch, Result 2: high-side switch
Mechanical/Electrical	
Supply Voltage/Power Consumption	15…30 V DC/typ. 7 W, max. 10 W
Dimensions	
End Scanning	3.1 x 1.5 x 4.4 in (80 x 39 x 112 mm)
Side Scanning	3.1 x 1.5 x 4.4 in (80 x 39 x 112 mm)
Weight	Approx. 900 g with connecting cable
Housing	Zinc die-cast
Enclosure Rating	Max. IP 65 (to DIN 40 050), Ethernet interface max. IP 30 when connected
Connectivity	15-pin D-Sub high density connector, cable length 0.9 m/RJ-45 socket for Ethernet
Environmental	
Ambient Operating Temperature	32…104°F (0…40°C)
Storage Temperature	-4…158°F (-20…70°C)
Vibration	To EN 61010-1
Shock	To EN 60068-2-27
EMC	Tested to EN 61000-6-2, EN 61000-6-4
Protection Class	Class III (to VDE 0106/IEC 1010-1
Maximum Relative Humidity	90%, non-condensing

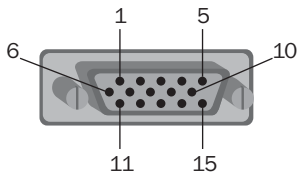
Models and Part Numbers

	ICR 840
Model	ICR 840-0020
Part Number	1 027 176
Model	ICR 840-1020
Part Number	1 028 254

NOTE: Accessories information is located on page 95.

Pinouts

15-pin D Sub HD Plug



Pin	Signal	Function
1	15…30 V DC	Power supply
2	RxD (Aux)	Auxiliary interface (receiver)
3	TxD (Aux)	Auxiliary interface (transmitter)
4	Sensor 2	Switching input, variable function
5	GND	Ground
6	RD+ (RS 422/485)	Host interface (receiver)
7	RD- (RS 422/485); RxD (RS 232)	Host interface (receiver)
8	TD+ (RS 422/485)	Host interface (transmitter)
9	TD- (RS 422/485); TxD (RS 232)	Host interface (transmitter)
10	CAN H	CAN bus (IN/OUT)
11	CAN L	CAN bus (IN/OUT)
12	Result 1	Switching output, variable function
13	Result 2	Switching output, variable function
14	Sensor 1	Switching input for external reading pulse
15	SensGND	Common ground for all inputs
-	-	Shield

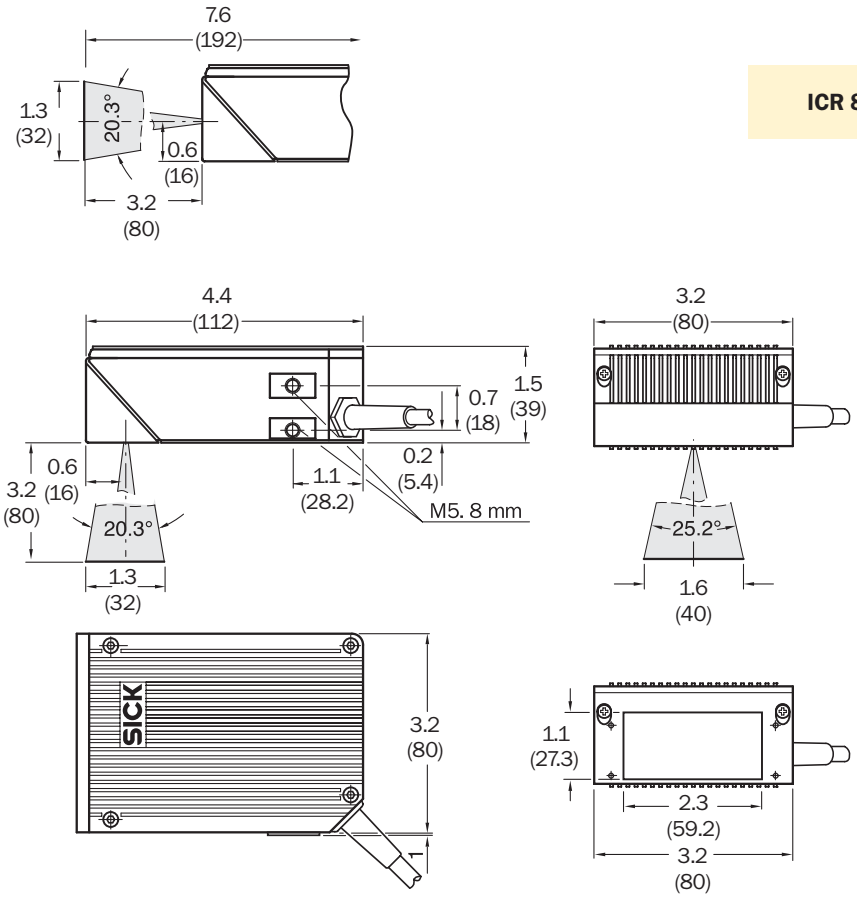
RJ 45 Socket 10Base-T Ethernet

Pin	Signal	Function
1	TX+	Transmitter +
2	TX–	Transmitter –
3	RX+	Receiver +
6	RX–	Receiver –
4, 5, 7, 8	n.c.	Not connected

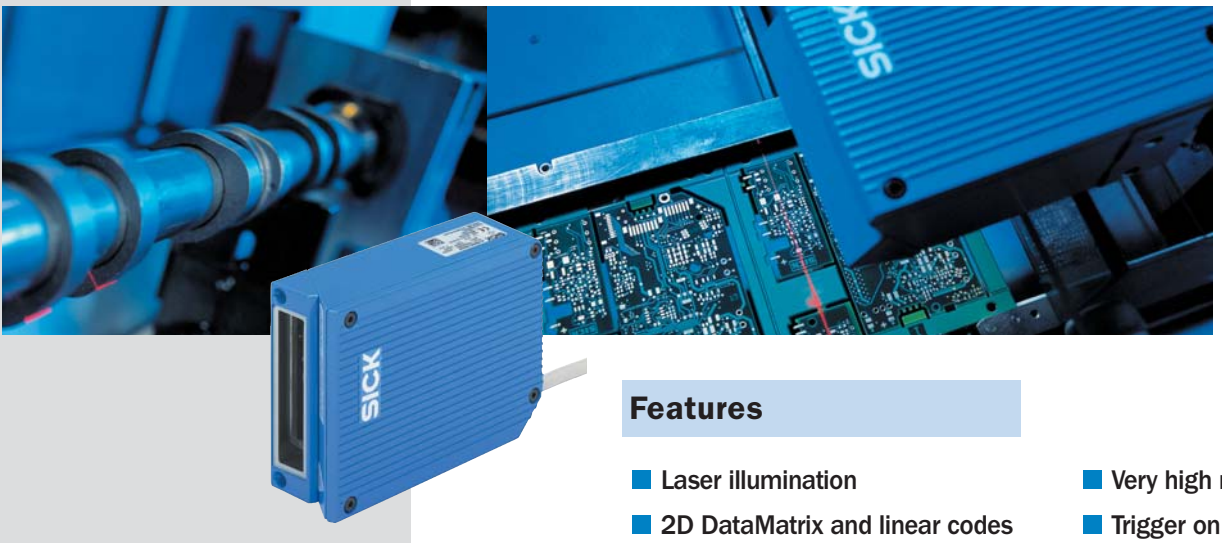
Drawings

Dimensions in inches (mm)

ICR 840



ICR 850/852/855
Fixed Position 2D Linear Imager



Features

- Laser illumination
- 2D DataMatrix and linear codes
- On-board Ethernet
- Intuitive use and setup
- Very high resolution
- Trigger on object
- Space-saving design
- High speed (45 kHz)

Utilizing a platform of powerful processing technology and an innovative illumination concept, the ICR 85x Scanner Series sets new benchmarks in reading performance for 2D and linear codes. The integrated laser line source provides a powerful illumination of the reading field for the best code reading results.

The ICR 85x Series is comprised of three different models. The ICR 850 is the standard model, the ICR 852 is designed for high-speed applications, and the ICR 855 is best suited for high-density codes.

The ICR 850 reads codes with a minimum cell size of 0.0078 inches (0.2 mm) at an internal scan frequency of 15 kHz. The ICR 855 has an internal scan frequency of up to 45 kHz and can read codes at a minimum cell size of 0.014 inches (0.35 mm). The ICR 852 can read codes on cells as small as 0.004 inches (0.1 mm) with a reading field of 1.6 inches (40 mm).

For all scanner models, the specific advantages of using laser line illumination and a CCD line sensor apply. In contrast to area sensor concepts, coded objects do not need to stop to be scanned. Codes are read as they pass the scanner “on the fly” - throughput is maximized.

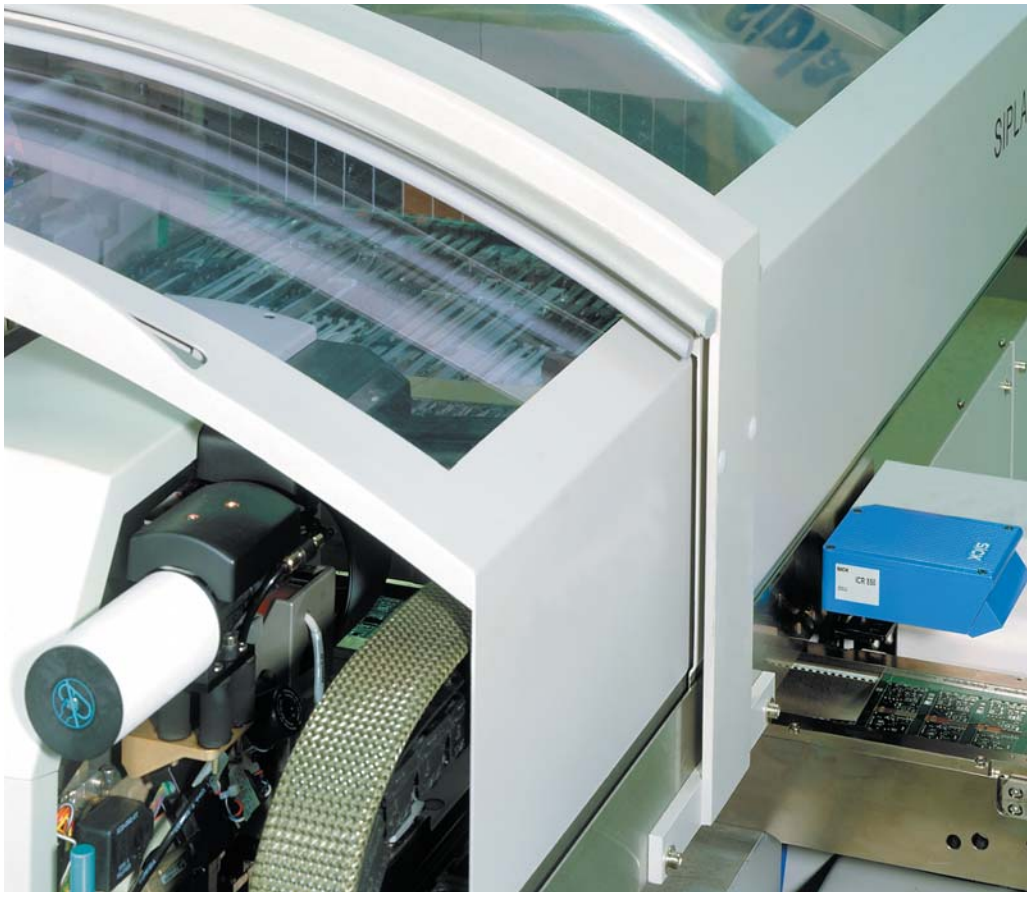
Another advantage is its ability to trigger on the object. While scanning the object surface, the ICR 85x recognizes code patterns and automatically starts decoding. Up to 50 different codes can be processed within one common reading signal.

The ICR 85x Series offers maximum flexibility for solving even the most demanding code reading tasks.

Comparison Table

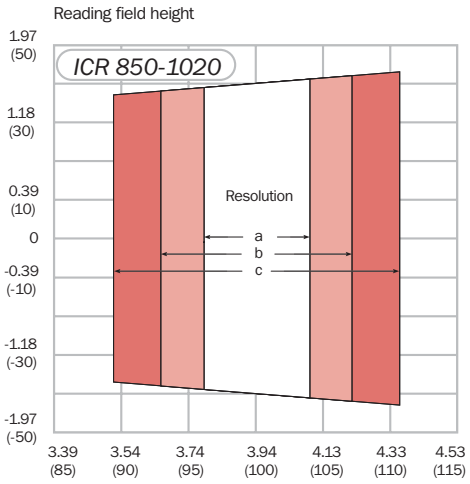
	ICR 850 Standard Density	ICR 852 High Density	ICR 855 High Speed
Reading Range	4.0 in (101 mm)	4.0 in (101 mm)	4.0 in (101 mm)
Scan Frequency	max. 15 kHz (software selectable)	max. 15 kHz (software selectable)	max. 45 kHz (software selectable)
Resolution	0.007…0.019 in (0.2…0.5 mm)	0.003…0.009 in (0.1…0.25 mm)	0.013…0.039 in (0.35…1 mm)
Cloning*	■	■	■
Fixed Focus	■	■	■
Dynamic Focus			
Auto Focus			
Standard Decoding	■	■	■
SMART Decoding	■	■	■
Linear Imager	■	■	■
Raster Scanner			
Oscillating Mirror Scanner			
Front Emitting	■	■	■
Side Emitting	■	■	■

* Requires use of CDM 420 or CDB 420 Connectivity Device with optional CMC 400 Cloning Module.

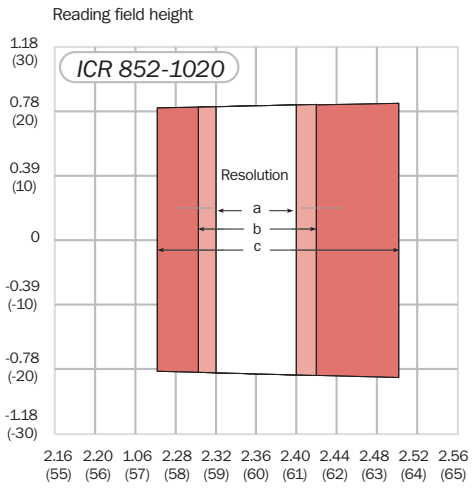


Reading Ranges

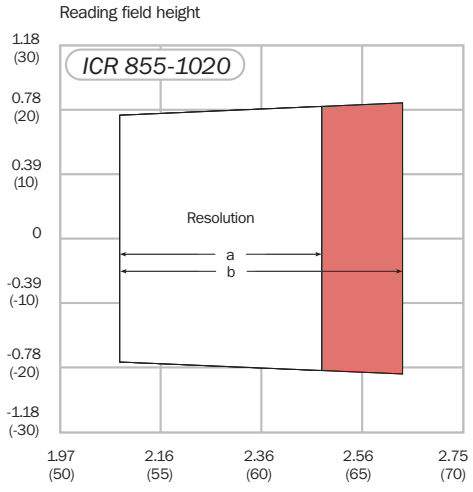
Dimensions in inches (mm)



Code Resolution
- a: 0.010 in (0.25 mm)
- b: 0.013 in (0.35 mm)
- c: 0.019 in (0.5 mm)



Code Resolution
- a: 0.004 in (0.10 mm)
- b: 0.006 in (0.15 mm)
- c: 0.010 in (0.25 mm)



Code Resolution
- a: 0.013 in (0.35 mm)
- b: 0.019 in (0.5 mm)

Technical Specifications

	ICR 850	ICR 852	ICR 855
Scanning Characteristics			
Scanning Method	Line CCD		
Scanning Frequency	Maximum 15 kHz	maximum 15 kHz	maximum 45 kHz
Light Source/Illumination	Visible laser diode, red light (650 nm)		
Laser Class	Class II pursuant to DIN EN 60825-1		
Reading Distance	4.0 in (101.6 mm) Fixed Focus		
Reading Field Height	Up to 3.1 in (80 mm)		
Depth of Field (Bar Code Dependent)	±0.4 in (±10.2 mm)		
Resolution	0.007…0.019 in (0.2…0.5 mm)	0.003…0.009 in (0.1…0.25 mm)	0.013…0.039 in (0.35…1 mm)
Bar Code Types			
Bar Code Symbology	2D: DataMatrix ECC200; Linear: UPC, Codabar, Code 39, EAN, Interleaved 2/5, Code 128, EAN 128, Pharmacode		
Readability	1…20 bar codes per scan (standard decoder), 1…6 bar codes per scan (SMART decoder)		
Auto Discrimination	1…50 bar codes per reading gate		
Bar Code Length	Max. 50 characters (max. 4000 characters across all codes per reading interval)		
2D Code Types	DataMatrix ECC200		
2D Code Length	To 1556 data bytes		
Readability	1…20 2D codes per scan		
Auto Discrimination	1…50 2D codes per reading gate		
Communications / I/O / Indicators			
LED Interface	4 x LEDs (status indicator)		
Host Interface	RS 232, RS 422/485 (software selectable)		
Baud Rate	300…57,600 (software selectable)		
“CAN” Data Interface	CAN open protocol, CAN scanner		
“CAN” Data Transfer Rate	10 kBit/s…1 MBit/s (software selectable)		
“Ethernet” Data Interface	10 MBit/s, TCP IP, FTP		
“Aux” Data Interface	RS 232, 9,600 Bd, 8 data bits, no parity, 1 stop bit, fixed output format		
Switching Inputs	2 (“sensor 1”, “sensor 2”)		
Switching Outputs	2 (“result 1”, “result 2”)		
Mechanical/Electrical			
Supply Voltage/Power Consumption	10…30 V DC		
Current Consumption	355 mA at 24 V DC / 8.5 W		
Dimensions			
End Scanning	3.1 x 1.5 x 4.4 in (80 x 39 x 111 mm)		
Side Scanning	3.1 x 1.5 x 4.5 in (80 x 39 x 115 mm)		
Weight	Approx. 1.98 lb (0.9 kg) with connecting cable		
Housing	Zinc die cast		
Enclosure Rating	Maximum IP 65 (to DIN 40 050), Ethernet interface IP 30 when connected		
Connectivity	15-pin D-Sub high density connector, cable length 0.9 m/RJ-45 socket for Ethernet		
Environmental			
Ambient Operating Temperature	32…104°F (0…40°C)		
Storage Temperature	-4…158°F (-20…70°C)		
Vibration	IEC 68-2-6 Test FC		
Shock	IEC 68-2-27 Test EA		
EMC	To EN 61000-6-2, EN 55011		
Protection Class	Class III (to VDE 0106/IEC 1010-1)		
Maximum Relative Humidity	90%, non condensing		

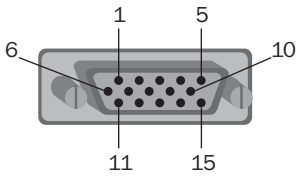
Models and Part Numbers

	ICR 850	ICR 852	ICR 855
Front Emitting Scanner			
Model	ICR 850-0020	ICR 852-0020	ICR 855-0020
Part Number	1 022 583	1 025 525	1 025 527
Side Emitting Scanner			
Model	ICR 850-1020	ICR 852-1020	ICR 855-1020
Part Number	1 022 585	1 025 526	1 025 528

NOTE: Accessories information is located on page 96.

Pinouts

15-pin connector

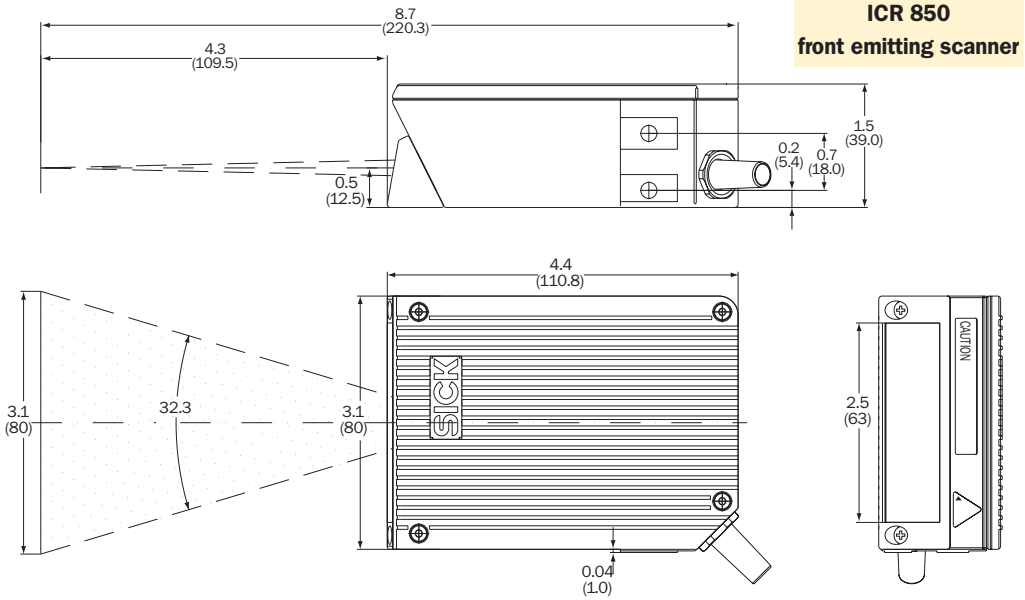


Pin	Signal	Function
1	10…30 V DC	Power supply
2	RxD (Terminal)	Auxiliary interface (receiver)
3	TxD (Terminal)	Auxiliary interface (sender)
4	Sensor 2	Switching input (Function programmable)
5	GND	Ground
6	RD+ (RS 422/485)	Host interface (receiver)
7	RD- (RS 422/485) RxD (RS 232)	Host interface (receiver)
8	TD+ (RS 422/485)	Host interface (sender)
9	TD- (RS 422/485) TxD (RS 232)	Host interface (sender)
10	CAN H	CAN Bus (In/Out)
11	CAN L	CAN Bus (In/Out)
12	Result 1	Switching output (Function programmable)
13	Result 2	Switching output (Function programmable)
14	Sensor 1	Switching input for reading gate signal
15	SensGND	Common ground for all inputs

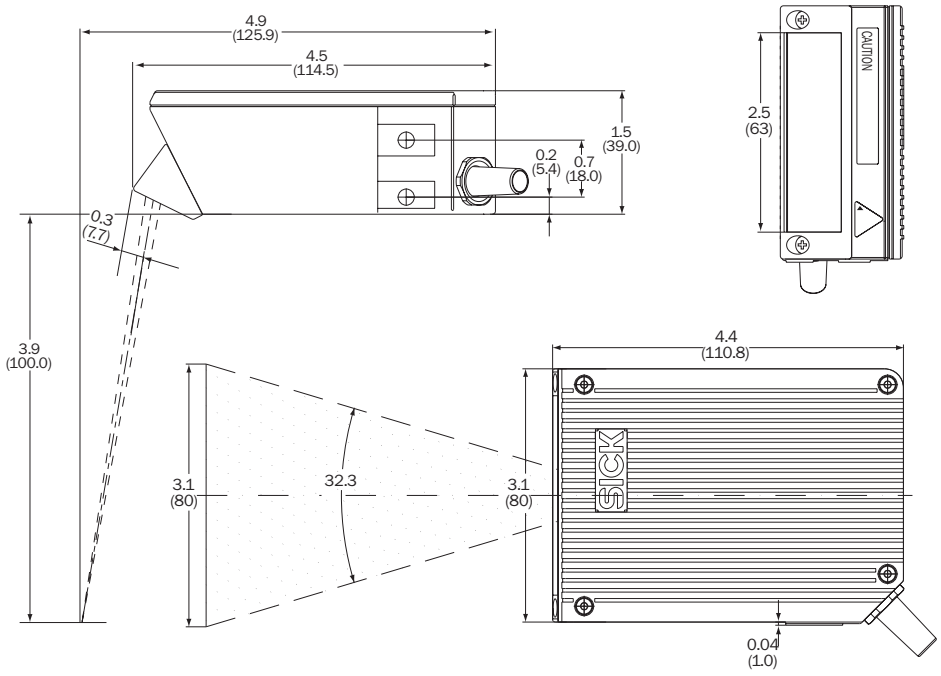
Drawings

Dimensions in inches (mm)

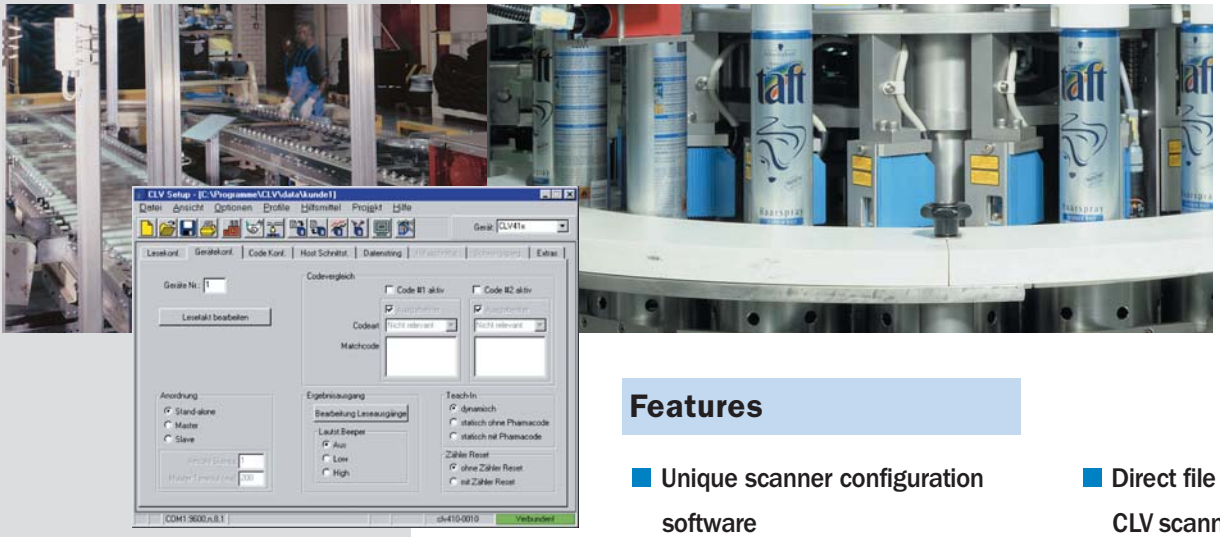
ICR 850
front emitting scanner



ICR 850
side emitting scanner



CLV Setup Software
Fixed Position Scanner



Features

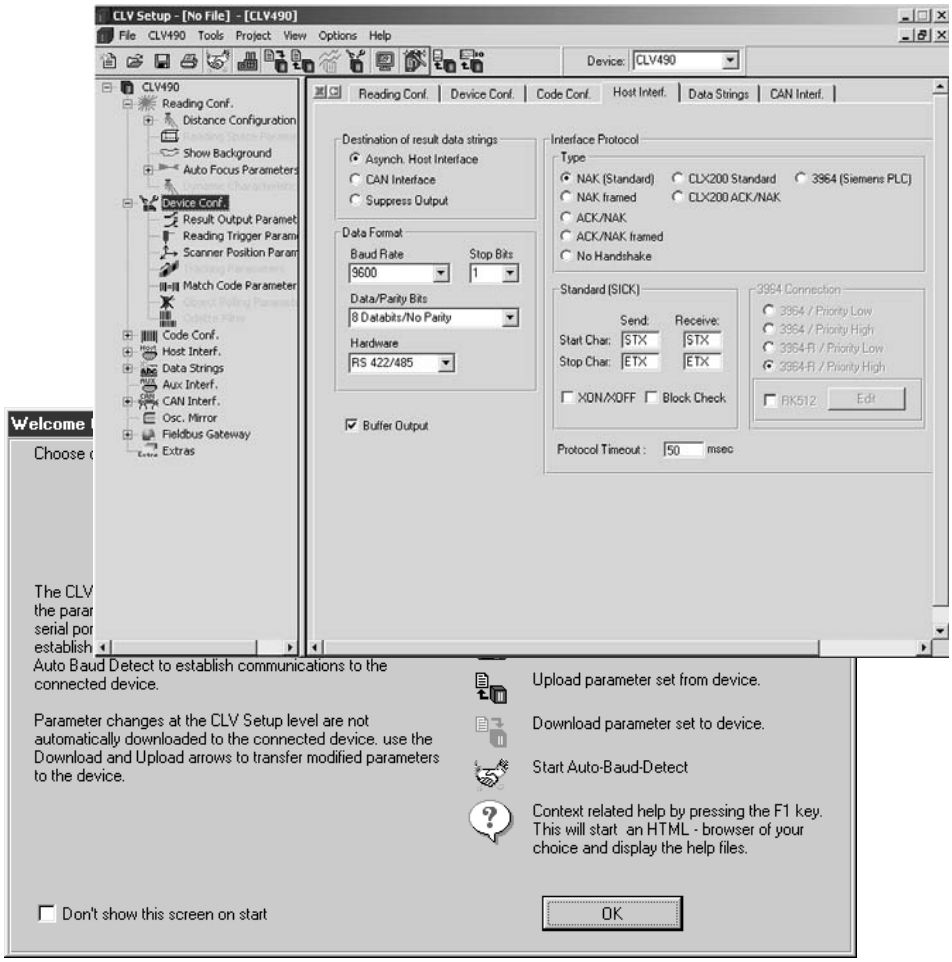
- Unique scanner configuration software
- Windows™-based, user-friendly format
- Stand-alone operation
- Direct file transfer to/from all CLV scanners
- Long term file storage on disk
- One package for all scanners

CLV Setup Software is a Windows™-based software package that allows quick and simple configuration of all user-defined scanner parameters. A single software package supports everything from our simplest line scanner to the most complex omni directional tunnel.

User-defined parameters include focus control, data filtering, real-time diagnostics, scan frequency, bar code label specifications, real-time performance statistics, networking, and communications.

Comparison Table

	CLV Setup Software
Part Number	7 026 126 (CD)
Computer	Minimum IBM 486, or true 486 IBM compatible
Hard Disk Space	10 MB of available disk space
Disk Drive	One CD ROM drive
Memory Requirements	Recommended 8 MB RAM
System Software	Windows™ 98, NT, 2000, XP, ME
Mouse	Optional but recommended
CLV Scanner Interface/ Compatibility	CLV 210/212/214/220/230/250/265,/280/295/410/412/ 414/420,/421/422/430/431/432/440/442/450/450 OTS/451/480/490, CLX 490, ICR 840, ICR 850/852/855 or OPS 400, OTC 400/MUX 400

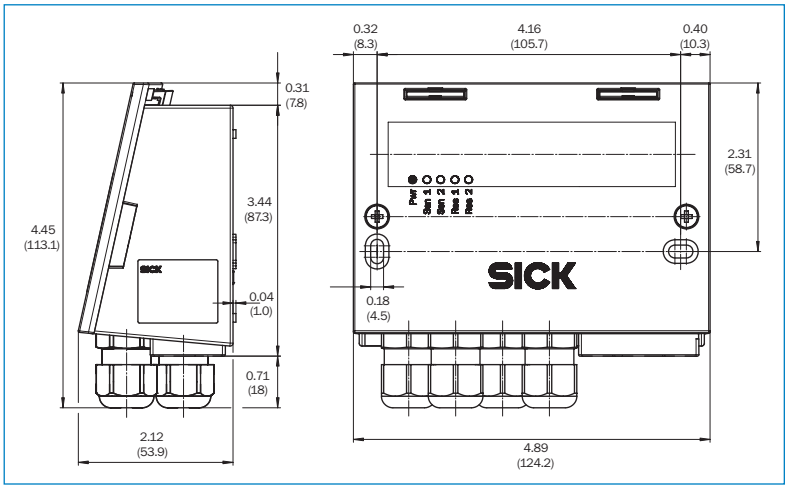


Power Supply

CDB - Connection Device Basic

- Connects CLV 4xx or ICR 85x scanners to a network or host system
- Housing for CMC 400 parameter memory unit
- Designed for ease of CAN scanner network setup
- Service connection for direct access to the AUX interface of the bar code scanner
- Connection diagram integrated in lid
- Compact footprint - 4.9 x 4.5 x 2.1 inches

Dimensions in inches (mm)

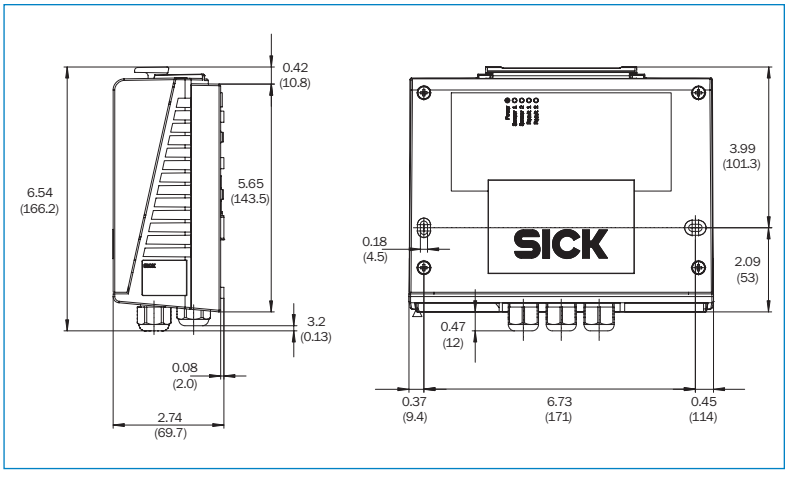


Part Number	Model
7 027 806	CDB 410-001 KIT
7 027 805	CDB 420-001 KIT

CDM - Connection Device Modular

- Connects CLV 4xx or ICR 85x scanners to a network or host system
- Housing for CMC 400 parameter memory unit
- Optional AC power supply module
- Optional Display Module for simple diagnosis and monitoring of bar code data
- 3 slots for optional field bus modules
- Designed for ease of CAN scanner network setup
- Service connection for direct access to the AUX interface of the bar code scanner

Dimensions in inches (mm)

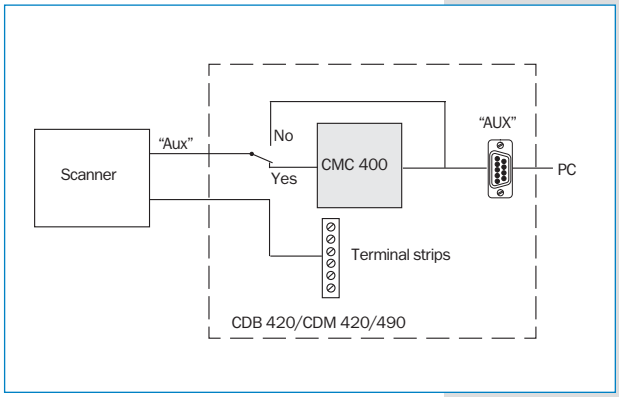


Part Number	Model
7 028 866	CDM 410-0101 KIT DC
7 028 867	CDM 410-0102 KIT AC
1 025 364	CDM 420-0101 DC
1 026 220	CDM 420-0102 AC
7 028 868	CDM 420-1101 KIT DC
7 028 869	CDM 420-1102 KIT AC
1 025 365	CDM 490-0101 DC
1 026 264	CDM 490-0102 AC
7 028 870	CDM 490-1101 KIT DC
7 028 871	CDM 490-1102 KIT AC

PS Modules

CMC - Connection Module Cloning

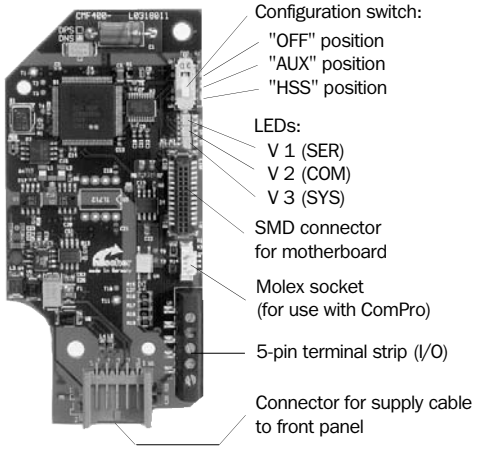
- Externally saves bar code scanner parameters
- No configuration due to “plug and play” functionality
- Visible hardware switch to define CAN network address and baud rate
- Works in conjunction with CDM and CDB connection devices
- No extra wiring or additional space required



Part Number	Model
1 023 850	CMC 400-101

CMF- Connection Module Fieldbus

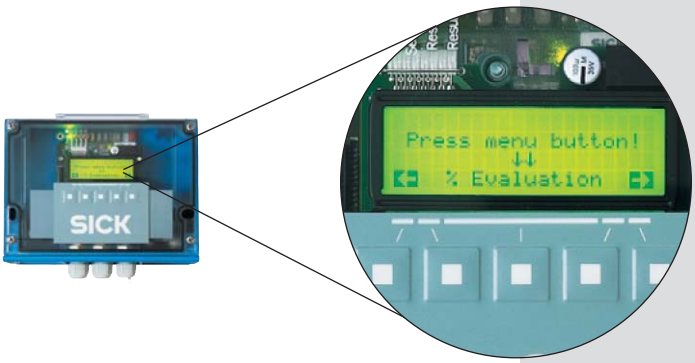
- Easy integration into Profibus-DP, DeviceNet, or Ethernet TCP/IP fieldbus systems
- Common connectivity concept for bar code scanner interfacing to fieldbus systems
- Quick and easy commissioning of SICK bar code scanners
- Comprehensive error diagnosis tools



Part Number	Model
7 028 943	CMF 400-1001 PROFIBUS KIT
7 028 942	CMF 400-2101 DNET KIT
7 029 481	CMF 400-3101 Ethernet TCP/IP KIT

CMD - Connection Module Display*

- Display of scanner data, including scanner result, diagnostics, host communications, etc.
- 4 x 20 character, background illuminated
- 6 operational modes interfaced by keypad
- Simple diagnosis of bar code scanner issues without the use of a PC



Part Number	Model
2 029 466	CMD 400 (display)

* Requires the use of CMC above

CLP 100

Line Scanners

Part Number	Model	Description
1 018 333	CLP 100-0110	Straight reading window, open cable end
1 018 334	CLP 100-2110	Right angle mirror, open cable end
1 018 331	CLP 100-0010	Straight reading window, DB9 connector
1 018 332	CLP 100-2010	Right angle mirror, DB9 connector

Setup Software

Part Number	Model	Description
2 021 674	CLP Setup Software	Windows™-based CLP programming software

CLV 410/412/414

Line Scanners

Part Number	Model	Description
1 015 421	CLV 410-0010	Line scanner, standard / Host Port RS 232, RS 422/485
1 017 534	CLV 410-2010	Line scanner, standard, right angle mirror / Host Port RS 232, RS 422/485
1 017 527	CLV 412-0010	Line scanner, high density / Host Port RS 232, RS 422/485
1 017 538	CLV 412-2010	Line Scanner, high density, right angle mirror / Host Port RS 232, RS 422/485
1 017 368	CLV 414-0010	Line scanner, close range / Host Port RS 232, RS 422/485
1 017 396	CLV 414-2010	Line scanner, close range, right angle mirror / Host Port RS 232, RS 422/ 485

Raster Scanners

Part Number	Model	Description
1 015 427	CLV 410-1010	Raster scanner, standard / Host Port RS 232, RS 422/485
1 017 536	CLV 410-3010	Raster scanner, standard, right angle mirror / Host Port RS 232, RS 422/485
1 017 528	CLV 412-1010	Raster scanner, high density / Host Port RS 232, RS 422/485
1 017 540	CLV 412-3010	Raster scanner, high density, right angle mirror / Host Port RS 232, RS 422/485
1 016 767	CLV 414-1010	Raster scanner, close range / Host Port RS 232, RS 422/485
1 016 831	CLV 414-3010	Raster scanner, close range, right angle mirror / Host Port RS 232, RS 422/485

Power Supplies

Part Number	Model	Description
7 028 866	CDM 410-0101 KIT DC	For use with CLV 41x, 24 V DC required, includes null modem connector
7 028 867	CDM 410-0102 KIT AC	For use with CLV 41x, includes 115/230 V AC power, 6 ft US line cord, null modem connector
7 026 806	CDB 410-001 KIT	24 V DC required, kit includes null modem connector

Brackets

Part Number	Model	Description
2 020 077	MB-CLV410S	Small right angle bracket for the CLV 410/420
2 020 078	MB-CLV410L	Large right angle bracket for the CLV 410/420
7 024 011	MB-W45A-43X-QR	Ball and socket bracket with Quick Release

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

CLV 420/421/422

Line Scanners

Part Number	Model	Description
1 022 031	CLV 420-0010	Line scanner, standard / Host Port RS 232, RS 422/485
1 022 033	CLV 420-2010	Line scanner, standard, right angle mirror / Host Port RS 232, RS 422/485
1 022 547	CLV 421-0010	Line scanner, long range / Host Port RS 232, RS 422/485
1 022 617	CLV 421-2010	Line scanner, long range, right angle mirror / Host Port RS 232, RS 422/485
1 022 548	CLV 422-0010	Line scanner, high density / Host Port RS 232, RS 422/485
1 022 620	CLV 422-2010	Line scanner, high density, right angle mirror / Host Port RS 232, RS 422/485

Raster Scanners

Part Number	Model	Description
1 022 032	CLV 420-1010	Raster scanner, standard / Host Port RS 232, RS 422/485
1 022 034	CLV 420-3010	Raster scanner, standard, right angle mirror / Host Port RS 232, RS 422/485
1 022 616	CLV 421-1010	Raster scanner, long range / Host Port RS 232, RS 422/485
1 022 618	CLV 421-3010	Raster scanner, long range, right angle mirror / Host Port RS 232, RS 422/485
1 022 619	CLV 422-1010	Raster scanner, high density / Host Port RS 232, RS 422/485
1 022 621	CLV 422-3010	Raster scanner, high density, right angle mirror / Host Port RS 232, RS 422/485

Power Supplies

Part Number	Model	Description
7 027 805	CDB 420-001 KIT DC	24 V DC required, for use with CLV 420-450, includes null modem connector
1 025 364	CDM 420-0101 DC	For use with CLV 42x-45x, 24 V DC required
1 026 220	CDM 420-0102 AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord
7 028 868	CDM 420-1101 KIT DC	For use with CLV 42x-45x, 24 V DC required, includes CMC cloning module
7 028 869	CDM 420-1102 KIT AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410, 420 or 490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410, 420 or 490
7 028 481	CMF 400-3101 Ethernet Kit	Ethernet communication module kit, use with CDM 410, 420 or 490
2 029 468	CMP 400 Power Supply	Use with CDM 410 or 420
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 connection device

Brackets

Part Number	Model	Description
2 020 077	MB-CLV410S	Small right angle bracket for the CLV 410/420
2 020 078	MB-CLV410L	Large right angle bracket for the CLV 410/420
7 024 011	MB-W45A-43X-QR	Ball and socket bracket with Quick Release

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

CLV 430/431/432

Line Scanners

Part Number	Model	Description
1 017 585	CLV 430-0010	Line scanner, standard / software selectable Host Port RS 232, RS 422/485
1 017 622	CLV 431-0010	Line scanner, mid-range / software selectable Host Port RS 232, RS 422/485
1 016 746	CLV 431-2010	Line scanner, mid-range, right angle mirror / software selectable Host Port RS 232, RS 422/485
1 017 623	CLV 432-0010	Line scanner, close-range / software selectable Host Port RS 232, RS 422/485
1 016 748	CLV 432-2010	Line scanner, close-range, right angle mirror / software selectable Host Port RS 232, RS 422/485

Raster Scanners

Part Number	Model	Description
1 016 705	CLV 430-1010	Raster scanner, standard / software selectable Host Port RS 232, RS 422/485
1 016 679	CLV 431-1010	Raster scanner, mid-range / software selectable Host Port RS 232, RS 422/485
1 016 747	CLV 431-3010	Raster scanner, mid-range, right angle mirror / software selectable Host Port RS 232, RS 422/485
1 016 680	CLV 432-1010	Raster scanner, close-range / software selectable Host Port RS 232, RS 422/485
1 016 749	CLV 432-3010	Raster scanner, close-range, right angle mirror / software selectable Host Port RS 232, RS 422/485

Oscillating Mirror scanners

Part Number	Model	Description
1 017 981	CLV 430-6010	Oscillating mirror, standard / Host Port RS 232, RS 422/485
1 017 982	CLV 431-6010	Oscillating mirror, mid-range / Host Port RS 232, RS 422/485
1 017 983	CLV 432-6010	Oscillating mirror, close-range / Host Port RS 232, RS 422/485

Power Supplies

Part Number	Model	Description
7 024 454	PS 51-1000-DNET-MICRO	115/230 V AC DeviceNet unit with micro connector
7 024 686	PS 51-0000-DNET-MINI	DeviceNet unit with mini connector, 24 V DC required
7 027 805	CDB 420-001 KIT	24 V DC required, for use with CLV 420-450, includes null modem connector
1 025 364	CDM 420-0101 DC	For use with CLV 42x-45x, 24 V DC required
1 026 220	CDM 420-0102 AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord
7 028 868	CDM 420-1101 KIT DC	For use with CLV 42x-45x, 24 V DC required, includes CMC cloning module
7 028 869	CDM 420-1102 KIT AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
7 028 481	CMF 400-3101 Ethernet Kit	Ethernet communication module kit, use with CDM 410, 420 or 490
2 029 468	CMP 400 Power Supply	Use with CDM 410/420
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 communication device

Brackets

Part Number	Model	Description
2 020 410	CLV 43x/44x Bracket	Right angle bracket
7 024 011	MB-W45A-43x QR	Ball and socket bracket with Quick Release
2 022 564	U-Shaped Bracket	U-shaped bracket
2 023 691	Pole-Mount Bracket	U-shaped pole mount bracket
2 021 342	Vibration Bracket	U-shaped vibration dampening bracket

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m

Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

CLV 440/442

Line Scanners

Part Number	Model	Description
1 017 588	CLV 440-0010	Line scanner, standard / software selectable Host Port RS 232, RS 422/485
1 017 595	CLV 422-0010	Line scanner, high density / software selectable Host Port RS 232, RS 422/485

Oscillating Mirror Scanners

Part Number	Model	Description
1 017 984	CLV 440-6010	Oscillating mirror, standard / software selectable Host Port RS 232, RS 422/485

Power Supplies

Part Number	Model	Description
7 027 805	CDB 420-001 KIT null modem connector	24 V DC required, for use with CLV 420-450, includes
1 025 364	CDM 420-0101 DC	For use with CLV 42x-45x, 24 V DC required
1 026 220	CDM 420-0102 AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord
7 028 868	CDM 420-1101 KIT DC	For use with CLV 42x-45x, 24 V DC required, includes CMC cloning module
7 028 869	CDM 420-1102 KIT AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDB 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
7 028 481	CMF 400-3101 Ethernet Kit	Ethernet communication module kit, use with CDM 410, 420 or 490
2 029 468	CMP 400 Power Supply	Use with CDM 410/420
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 communication device

Brackets

Part Number	Model	Description
2 020 410	CLV 43x/44x Bracket	Right angle bracket
7 024 011	MB-W45A-43x QR	Ball and socket bracket with Quick Release
2 022 564	U-Shaped Bracket	U-shaped bracket
2 023 691	Pole-Mount Bracket	U-shaped pole mount bracket
2 021 342	Vibration Bracket	U-shaped vibration dampening bracket

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

CLV 450

Line Scanner

Part Number	Model	Description
1 018 556	CLV 450-0010	Line scanner, standard / software selectable Host Port RS 232, RS 422/485

Oscillating Mirror

Part Number	Model	Description
1 019 218	CLV 450-6010	Oscillating mirror, standard / software selectable Host Port RS 232, RS 422/485

Power Supplies

Part Number	Model	Description
7 027 805	CDB 420-001 KIT null modem connector	24 V DC required, for use with CLV 420-450, includes
1 025 364	CDM 420-0101 DC	For use with CLV 42x-45x, 24 V DC required
1 026 220	CDM 420-0102 AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord
7 028 868	CDM 420-1101 KIT DC	For use with CLV 42x-45x, 24 V DC required, includes CMC cloning module
7 028 869	CDM 420-1102-KIT AC	For use with CLV 42x-45x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
7 028 481	CMF 400-3101 Ethernet Kit	Ethernet communication module kit, use with CDM 410, 420 or 490
2 029 468	CMP 400 Power Supply	Use with CDM 410/420
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 connection device

Brackets

Part Number	Model	Description
2 020 410	CLV 43x/44x Bracket	Right angle bracket
7 024 011	MB-W45A-43x-QR	Ball and socket bracket with Quick Release
2 022 564	U-Shaped Bracket	U-shaped bracket
2 023 691	Pole-Mount Bracket	U-shaped pole mount bracket
2 021 342	Vibration Bracket	U-shaped vibration dampening bracket

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

CLV 480

Line Scanners

Part Number	Model	Description
1 024 065	CLV 480-0010	Line scanner, standard / software selectable Host Port RS 232, RS 422/485
1 024 067	CLV 480-0011	Line scanner, standard / software selectable Host Port RS 232, RS 422/485 with heater

Oscillating Mirror Scanners

Part Number	Model	Description
1 024 066	CLV 480-1010	Oscillating mirror scanner, standard / software selectable Host Port RS 232, RS 422/485
1 024 068	CLV 480-1011	Oscillating mirror scanner, standard / software selectable Host Port RS 232, RS 422/485 with heater

Power Supplies

Part Number	Model	Description
7 026 160	RELAY 54/56	Relay module for PS 56
7 027 805	CDB 420-001 KIT	24 V DC required, for use with CLV 420-450, includes null modem connector, Y-cable required
1 025 365	CDM 490-0101 DC	For use with CLV 48x-49x, 24 V DC required
1 026 264	CDM 490-0102 AC	For use with CLV 48x-49x, includes 115/230 V AC power, 6 ft US line cord, cannot be used in conjunction with CMD display module
7 028 870	CDM 490-1101 KIT DC	For use with CLV 48x-49x, 24 V DC required, includes CMC cloning module
7 028 871	CDM 490-1102 KIT AC	For use with CLV 48x-49x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module, cannot be used in conjunction with CMD display module
1 023 850	CMC 400-101	Cloning module for use only with CDx 420-490

Brackets

Part Number	Model	Description
2 011 436	BEF-KK-W45	Mounting bracket for W.45 with ball-joint
7 023 285	MB-W45A-QR	Ball and socket, Quick Release bracket
2 013 824	MB-CLV-S	Angle bracket, single
2 013 825	MB-CLV-D	Angle bracket, double

Cables

Part Number	Model	Description
7 026 219	KP-DB15H-3E	15-pin F to 15-pin M, straight through 3 m long cable (PS 56)
7 023 386	KP-DB15M/09F-2E	15-pin M to 9-pin F, CLV I/O Port to PS 51, 2 m long cable
7 023 387	KP-DB15M/09F-3E	15-pin M to 9-pin F, CLV I/O Port to PS 51, 3 m long cable
7 023 388	KP-DB15F/09M-2E	15-pin F to 9-pin M, CLV Host/Term Port to PS 51, 2 m long cable
7 023 389	KP-DB15F/09M-3E	15-pin F to 9-pin M, CLV Host/Term Port to PS 51, 3 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
2 020 307	KP-DB15/2-DB15-3M-EE	Cloning plug cable, 3 m long, two High Density DB15 connectors (PS 56)
2 020 981	KP-DB15/LEADS-3M-EE	Cloning plug cable, 3 m long, two 15 conductor bare lead cables
2 020 622	KP-DB9/2-2M-EE	Cloning plug cable, 3 m long, two DB 9 connectors (PS 51-DNET)
2 021 044	KP-DB15-15M-EE	Cloning plug cable, 15 m long, single cable to bare leads (Limited pins)

Cables

Part Number	Model	Description
2 021 298	KP-DB15/DB15-3M-IP65-COLD	Low Temperature cable, 3 m long without EEPROM - use w/ AMV 100
2 021 299	KP-DB15/DB15-10M-IP65-COLD	Low Temperature cable, 10 m long without EEPROM - use w/ AMV 100
2 021 689	KP-DB15/DB15-3M-EE-COLD	Low Temperature cable, 3 m long with EEPROM - Only use with AMV 100
2 021 208	KP-DB15/BareLeads-10M-COLD	Low Temperature cable, 10 m long bare leads, without EEPROM
2 027 046	Y-cable for CDB 420	Y-Cable for connection of CLV 480/490 or CLX 490 to CDB 420

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

CLV 490

Line Scanners

Part Number	Model	Description
1 016 958	CLV 490-0010	Line scanner, standard / software selectable Host Port RS 232, RS 422/485
1 016 960	CLV 490-0011	Line scanner, standard / software selectable Host Port RS 232, RS 422/485 with Heater
1 019 311	CLV 490-2010	Line scanner, high density / software selectable Host Port RS 232, RS 422/485
1 019 312	CLV 490-2011	Line scanner, high density / software selectable Host Port RS 232, RS 422/485 with Heater
1 018 872	CLV 490-6010	Line scanner, low density / software selectable Host Port RS 232, RS 422/485
1 019 095	CLV-490-6011	Line scanner, low density / software selectable Host Port RS 232, RS 422/485 with Heater

Oscillating Mirror Scanners

Part Number	Model	Description
1 016 959	CLV 490-1010	Oscillating mirror, standard / software selectable Host Port RS 232/422/485
1 016 961	CLV 490-1011	Oscillating mirror, standard / software selectable Host Port RS 232/422/485 with Heater
1 019 313	CLV 490-3010	Oscillating mirror, high density / software selectable Host Port RS 232/422/485
1 019 314	CLV 490-3011	Oscillating mirror, high density / software selectable Host Port RS 232/422/485 with Heater
1 019 094	CLV 490-7010	Oscillating mirror, low density / software selectable Host Port RS 232/422/485
1 019 096	CLV 490-7011	Oscillating mirror, low density / software selectable Host Port RS 232/422/485 with Heater

Power Supplies

Part Number	Model	Description
7 026 160	Relay 54/56	Relay module for PS 56
7 027 805	CDB 420-001 KIT	24 V DC required, for use with CLV 420-490, CLX 490, includes Null Modem connector, Y-cable required
1 025 365	CDM 490-0101 DC	For use with CLV 48x-49x, 24 V DC required
1 026 264	CDM 490-0102 AC	For use with CLV 48x-49x, includes 115/230 V AC power, 6 ft US line cord, cannot be used in conjunction with CMD display module
7 028 870	CDM 490-1101 KIT DC	For use with CLV 48x-49x, 24 V DC required, includes CMC cloning module
7 028 871	CDM 490-1102 KIT AC	For use with CLV 48x-49x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module, cannot be used in conjunction with CMD display module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
2 030 091	CMP 490 Power Supply	Use with CDM 490
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 connection device

Brackets

Part Number	Model	Description
2 011 436	BEF-KK-W45	Mounting brackets for W.45 with ball-joint
7 023 285	MB-W45A-QR	Ball and socket, Quick Release bracket
2 013 824	MB-CLV-S	Angle bracket, single
2 013 825	MB-CLV-D	Angle bracket, double

Cables

Part Number	Model	Description
7 026 219	KP-DB15H-3E	15-pin F to 15-pin M, straight through 3 m long cable (PS 56)
7 023 386	KP-DB15M/09F-2E	15-pin M to 9-pin F, CLV I/O Port to PS 51, 2 m long cable
7 023 387	KP-DB15M/09F-3E	15-pin M to 9-pin F, CLV I/O Port to PS 51, 3 m long cable
7 023 388	KP-DB15F/09M-2E	15-pin F to 9-pin M, CLV Host/Term Port to PS 51, 2 m long cable
7 023 389	KP-DB15F/09M-3E	15-pin F to 9-pin M, CLV Host/Term Port to PS 51, 3 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
2 020 307	KP-DB15/2-DB15-3M-EE	Cloning plug cable, 3 m long, two High Density DB15 connectors (PS 56)
2 020 981	KP-DB15/LEADS-3M-EE	Cloning plug cable, 3 m long, two 15 conductor bare lead cables
2 020 622	KP-DB9/2-2M-EE	Cloning plug cable, 3 m long, two DB 9 connectors (PS 51-DNET)
2 021 044	KP-DB15-15M-EE	Cloning plug cable, 15 m long, single cable to bare leads (Limited pins)
2 021 298	KP-DB15/DB15-3M-IP65-COLD	Low Temperature cable, 3 m long without EEPROM - use w/ AMV 100
2 021 299	KP-DB15/DB15-10M-IP65-COLD	Low Temperature cable, 10 m long without EEPROM - use w/ AMV 100
2 021 689	KP-DB15/DB15-3M-EE-COLD	Low Temperature cable, 3 m long with EEPROM - Only use with AMV 100
2 021 208	KP-DB15/BareLeads-10M-COLD	Low Temperature cable, 10 m long bare leads, without EEPROM
2 027 046	Y-cable for CDB 420	Y-Cable for connection of CLV 480/490 or CLX 490 to CDB 420

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

ICR 840

Line Scanner

Part Number	Model	Description
1 027 176	ICR 840-0020	Straight reading window, RS 232/422/485 and Ethernet
1 028 254	ICR 840-1020	Lateral reading window, RS 232/422/485 and Ethernet

Power Supply

Part Number	Model	Description
7 027 805	CDB 420-001 KIT	24 V DC required, for use with CLV 420-450 and ICR 85x, includes null modem connector
1 025 364	CDM 420-0101 DC	For use with CLV 42x-45x and ICR 85x, 24 V DC required
1 026 220	CDM 420-0102 AC	For use with CLV 42x-45x and ICR 85x, includes 115/230 V AC power, 6 ft US line cord
7 028 868	CDM 420-1101 KIT DC	For use with CLV 42x-45x and ICR 85x, 24 V DC required, includes CMC cloning module
7 028 869	CDM 420-1102 KIT AC	For use with CLV 42x-45x and ICR 85x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
2 029 468	CMP 400 Power Supply	Use with CDM 410 or 420
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 connection device

Bracket

Part Number	Model	Description
2 025 491	ICR 850 Bracket	Mounting bracket including screws (2 x self-locking screw M 5x16)

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m
6 026 083	ICR to Ethernet Cable	ICR to Ethernet network
6 026 084	ICR to PC Cable	ICR to PC

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

ICR 850/852/855

Line Scanner

Part Number	Model	Description
1 022 583	ICR 850-0020	Front reading window / RS 232, RS 422/485, CAN, Ethernet
1 022 585	ICR 850-1020	Side reading window / RS 232, RS 422/485, CAN, Ethernet
1 025 525	ICR 852-0020	High density, front reading window / RS 232, RS 422/485, CAN, Ethernet
1 025 526	ICR 852-1020	High density, side reading window / RS 232, RS 422/485, CAN, Ethernet
1 025 527	ICR 855-0020	High speed, front reading window / RS 232, RS 422/485, CAN, Ethernet
1 025 528	ICR 855-1020	High speed, side reading window / RS 232, RS 422/485, CAN, Ethernet

Power Supply

Part Number	Model	Description
7 027 805	CDB 420-001 KIT	24 V DC required, for use with CLV 420-450 and ICR 85x, includes null modem connector
1 025 364	CDM 420-0101 DC	For use with CLV 42x-45x and ICR 85x, 24 V DC required
1 026 220	CDM 420-0102 AC	For use with CLV 42x-45x and ICR 85x, includes 115/230 V AC power, 6 ft US line cord
7 028 868	CDM 420-1101 KIT DC	For use with CLV 42x-45x and ICR 85x, 24 V DC required, includes CMC cloning module
7 028 869	CDM 420-1102 KIT AC	For use with CLV 42x-45x and ICR 85x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
2 029 468	CMP 400 Power Supply	Use with CDM 410 or 420
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 connection device

Bracket

Part Number	Model	Description
2 025 491	ICR 850 Bracket	Mounting bracket including screws (2 x self-locking screw M 5x16)

Cables

Part Number	Model	Description
6 010 075	KP-DB15H-2E	15-pin F to 15-pin M, straight through 2 m long cable
7 021 851	KP-DB09-2E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 2 m
7 021 849	KP-DB09-3E	Cable, for DME, DB 9 serial interface/PC connection, 9-pin F to 9-pin M, 3 m
6 026 083	ICR to Ethernet Cable	ICR to Ethernet network
6 026 084	ICR to PC Cable	ICR to PC

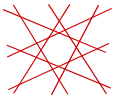
Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

Introduction

Laser-Based Omni Directional Systems

Dimensioning Systems

	Scan Window (Conveyor Width)	Depth of Field	Maximum Conveyor Speed	Host Data Interface
 CLX 490	16”	20”	600 ft/min	RS 232, RS 422/485, Ethernet TCP/IP, Profibus, DeviceNet, CAN, Ethernet IP
 OPS 400	32”	32”	600 ft/min	RS 232, RS 422/485
 OPS 290	32”	32”	600 ft/min	RS 232, 422/485 Ethernet TCP/IP, Profibus DeviceNet, Ethernet IP
 OPS 490	59”	32”	600 ft/min	RS 232, 422/485 Ethernet TCP/IP, Profibus DeviceNet, Ethernet IP
 OPS 360	24”	32”	600 ft/min	RS 232, 422/485 Ethernet TCP/IP, Profibus DeviceNet, Ethernet IP
 OPS 560	44”	32”	600 ft/min	RS 232, 422/485 Ethernet TCP/IP, Profibus DeviceNet, Ethernet IP
 OPS Tire	28…43”	6…16”	390 ft/min	RS 232, 422/485 Ethernet TCP/IP, Profibus DeviceNet, Ethernet IP
 ALIS 400	39”	32”	390 ft/min	RS 232, 422/485 Ethernet TCP/IP, Profibus DeviceNet, Ethernet IP
 VMS 200	118”	118”	Up to 400 ft/min	RS 232, 422 Ethernet TCP/IP
 VMS 5xx, 4xx	40”	63”	410/5x0: 400 ft/min 420: 600 ft/min	RS 232, 422 Ethernet TCP/IP, CAN

	Cloning Capability	Max. Number of Bar Codes per Object	Max. Number of Objects per Reading Field	Focus Type	Page
CLX 490	yes (optional)	50	10	Automatic Focus	100
OPS 400	no	40	20	Automatic Focus	106
OPS 290	yes	40	20	Automatic Focus	112
OPS 490	yes	40	20	Automatic Focus	112
OPS 360	yes	40	20	Automatic Focus	112
OPS 560	yes	40	20	Automatic Focus	112
OPS Tire	yes	40	20	Automatic Focus	118
ALIS 400	yes	40	20	Automatic Focus	126
VMS 220	no	NA	1	NA	134
VMS 4xx, 5xx	yes (optional)	NA	1	NA	134

CLX 490
Omni Directional Scanner

Features

- Ultra compact omni directional bar code reader
- SICK's Modular Advanced Recognition Technology (SMART)
- Patented Automatic Focus Control
- Integrated tracking functionality
- High scan rate (1200 Hz)
- Large depth of field
- Automatic scanner setup (cloning module)
- Optional internal heater available

The CLX 490 is the most compact, industrial omni directional scanner on the market. It incorporates Automatic Focus Control, SMART Technology, a high scan rate and package tracking into one unit.

The CLX 490's SMART (SICK's Modular Advanced Recognition Technology) enables the scanner to read bar codes that can not be read by other scanners. The CLX 490 processes the complete bar code images before decoding. This translates to a much higher percentage of successful reads, even with bar codes presented at high tilt angles or partially damaged bar codes. The CLX 490 also allows small object spacing through its integrated tracking function.

The CLX 490 has real-time, patented Automatic Focus Control; the scanner automatically focuses according to the distance to the object. No additional components are necessary to detect the object distance.

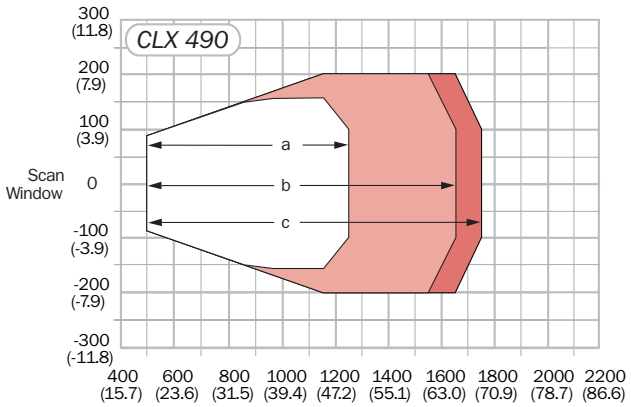
The settings of the CLX 490 are stored in the optional cloning module for quick replacement if necessary. Optional internal heating is also available. The CLX 490 is ideal for conveyor widths up to 16 inches (400 mm) and conveyor speeds up to 590 feet per minute (180 m/min).

Comparison Table

	CLX 490 Standard	CLX 490 Low Temperature
Scan Frequency	600…1200 Hz	600…1200 Hz
Coverage Width	16 in (406 mm)	16 in (406 mm)
Coverage Height	20 in (508 mm)	20 in (508 mm)
Supply Voltage	10…30 V DC	10…30 V DC +20°/-10°
Current Consumption	9 W typical, 16 W max	75 W typical, 90 W max
Ambient Operating Temperature	32…104°F (0…40°C)	-31…95°F (-35…35°C)
Storage Temperature	-4…158°F (-20…70°C)	-4…158°F (-20…70°C)

Reading Ranges

Dimensions in inches (mm)



Code Resolution
- a: 0.30 mm (0.011 in)
- b: 0.35 mm (0.013 in)
- c: 0.50 mm (0.020 in)

Technical Specifications

	CLX 490
Scanning Characteristics	
Scanner Design	X-pattern (2 lines at 45° to conveyor direction)
Scanning Method	8-sided polygon mirror wheel
Aperture Angle	maximum 60°
Scanning Frequency	600…1200 Hz (software selectable)
Coverage for 0.014…0.02 (0.35…0.5 mm)	
Width	15.7 in (400 mm)
Height	31.5 in (800 mm)
Speed	590 ft/min (180 m/min)
Light Source	Visible laser diode (650 nm); CDRH Class II
Reading Distance (bar code dependent)	23.6…68.9 in (500…1750 mm)
Resolution	0.011…0.020 in (0.30…0.50 mm)
Bar Code Types	
Bar Code Symbology	Code 39, Interleaved 2/5, Industrial 2/5, Codabar, Code 93, EAN/EAN 128, UPC, Code 128
Readability	1 to 12 bar codes per reading gate (standard decoder); 1 to 5 (SMART)
Auto Discrimination	8 different symbologies per reading gate
Communications / I/O / Indicators	
Host Interface	RS 232 or RS 422/485 variable data output (software selectable)
Baud Rate	300…57,600 (software selectable)
Data Format	Data bits, stop bits, parity (software selectable)
Network Configuration	Pass-through; master/slave; RS 485 network; CAN Bus network
LED Indicators	Device ready, result, sensor, data
Switching Inputs	6 x PNP, opto-decoupled / maximum 30 V DC
Switching Outputs	4 x PNP, maximum 100 mA / 24 V DC
Trigger Methods	Sensor input (I/O interface) / Serial (host interface) / Free Running
Mechanical/Electrical	
Supply Voltage	Operating voltage 18…30 V DC
Current Consumption	375 mA at 24 V DC / 9.0 W; maximum 16.0 W
Dimensions	6.0 x 3.6 x 8.0 in (152.5 x 93.5 x 208 mm)
Weight	Approx. 4.9 lb (2.2 kg)
Housing / Enclosure Rating	Die cast aluminum / IP 65
Connectivity	2 15 pin D-Sub high density connectors (1 male/1 female)
Environmental	
Ambient Operating Temperature	32…104°F (0…40°C)
Storage Temperature	-4…158°F (-20…70°C)
Vibration	To IEC 68-2-6 test FC
Shock	To IEC 68-2-27 test EA
EMV	To IEC 801
Maximum Relative Humidity	90%, non-condensing
Programming	Windows™-based CLV setup software

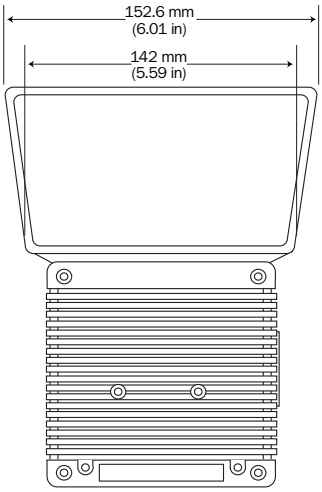
Models and Descriptions

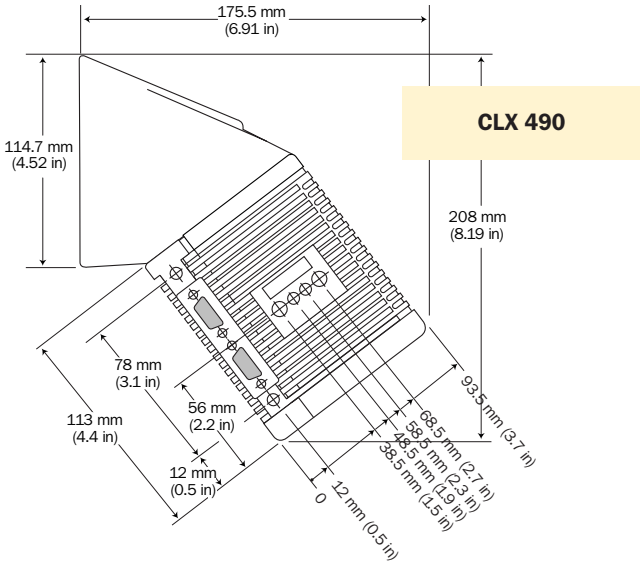
	CLX 490
Omni Directional Scanner	
Model	CLX 490-0010
Description	Integrated Omni Directional Scanner/software selectable
Omni Directional Scanner with Heater	
Model	CLX 490-0011
Description	Integrated Omni Directional Scanner with integrated heater

NOTE: Accessories information is located on pages 140 - 141.

Drawings

Dimensions in inches (mm)





OPS 400
Omni Directional

Features

- Compact, integrated housing
- Plug and play (common CLV Setup platform)
- High scan rate (up to 1200 Hz)
- Real-time Auto Focus Control
- Available in standard, high- and low-density models
- SMART code recognition
- Integrated tracking

The OPS 400 is a simple to operate, compact solution for omni directional bar code reading tasks in retail distribution, parcel logistics, and postal applications. It incorporates the same advanced functionality of the modular SICK OPS Scanning Systems, but is integrated into a single housing.

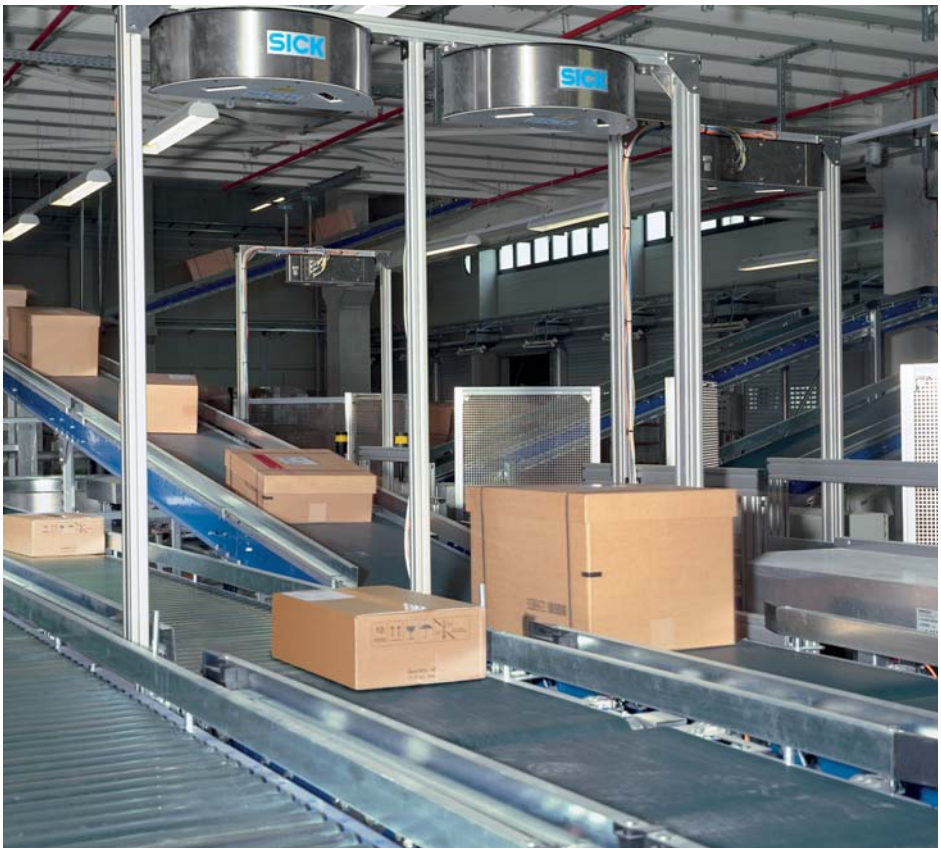
A high scan frequency (user selectable from 600 to 1200 Hz), SMART Technology, and real-time Automatic Focus Control make this solution ideal for demanding top or side reading applications with coverage requirements up to 31.5 inches (800 mm). It is available in three different configurations for reading standard, low-density, and high-density bar codes. Integrated tracking capability allows the OPS 400 to track individual items on high-speed conveyors with item gaps as small as 2 inches.

Since the OPS 400 is fully integrated, installation and commissioning is greatly simplified. Its simple plug and play operation uses the common CLV Setup Software for parameter optimization. And, 16 switching inputs and 4 programmable outputs allow for a variety of configurations with today's most advanced material handling systems.

For entry level, stand-alone omni directional scanning with the optical performance of a high-end modular system, the OPS 400 is the ideal solution.

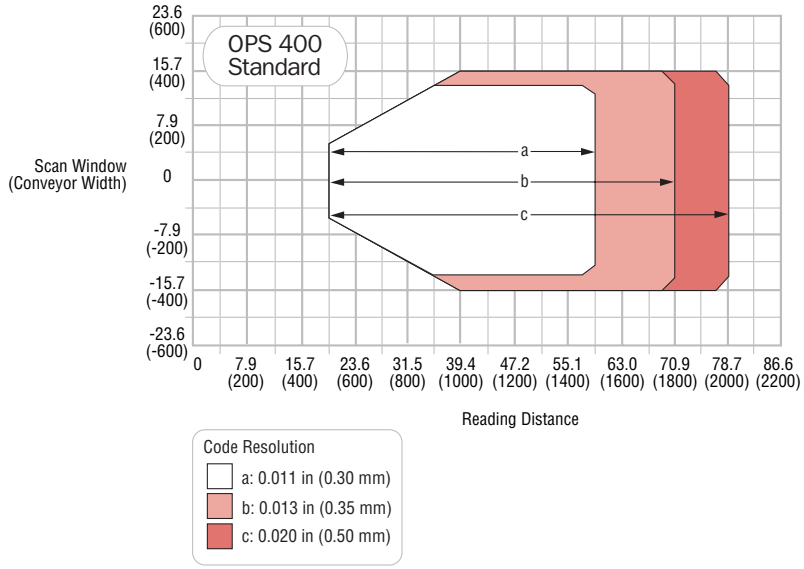
Comparison Table

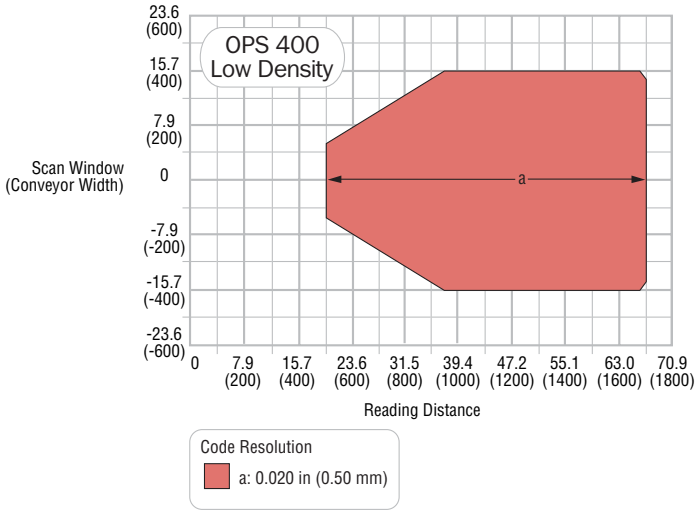
	OPS 400 Standard	OPS 400 High Density	OPS 400 Low Density
Scanner Pattern	X-pattern (2 lines at 45° to conveyor direction)	X-pattern (2 lines at 45° to conveyor direction)	X-pattern (2 lines at 45° to conveyor direction)
Scan Frequency	600…1200 Hz	600…1200 Hz	600…1200 Hz
Coverage Width	31.5 in (800 mm)	27.5 in (700 mm)	31.5 in (800 mm)
Coverage Height	31.5 in (800 mm)	22 in (558 mm)	30 in (761 mm)
Maximum Tilt	45°	45°	45°
Line Speed	Up to 600 fpm	Up to 600 fpm	Up to 600 fpm

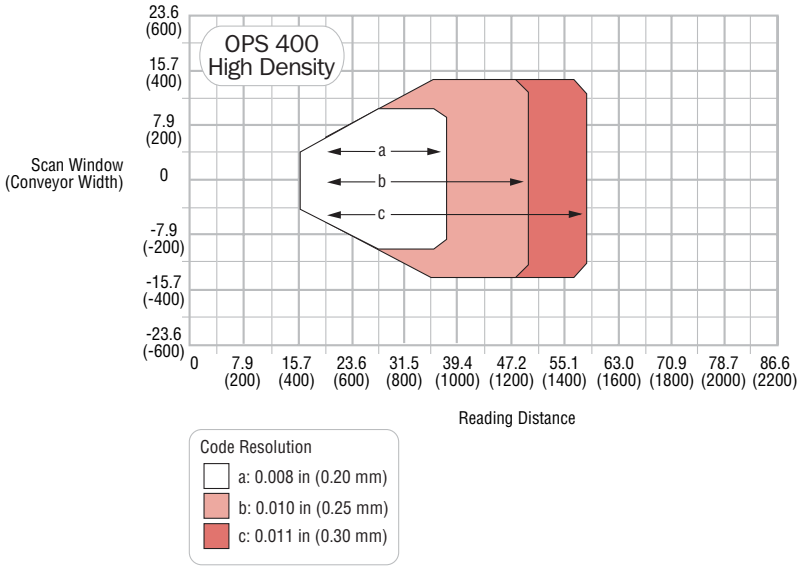


Reading Ranges

Dimensions in inches (mm)







Technical Specifications

	OPS 400
Scanning Characteristics	
Scanner Design	X-scanner (2 lines at 90° to one another)
Light Source	Laser diode, red light (650 nm)
Laser Class	Class II (EN-60925-1)
Ambient Light Compatibility	2000 lx (on bar code)
Scanning Frequency	600…1200 Hz
Path Width Covered	Standard and low density: 31.5 in (800 mm); high density: 27.6 in (700 mm)
Operation and Parameterization	With Windows™-based CLV Setup Software or command strings
Communications / I/O / Indicators	
Data Interfaces	Host: RS 232, RS 422/485; Terminal: RS 232
Indicators	26 LED and status indicators
Switching Inputs	16 x IN
Switching Outputs	4 x OUT / 1 x OUT relay
Mechanical/Electrical	
Electrical Connection	2 x 9-pin D-Sub plugs/terminals
Operating Voltage	85…264 V AC (100…240 V AC +10%/-15%)
Power Consumption	Typical 30 W, maximum 70 W
Housing	Sheet steel with aluminum top and base
Enclosure Rating	IP 54/optics IP 65 (DIN 40 050)
Protection Class	Class III (VDE 0106)
Environmental	
Operating Temperature	32…104°F (0…40°C)
Storage Temperature	-4…158°F (-20…70°C)
Weight	23.6 lb (10.7 kg)
EMC Test	IEC 801

* For complete CLV 490 specification, please see page 64.

Models and Descriptions

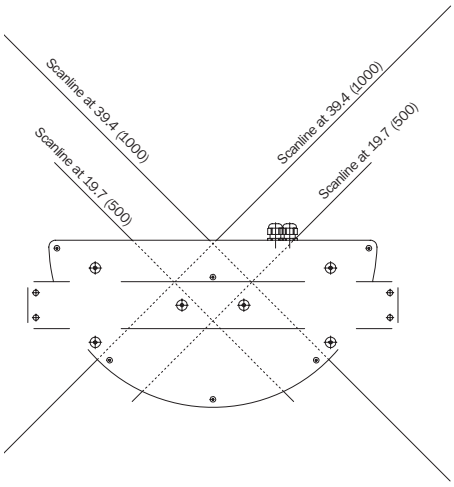
	OPS 400
Model	OPS 400-00
Description	OPS 400 - integrated Omni Scanner (standard optics)
Model	OPS 400-20
Description	OPS 400 - integrated Omni Scanner (high-density optics)
Model	OPS 400-60
Description	OPS 400 - integrated Omni Scanner (low-density optics)

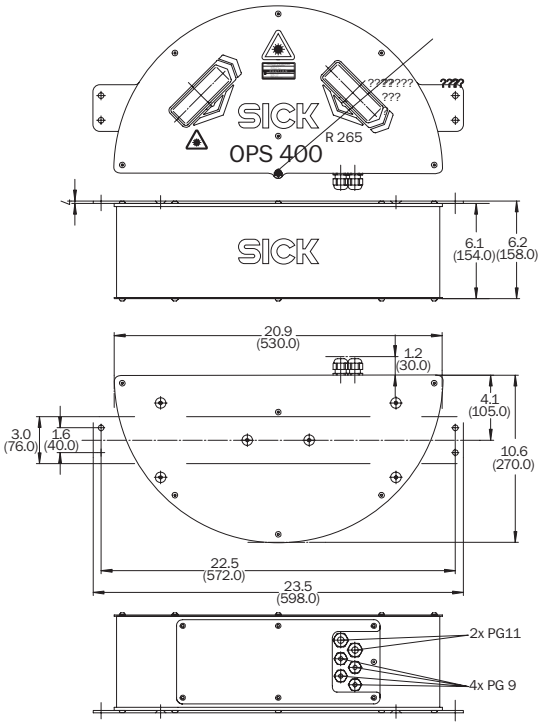
NOTE: Accessories information is located on page 142.

Drawings

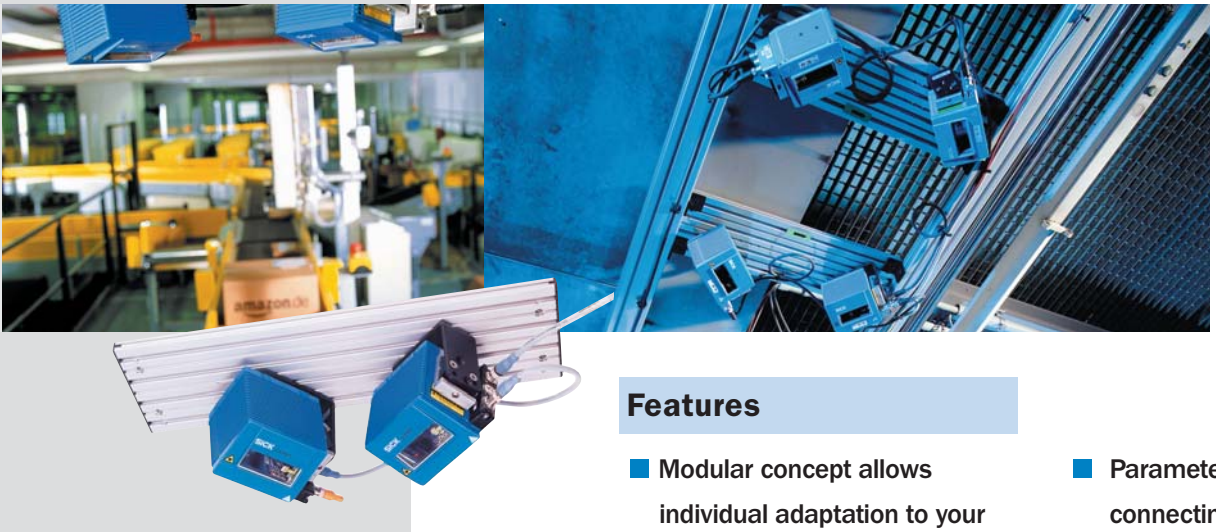
Dimensions in inches (mm)

OPS 400





OPS 290/490/360/560
Omni Directional Scanning Systems



Features

- Modular concept allows individual adaptation to your application
- Use of CLV 490 high-end scanners (see CLV 490 features, pages 58-63)
- Real-time Auto Focus Control function without additional hardware
- Parameters stored in the connecting plug and Quick Release Brackets allow easy scanner replacements
- Extremely large depths of field even with narrow module widths due to the Auto Focus Control function and state-of-the-art optics design

The SICK OPS (Omni Portal System) is a modular bar code reading system that meets the most modern logistical demands. For bar code labels to be read in random orientation, it is important to optimize the design of the scanning system according to the individual requirements of the application. The modular concept of the SICK OPS makes it easy - the use of individual scanners allows the ideal configuration for your individual application.

The SICK OPS utilizes CLV 490 Scanners with patented, real-time Automatic Focus Control to provide optimum read rates at maximum depths of field. The CLV 490 also has SMART code recognition technology to provide reliable identification even if bar codes are damaged, dirty, tilted, or partially hidden. Via its cloning capabilities, parameters for each individual scanner are stored in the connecting plug. This allows for easy device replacement with minimal downtime, resulting in extremely high productivity. All OPS Systems include a tracking module to accurately assign a bar code to a package when package gaps are small.

The OPS is ideal for identifying bar codes on goods and freight in retail distribution, warehousing, and parcel logistics environments. SICK offers a comprehensive system solution: from electronics, photoelectric switches and evaluation software to commissioning and worldwide service.

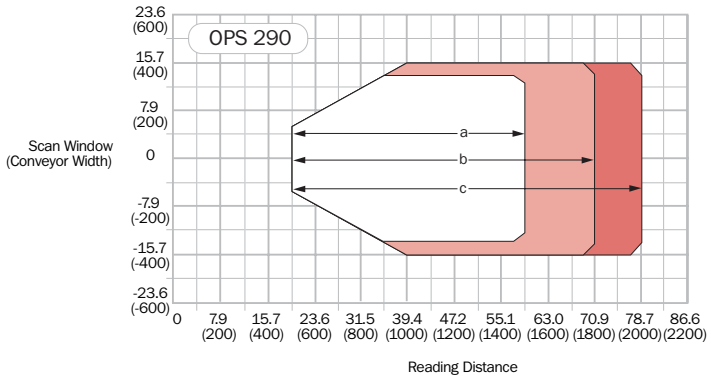
Comparison Table

	OPS 290 Standard	OPS 490 Standard
Number of Scanners and Angle to Conveyor	2 line scanners at 45°	4 line scanners at 45°
Maximum Tilt	45°	45°
Scan Frequency	600…1200 Hz per scan line	600…1200 Hz per scan line
Coverage Width	31.5 in (800 mm)	59.1 in (1500 mm)
Coverage Height	31.5 in (800 mm)	31.5 in (800 mm)
Line Speed	up to 590 ft/min (180 m/min)	up to 590 ft/min (180 m/min)

	OPS 360 Standard	OPS 560 Standard
Number of Scanners and Angle to Conveyor	2 line scanners at 30° 1 line scanner at 90°	4 line scanners at 30° 1 line scanner at 90°
Maximum Tilt	45°	45°
Scan Frequency	600…1200 Hz per scan line	600…1200 Hz per scan line
Coverage Width	23.5 in (597 mm)	42.5 in (1080 mm)
Coverage Height	31.5 in (800 mm)	31.5 in (800 mm)
Line Speed	up to 590 ft/min (180 m/min)	up to 590 ft/min (180 m/min)

Reading Ranges

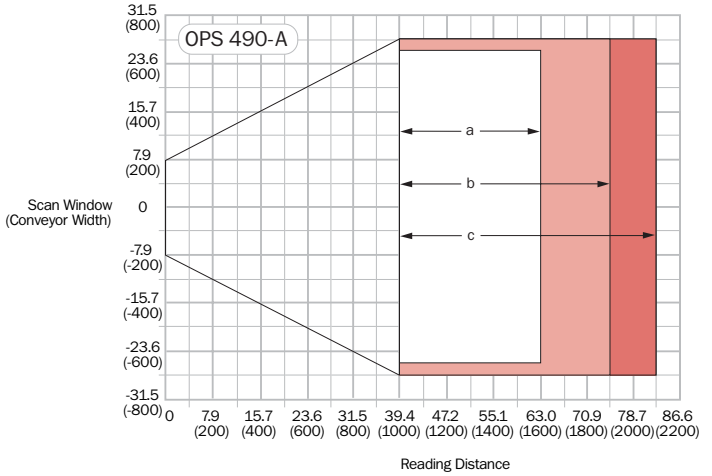
Dimensions in inches (mm)



Code Resolution
- a: 0.011 in (0.30 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

Conveyor Width
- a: 27.6 in (700 mm)
- b: 31.5 in (800 mm)
- c: 31.5 in (800 mm)

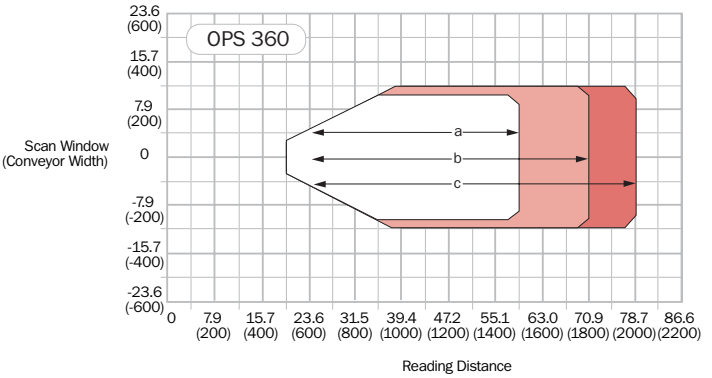
Depth of Field
- a: 21.7 in (550 mm)
- b: 31.5 in (800 mm)
- c: 37.4 in (950 mm)



Code Resolution
- a: 0.011 in (0.30 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

Conveyor Width
- a: 51.2 in (1300 mm)
- b: 55.2 in (1400 mm)
- c: 55.2 in (1400 mm)

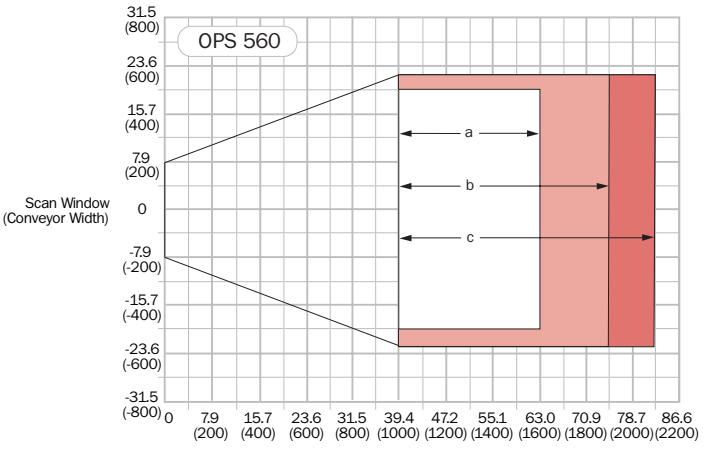
Depth of Field
- a: 23.6 in (600 mm)
- b: 31.5 in (800 mm)
- c: 39.4 in (1000 mm)



Code Resolution
- a: 0.011 in (0.30 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

Conveyor Width
- a: 19.7 in (500 mm)
- b: 23.6 in (600 mm)
- c: 23.6 in (600 mm)

Depth of Field
- a: 21.7 in (550 mm)
- b: 31.5 in (800 mm)
- c: 37.4 in (950 mm)



Code Resolution
- a: 0.011 in (0.30 mm)
- b: 0.013 in (0.35 mm)
- c: 0.020 in (0.50 mm)

Conveyor Width
- a: 35.5 in (900 mm)
- b: 39.4 in (1000 mm)
- c: 39.4 in (1000 mm)

Depth of Field
- a: 23.6 in (600 mm)
- b: 31.5 in (800 mm)
- c: 39.4 in (1000 mm)

Technical Specifications

	OTS Controller	OTC
Number of Bar Codes per Object	Maximum 20 (with maximum 4 scanners)	
Number of Bar Codes per Reading Field	Maximum 15 (auto-discriminating)	
Bar Code Types	Code 39, Code 128, Code 93, Codabar, EAN, EAN 128, UPS, Interleaved 2/5	
Bar Code Length	Maximum 50 characters (maximum 600 characters for all bar code per reading gate)	
Print Ratio	2:1 to 3:1	
Optical Indicators	26 x LED status and function indicators	
Reading Timing	Switching inputs “Triggers 1, 2 and 3” / Software trigger	
“Host” Data Interface	RS 232 or RS 422	
Electrical Connections	1 x AUX connection (9-pin D-Sub HD plug for diagnosis, serial) 1 x CAN connection (9-pin D-Sub HD socket)	
Operating Voltage/Power Consumption	115 V AC (230 V AC) +10%/-15%	24 V +20%/-10%
Housing	Sheet steel, lacquered, reading window from PC	Continuous cast aluminum sections
Protection Category	IP 65 (DIN 40 050)	
Protection Class	Class II (VDE 0106 / IEC 1010-1)	
EMC	IEC 801	
Vibration	IEC 68-2-6 Test FC	
Shock	IEC 68-2-27 Test EA	
Weight	Approx. 22.7 lb (10.3 kg)	Approx 2.9 lb (1.3 kg)
Operating Temperature	32…122°F (0…50°C)	
Storage Temperature	-13…158°F (-25…70°C)	
Maximum Relative Humidity	90%, non-condensing	

	OPS 290
Number of Scanners and Angle to Conveyor	2 line scanners at 45°
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	31.5 in (800 mm)
Height	31.5 in (800 mm)
Speed	Up to 590 ft/min (180 m/min)
Code Height for Speed 1 m/s	>0.6 in (>15 mm) (C128)
	>0.8 in (>20 mm) (ITF2/5)
Code Height for Speed 2 m/s	>0.8 in (>20 mm) (C128)
	>1.0 in (>25 mm) (ITF2/5)

	OPS 490
Number of Scanners and Angle to Conveyor	4 line scanners at 45°
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	59.1 in (1500 mm)
Height	31.5 in (800 mm)
Speed	Up to 590 ft/min (180 m/min)
Code Height for Speed 1 m/s	>0.6 in (>15 mm) (C128)
	>0.8 in (>20 mm) (ITF2/5)
Code Height for Speed 2 m/s	>0.8 in (>20 mm) (C128)
	>1.0 in (>25 mm) (ITF2/5)

* For complete CLV 490 specification, please see page 64.

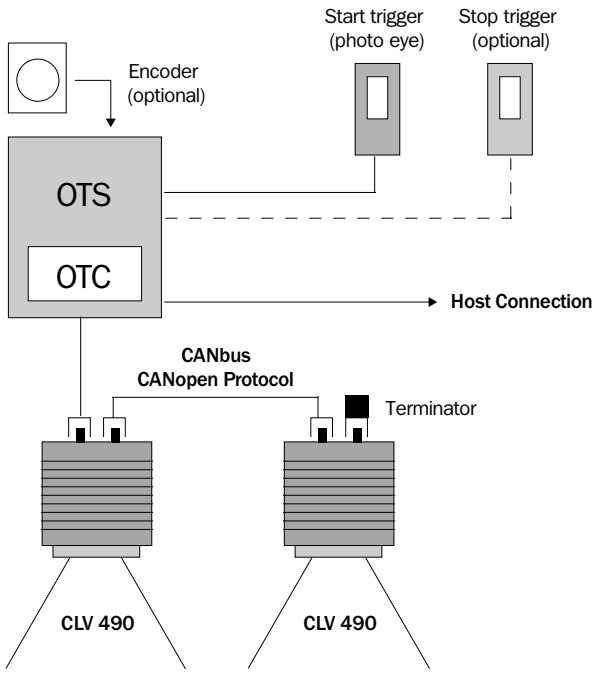
Technical Specifications

OPS 360	
Number of Scanners and Angle to Conveyor	2 line scanners at 30°, 1 line scanner at 90°
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	23.6 in (600 mm)
Height	31.5 in (800 mm)
Speed	Up to 590 ft/min (180 m/min)
Code Height for Speed 1 m/s	>0.5 in (>12 mm) (C128)
	>0.7 in (>17 mm) (ITF2/5)
Code Height for Speed 2 m/s	>0.7 in (>17 mm) (C128)
	>0.9 in (>23 mm) (ITF2/5)

OPS 560	
Number of Scanners and Angle to Conveyor	4 line scanners at 30°, 1 line scanner at 90°
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	43.3 in (1100 mm)
Height	31.5 in (800 mm)
Speed	Up to 590 ft/min (180 m/min)
Code Height for Speed 1 m/s	>0.5 in (>12 mm) (C128)
	>0.7 in (>17 mm) (ITF2/5)
Code Height for Speed 2 m/s	>0.7 in (>17 mm) (C128)
	>0.9 in (>23 mm) (ITF2/5)

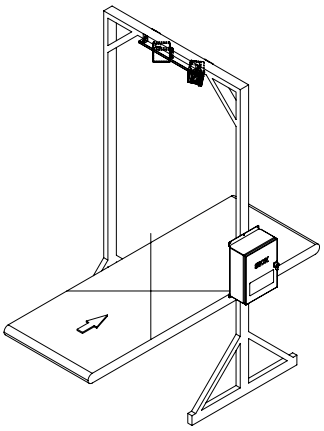
* For complete CLV 490 specification, please see page 64.

OPS-XXX System Hardware

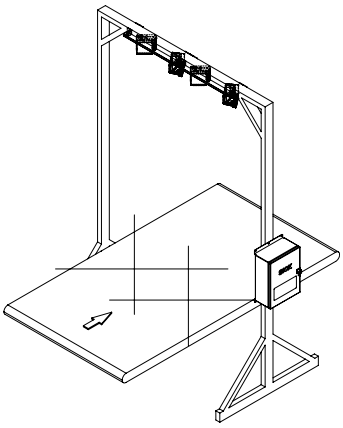


Drawings

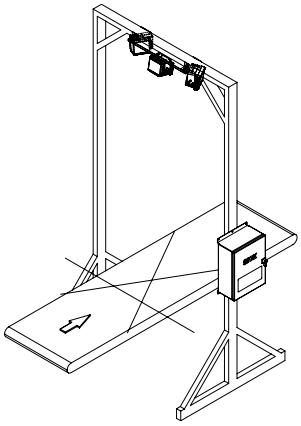
Dimensions in inches (mm)



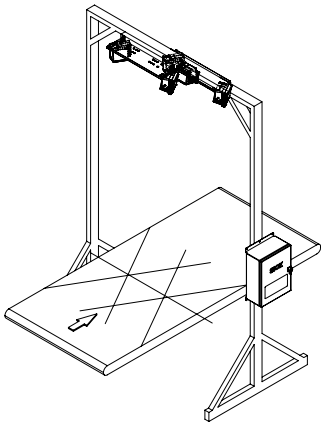
OPS 290
Omni Directional Scanner

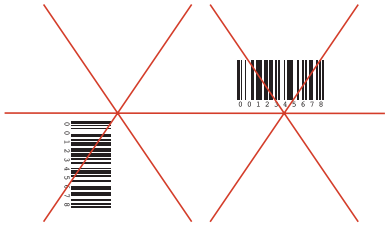


OPS 490
Omni Directional Scanner



OPS 360
Omni Directional Scanner





OPS 560
Omni Directional Scanner

OPS Tire
OPS Tire Scanning System

Features

- Designed specifically for tire manufacturing applications
- CLV 490 Bar Code Reader for best in class read-rate performance and reliability
- OTS tracking system
- SMART decoding software for damaged and poorly printed codes
- Parameter cloning module and Quick Release Brackets
- Simple to use CLV Setup Software for commissioning
- Available redundancy configurations
- RDT 400 (Remote Diagnostics Tool) optional

The OPS Tire Scanning System is designed for reading bar coded automobile and truck tires. It meets the most demanding tracking and sorting requirements of tire manufacturers.

The solution is based on SICK's OPS Omni Directional Scanner design concept. These specially designed systems produce a unique scan pattern, optimized to read low aspect bar codes that are placed on the inner bead of a tire.

The foundation of the OPS Tire System is the CLV 490 high-performance bar code reader. It provides a wide reading range, high scan frequency, and SMART decoding software for the best possible read performance. Parameter cloning, CAN networking and flexible mounting hardware simplify installation and maintenance.

An OTS 400 controller provides power, system communications and tracking capabilities. It is also the basis for RDT Software, which allows remote monitoring of system performance.

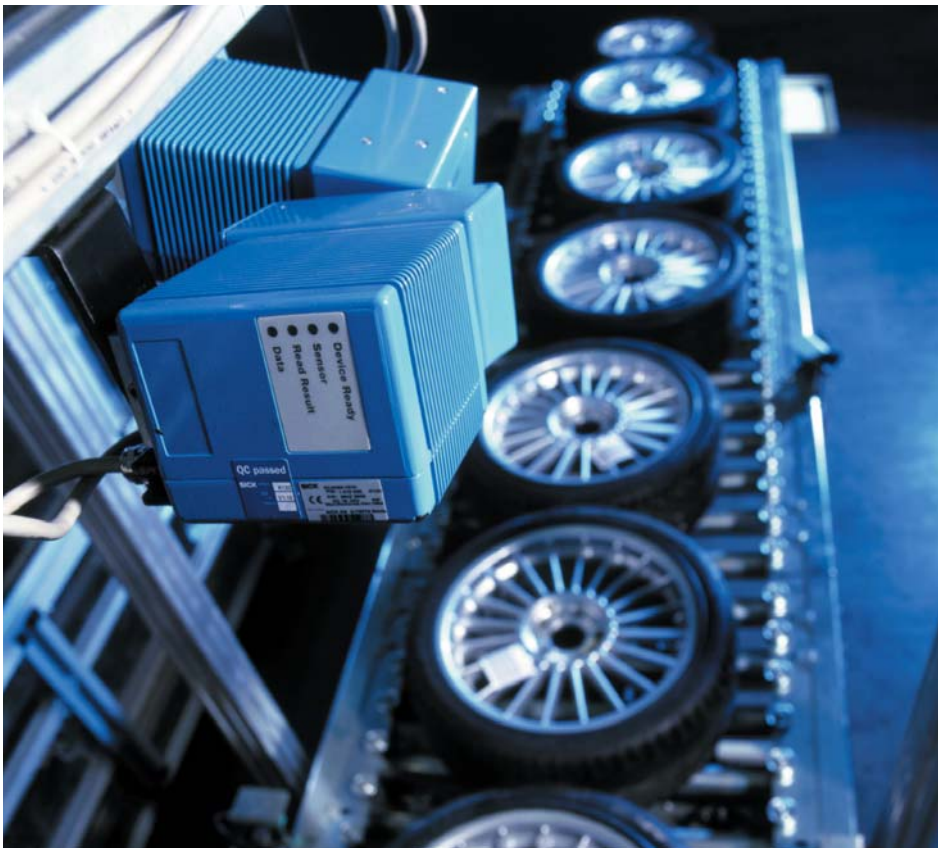
The OPS Tire System is available in a 100% redundant configuration. If a disturbance to the system causes the failure of a controller, power supply, encoder, or trigger photoelectric sensor, the system will continue to operate. A scanner can even fail with minimal reduction in read rate so production can continue uninterrupted.

Comparison Table

	OPS 622-1xxx	OPS 822-1xxx	OPS1022-1xxx
Omni Directional Scan Pattern	6 lines at 67.5° and 22.5° to conveyor travel	8 lines at 67.5° and 22.5° to conveyor travel	10 lines at 67.5° and 22.5° to conveyor travel
Maximum Conveyor Width	28 in (711 mm)	28 in (711 mm)	43 in (1092 mm)
Tire Class (recommended)	passenger	passenger/light truck	truck
Tire Justification (recommended)[1)]	center justified	center justified/ unjustified	center justified/ unjustified
Maximum Depth of Field	6 in (152 mm)	12 in (305 mm)	16 in (406 mm)
Scan Frequency	up to 1200 Hz	up to 1200 Hz	up to 1200 Hz
Minimum Code X Dimension[2)]			
Standard Density	12 mil	12 mil	12 mil
High Density	8 mil	8 mil	8 mil
Minimum Code Height[2)]	0.3 in (8mm)	0.3 in (8mm)	0.3 in (8mm)
Conveyor Speed[2)]	up to 200 fpm	up to 200 fpm	up to 200 fpm
RDT 400	optional	optional	optional
Redundancy	optional	optional	optional
Number of Scanners	6	8	10

1) Tire justification recommendation determined by calculating difference between minimum and maximum inside tire diameter relative to maximum conveyor coverage.

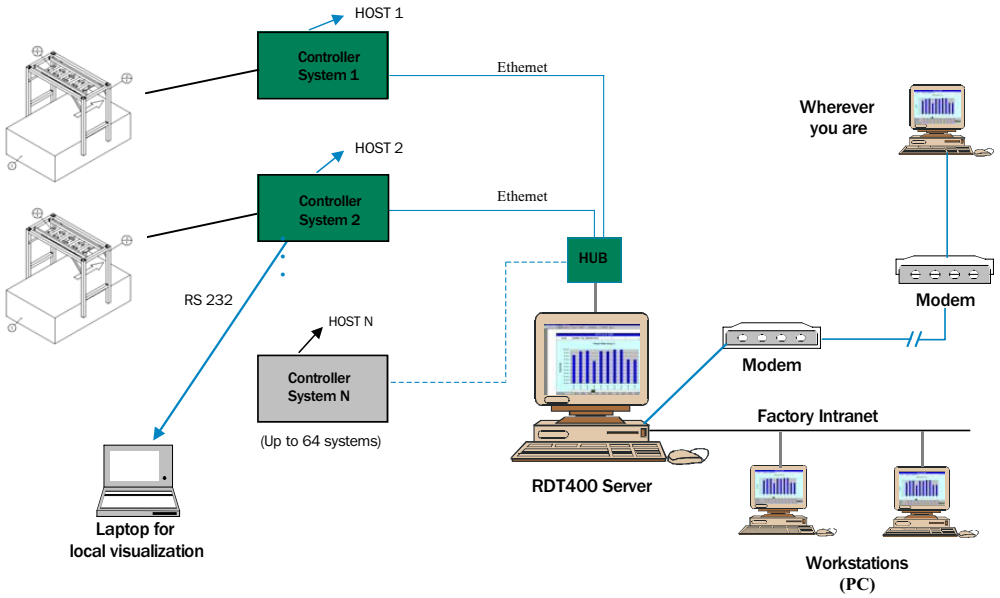
2) Application dependent. Actual specification may vary depending on conveyor speed and other application parameters.



Reading Ranges

	Depth of Field	Conveyor Width
OPS 622-1xxx		
10 mil	6 in (152.3 mm)	28 in (710.7 mm)
12 mil	8 in (203.1 mm)	30 in (761.4 mm)
OPS 822-1xxx		
10 mil	6 in (152.3 mm)	28 in (710.7 mm)
12 mil	12 in (304.6 mm)	33 in (837.6 mm)
OPS 1022-1xxx		
10 mil	10 in (253.8 mm)	36 in (913.7 mm)
12 mil	16 in (406.1 mm)	43 in (1091.4 mm)

System Architecture Using RDT Remote Diagnostic Tool



Technical Specifications

	OTS Controller	OTC
Number of Bar Codes per Object	Maximum 20 (with maximum 4 scanners)	
Number of Bar Codes per Reading Field	Maximum 15 (auto discriminating)	
Bar Code Types	Code 39, Code 128, Code 93, Codabar, EAN, EAN 128, UPS, Interleaved 2/5	
Bar Code Length	Maximum 50 characters (maximum 600 characters for all bar code per reading gate)	
Print Ratio	2:1 to 3:1	
Optical Indicators	26 x LED status and function indicators	
Reading Timing	Switching inputs “Triggers 1, 2 and 3” / Software trigger	
“Host” Data Interface	RS 232 or RS 422	
Electrical Connections	1 x AUX connection (9-pin D-Sub HD plug for diagnosis, serial) 1 x CAN connection (9-pin D-Sub HD socket)	
Operating Voltage/Power Consumption	115 V AC (230 V AC) +10%/-15%	24 V +20%/-10%
Housing	Sheet steel, lacquered, reading window from PC	Continuous cast aluminum sections
Protection Category	IP 65 (DIN 40 050)	
Protection Class	Class II (VDE 0106 / IEC 1010-1)	
EMC	IEC 801	
Vibration	IEC 68-2-6 Test FC	
Shock	IEC 68-2-27 Test EA	
Weight	Approx. 22.7 lb (10.3 kg)	Approx 2.9 lb (1.3 kg)
Operating Temperature	32…122°F (0…50°C)	
Storage Temperature	-13…158°F (-25…70°C)	
Maximum Relative Humidity	90%, non-condensing	

	OPS 622-1xxx
Number of Scanners and Angle to Conveyor	6 lines at 67.5° and 22.5° to conveyor travel
Maximum Tilt	45°
Scan Rate	600…1200 Hz
Coverage for 0.08…0.012 in (0.20…0.30 mm)	
Width	28 in (711 mm)
Height	6 in (152 mm)
Speed	up to 200 fpm (61 m per minute)
Code Height for Speed 1 m/s	0.3 in (8 mm)

	OPS 822-1xxx
Number of Scanners and Angle to Conveyor	8 lines at 67.5° and 22.5° to conveyor travel
Maximum Tilt	45°
Scan Rate	600…1200 Hz
Coverage for 0.08…0.012 in (0.20…0.30 mm)	
Width	28 in (711 mm)
Height	12 in (305 mm)
Speed	up to 200 fpm (61 m per minute)
Code Height for Speed 1 m/s	0.3 in (8 mm)

Technical Specifications

	OPS 1022-1xxx
Number of Scanners and Angle to Conveyor	10 lines at 67.5° and 22.5° to conveyor travel
Maximum Tilt	45°
Scan Rate	600…1200 Hz
Coverage for 0.08…0.012 in (0.20…0.30 mm)	
Width	43 in (1092 mm)
Height	16 in (406 mm)
Speed	up to 200 fpm (61 m per minute)
Code Height for Speed 1 m/s	0.3 in (8 mm)

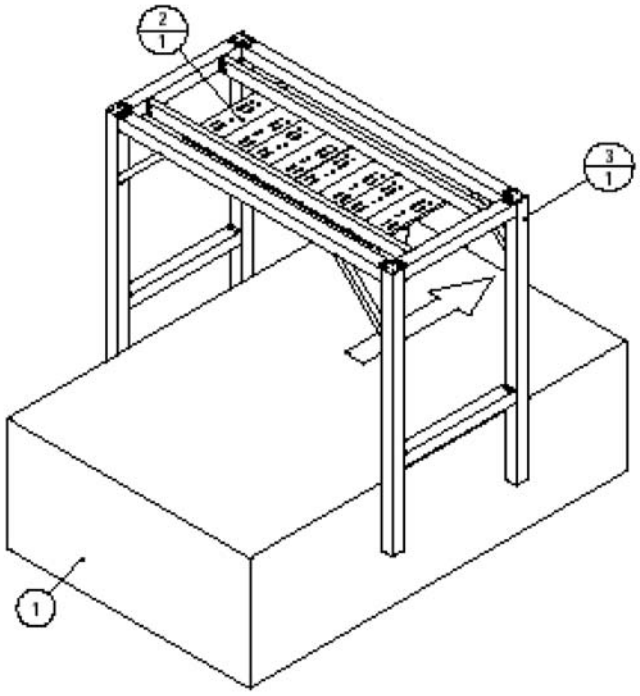
* For complete CLV 490 specification, please see page 64.

Models and Descriptions

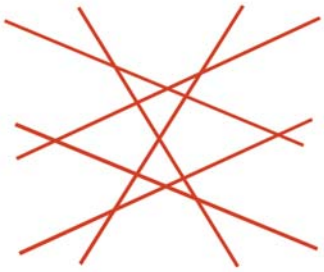
	Standard Density	High Density
Model	OPS 622-1000	OPS 622-1200
Description	OPS Tire scanning system with 6 scanners	OPS Tire scanning system with 6 scanners
Model	OPS 822-1000	OPS 822-1200
Description	OPS Tire scanning system with 8 scanners	OPS Tire scanning system with 8 scanners
Model	OPS 1022-1000	OPS 1022-1200
Description	OPS Tire scanning system with 10 scanners	OPS Tire scanning system with 10 scanners

NOTE: Accessories information is located on page 141.

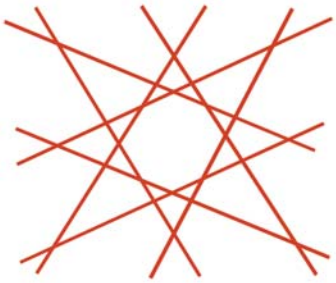
Drawings



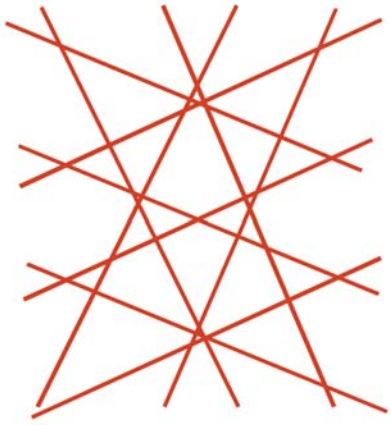
OPS 622-1xxx
Scan Pattern



OPS 822-1xxx
Scan Pattern



OPS 1022-1xxx
Scan Pattern



Advanced OPS and Tunnel Scanning Systems

Features

- Modular design configuration to optimize coverage requirements
- Optional VMS Dimensioning System
- Real-time and Automatic Focus Control for faster throughput
- Powerful integrated tracking capabilities
- Flexible communication for today's modern host network and controls systems
- High scan frequency for speeds up to 590 ft/min (180 m/min)
- Remote diagnostics tools to monitor system performance

Not every tunnel application is created equally, so SICK's modular Tunnel Scanning System allows individual adaptation of its standard OPS configurations to any application. Tunnel scanning solutions are configured using our most advanced scanning and control products. Whether your application requires ultra wide coverage on a single plane or multi-sided reading for every package side, SICK has a solution that will meet your needs reliably and accurately.

SICK uses the latest available technologies to produce the most accurate and dependable products. State-of-the-art optics and Automatic Focus Control provide extended coverage and depth of field, while high scan rates (up to 1200 Hz) and advanced code recognition software combine to ensure reliable reading and tracking even at speeds exceeding 550 ft/min. Common CLV Setup Software, Quick Release Brackets, CAN network connectivity, and SICK's own external parameter cloning modules, which store scanner configuration data for quick replacement, allow for streamlined installation as well as extremely low cost of ownership.

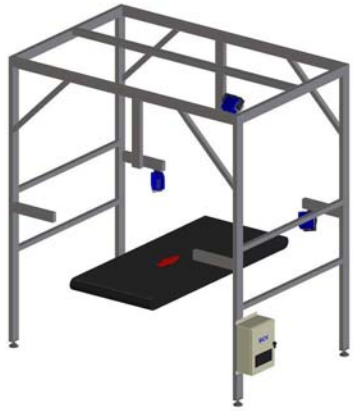
Contact SICK for more information about customized solutions for your most demanding omni directional scanning applications. SICK will work with you from design through implementation to ensure that our solution meets your specific needs.

Drawings

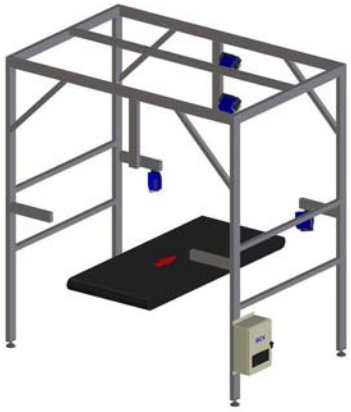
OPS 290-1xxx
Top Read Omni Directional System

OPS290-4xxx
Top Read Picket Fence / Ladder System

OPS390-1000
Front Read Omni Directional System

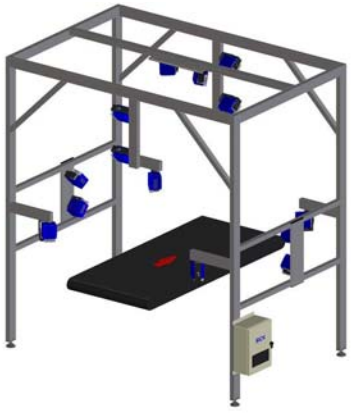


OPS490-1000
Front Read Omni Directional System



OPS690-3000
Three Sided Omni Directional System

OPS1490-5000
Five Sided Omni Directional System



ALIS
Airport Luggage Identification System

Features

- CLV 490 bar code reader for best in class read rate performance and reliability
- Reads all IATA codes (T-codes and linear codes)
- Auto Focus optics for large depth of field
- SMART decoding software for damaged and poorly printed codes
- Parameter cloning
- RDT (Remote Diagnostics Technology)
- Consultant certified for 100% redundancy

ALIS (Airport Luggage Identification System) is a flexible bar code reading system that is specially designed to identify IATA bar codes on airport luggage. This solution is based on SICK's OPS Omni Directional Scanner design concept and is equipped to meet all the requirements of today's modern baggage handling systems.

The foundation of the ALIS System is the CLV 490 high-performance bar code reader. It provides a wide reading range (up to 82 in), high scan frequency (user selectable up to 1200 Hz), Auto Focus, and SMART decoding software for the best possible read rate performance. Parameter cloning, CAN networking and flexible mounting hardware simplify installation and maintenance.

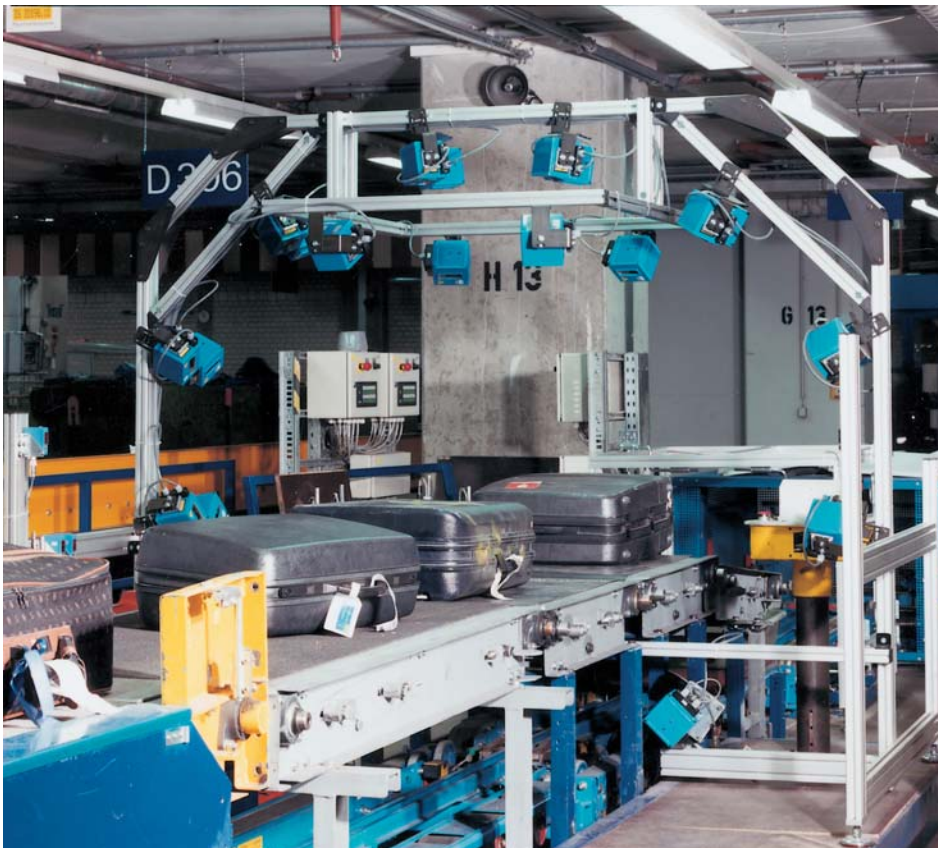
An OTS 400 Controller provides system communications and tracking capabilities and powers up to 14 CLV Scanners in a system. It is also the basis for RDT (Remote Diagnostics Tool) Software which allows comprehensive monitoring of system performance either locally or from remote locations via company Intranet or via the web.

The ALIS System is 100% redundant, and is therefore certified by the airport consultant community for use in airports around the world. If a disturbance to the system is experienced due to the failure of a scanner, controller, power supply, incremental encoder, interconnecting cables, or trigger photoelectric sensor, the system will continue to operate. Only a minimal reduction in read rates results even if a scanner fails, so operations can continue uninterrupted.

Comparison Table

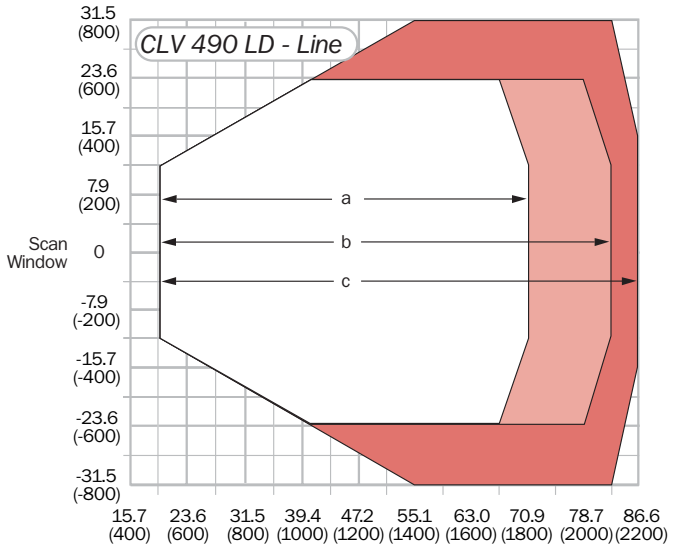
	ALIS 400/xx Tray Sorter	ALIS 400/xx Belt Conveyor
Scanner Design	Omni directional tunnel array 5-sided scan pattern (bottom scan at induction)	Omni directional tunnel array 6-sided scan pattern
Conveyor Type	Tray sorter	Belt conveyor
Code Type	IATA/DNR Mail	IATA/DNR Mail
Maximum Conveyor Width	39.4 in (1000 mm)	39.4 in (1000 mm)
Maximum Scanning Height	32 in (813 mm)	32 in (813 mm)
Optimal Number of Scanners per System (xx)[1)]		
T-Code	10	12
Linear Code	12	14
Scan Frequency	Up to 1200 Hz	Up to 1200 Hz

1) Actual scanner quantity may vary. Final scanner quantity is determined upon complete evaluation of customer application requirements. Consult a SICK Sales Engineer for more information.



Reading Ranges

Dimensions in inches (mm)



Tilt
- a: -45…+45
- b: -30…+30
- c: -15…+15

Code resolution:
0.020 in (0.5 mm)

Technical Specifications

	OTS Controller	OTC
Number of Bar Codes per Object	Maximum 20 (with maximum 4 scanners)	
Number of Bar Codes per Reading Field	Maximum 15 (auto discriminating)	
Bar Code Types	Code 39, Code 128, Code 93, Codabar, EAN, EAN 128, UPS, Interleaved 2/5	
Bar Code Length	Maximum 50 characters (maximum 600 characters for all bar code per reading gate)	
Print Ratio	2:1 to 3:1	
Optical Indicators	26 x LED status and function indicators	
Reading Timing	Switching inputs “Triggers 1, 2 and 3” / Software trigger	
“Host” Data Interface	RS 232 or RS 422	
Electrical Connections	1 x AUX connection (9-pin D-Sub HD plug for diagnosis, serial) 1 x CAN connection (9-pin D-Sub HD socket)	
Operating Voltage/Power Consumption	115 V AC (230 V AC) +10%/-15%	24 V +20%/-10%
Housing	Sheet steel, lacquered, reading window from PC	Continuous cast aluminum sections
Protection Category	IP 65 (DIN 40 050)	
Protection Class	Class II (VDE 0106 / IEC 1010-1)	
EMC	IEC 801	
Vibration	IEC 68-2-6 Test FC	
Shock	IEC 68-2-27 Test EA	
Weight	Approx. 22.7 lb (10.3 kg)	Approx 2.9 lb (1.3 kg)
Operating Temperature	32…122°F (0…50°C)	
Storage Temperature	-13…158°F (-25…70°C)	
Maximum Relative Humidity	90%, non-condensing	

Technical Specifications

ALIS-400/xx Belt Conveyor T-Code	
Number of Scanners and Angle to Conveyor	12 scan lines (including 2 scan lines projected from beneath the conveyor) optimized to cover 6 sides of an object
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	39.4 in (1000 mm)
Height	32 in (813 mm)
Speed	Up to 400 ft/min (2 m/s)

ALIS-400/xx Belt Conveyor Linear Code	
Number of Scanners and Angle to Conveyor	14 scan lines (including 2 scan lines projected from beneath the conveyor) optimized to cover 6 sides of an object
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	39.4 in (1000 mm)
Height	32 in (813 mm)
Speed	Up to 400 ft/min (2 m/s)

ALIS-400/xx Tray Sorter T-Code	
Number of Scanners and Angle to Conveyor	10 scan lines optimized to cover top, front, back and sides of an object Bottom scan capability also available and provided by UCB2 Induction Line Scanner
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	39.4 in (1000 mm)
Height	32 in (813 mm)
Speed	Up to 400 ft/min (m/s)

ALIS-400/xx Tray Sorter Linear Code	
Number of Scanners and Angle to Conveyor	12 scan lines optimized to cover top, front, back and sides of an object Bottom scan capability also available and provided by UCB2 Induction Line Scanner
Maximum Tilt	45°
Scan Rate	600…1200 Hz per scan line
Coverage for 0.014…0.02 in (0.35…0.5 mm)	
Width	39.4 in (1000 mm)
Height	32 in (813 mm)
Speed	Up to 400 ft/min (2 m/s)

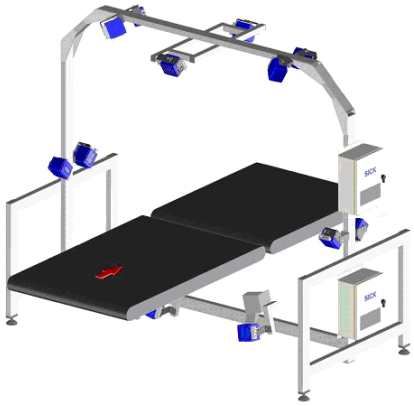
* For complete CLV 490 specification, please see page 64.

Models and Descriptions

	ALIS-400
Belt T-Code	
Model	ALIS-400/xx-Belt T-code
Description	ALIS Omni Directional Airport Luggage Identification System 12 scanners (optimal), 6-sided for IATA T-codes
Belt Linear Code	
Model	ALIS-400/xx-Belt Linear code
Description	ALIS Omni Directional Airport Luggage Identification System 14 scanners (optimal), 6-sided for IATA Linear codes
Tray T-Code	
Model	ALIS-400/xx-Tray T-code
Description	ALIS Omni Directional Airport Luggage Identification System 10 scanners (optimal), 5-sided for IATA T-codes (bottom scan at induction)
Tray Linear Code	
Model	ALIS-400/xx-Tray-Linear code
Description	ALIS Omni Directional Airport Luggage Identification System 12 scanners (optimal), 5-sided for IATA Linear codes (bottom scan at induction)

Drawings

ALIS-400/12 Belt Conveyor
6-sided tunnel scanning system
(redundant version shown)

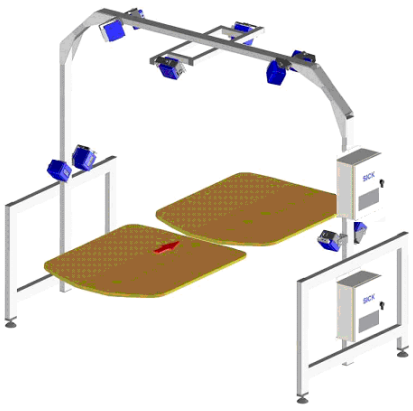


ALIS-400/12 Belt Conveyor
6-sided tunnel scanning system
(non-redundant version shown)

ALIS-400/14 Belt Conveyor
6-sided tunnel scanning system
(redundant version shown)

ALIS-400/14 Belt Conveyor
6-sided tunnel scanning system
(non-redundant version shown)

ALIS-400/10 Tilt Tray
5-sided tunnel scanning system
(redundant version shown)



UCB2 - Induction Line Scanner
(provides bottom scanning at indications on tilt tray sorter systems)

RDT 400
Remote Diagnostics Tool for OPS & ALIS

Features

- RDT 400 supports all OPS and ALIS systems
- Connect up to 64 scanner systems to a central RDT server via Ethernet
- Supports ALIS and OPS Systems consisting of up to 24 individual scanners
- Remote monitoring and log file download via Internet or company Intranet
- Easy-to-understand user interface
- Detailed system and individual scanner performance

RDT 400 (Remote Diagnostic Tool) is a comprehensive software application designed for use with OPS and ALIS Bar Code Reading Systems. It allows users to monitor their systems by providing graphic visualization of scanner performance. Users can stay on top of system performance and spot trouble before it begins.

The RDT 400 Software can be used two ways. Use it locally to monitor system performance directly at the system's site, or monitor multiple systems worldwide through your company network. Ethernet connectivity provides flexible communication for simplified use and operational efficiency.

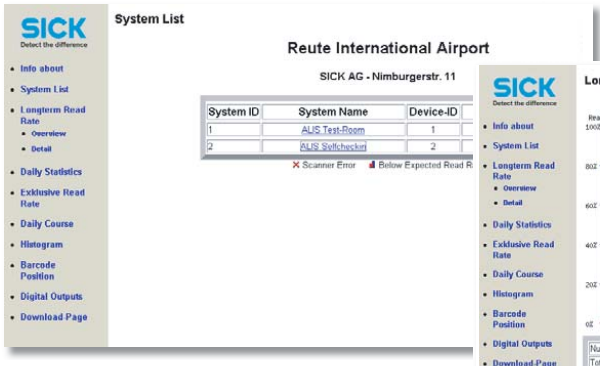
RDT uses a Windows™-based interface to provide easy-to-read information about your system's performance. Performance characteristics are provided for individual scanners as well as complete systems. Data can be gathered and logged over hourly, daily or annual intervals. You can also program alarm thresholds to monitor read rates and alert you when system performance falls below an acceptable level.

Some of the detailed information that RDT 400 provides includes: system list, long term read rate, daily read rate and daily course.

For enterprises seeking the highest level of data collection control, RDT 400 provides the performance statistics necessary to maximize operational efficiency.

RDT User Interface

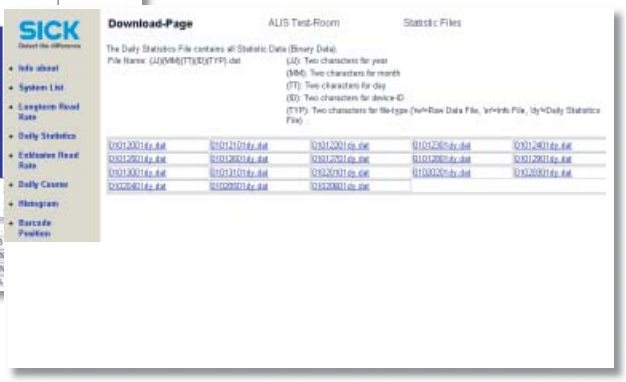
Main Menu



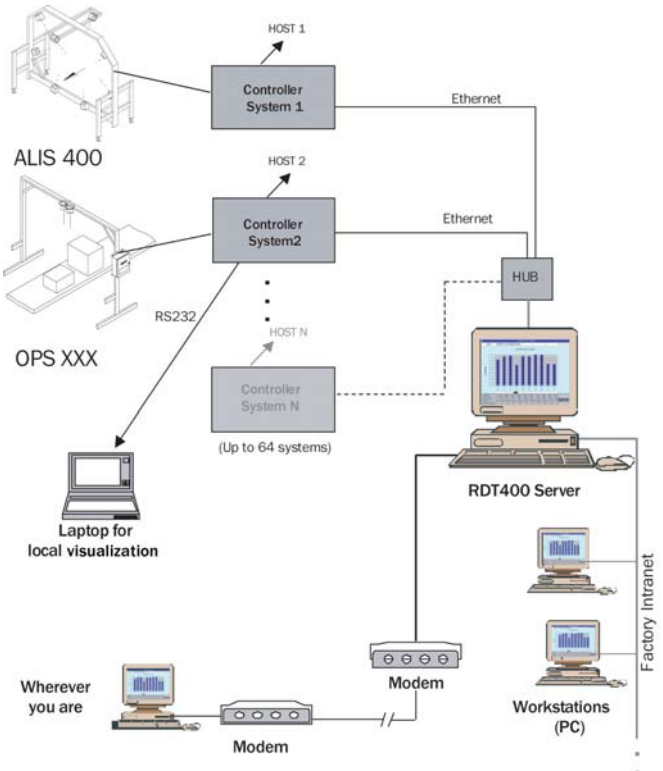
Long-term Read Rate Display

Detailed Read Rate Display

Download Page



RDT System Topology



VMS 200/4x0/5x0
Volume Measurement Systems

Features

- Non-contact measurement process measuring length, width, and height of objects
- Calculation of real volume and smallest box to enclose an object (box-volume)
- Measurement of all object shapes
- Legal-for-trade certified
- Real-time processing with optional integration of bar code data
- Low-maintenance system system – short MTTR through plug and play unit exchange

Manually determining the volume of parcels and pallets, airplane luggage, and air freight containers is relatively imprecise, difficult and sometimes not even possible. Rapid conveyor speeds, complex geometries and large dimensions require rapid automatic data processing. SICK offers several solutions with these requirements in mind so you can match the right solution to your specific application.

The VMS 420/520 Systems are standard solutions for determining parcel and freight volumes on conveyors. The VMS 420/520 are dual head systems certified "legal-for-trade" according to the standard OIML (International Organization for Legal Metrology). The VMS 410/510 are single headed systems designed for measuring the volumes of cuboidal objects or packages on flat conveyor belts. Another solution, the VMS 200, is a dual head system designed for determining volumes of extra large objects and is suitable for outdoor applications such as air freight, luggage, or pallets.

Whatever the shape or size, accurate volume measurement is the basis for calculating precise shipping charges and maximizing loads. Our VMS Systems meet the challenges of a global market, in which enterprises simply cannot afford inaccurate volume determination. With our VMS, you will be able to optimize parcel handling, improve measurement reliability and ultimately, reduce costs.

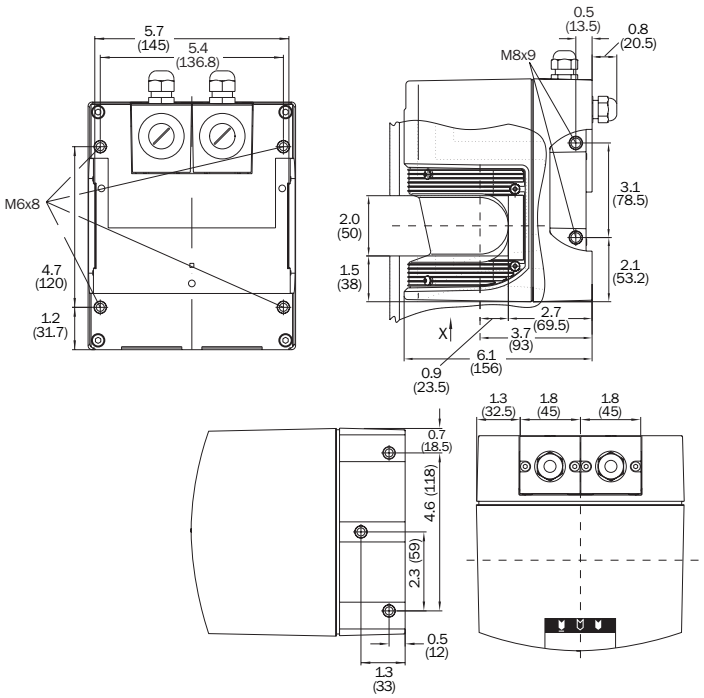
Comparison Table

	VMS 200	VMS 410/510	VMS 420/510
Design	2 - scanners	1 - scanner	2 - scanners
Aperture Angle	180°	70°	70°
Detectable Object Shape	Almost any shape	Cuboidal shape	Almost any shape
Minimum Detectable Object Size	100 x 100 x 100 mm^3	50 x 50 x 50 mm^3	50 x 50 x 50 mm^3
Maximum Detectable Object Size	7500 x 3000 x 3000 mm^3	2500 x 1000 x 1000 mm^3	2000 x 1000 x 1600 mm^3
Scan Head	LMS 200	LMS 400	LMS 400

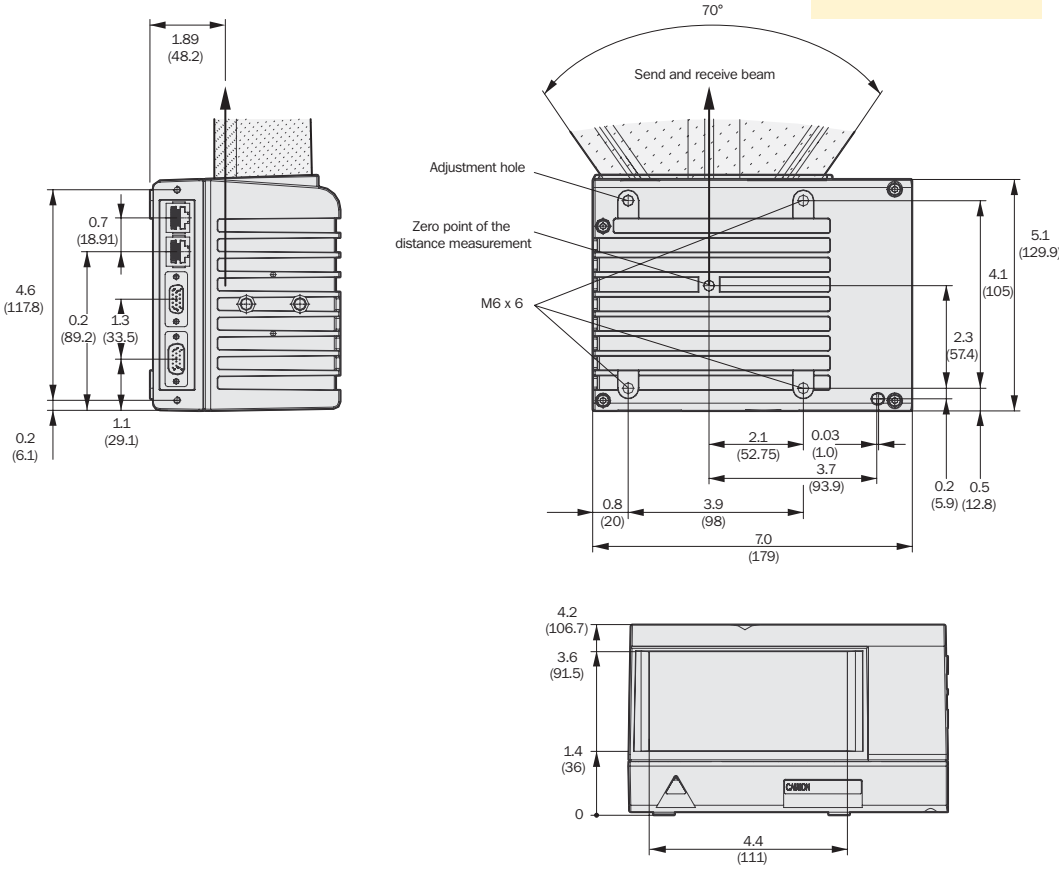
Drawings

Dimensions in inches (mm)

LMS 200-xx



LMS 400-xx



Technical Specifications

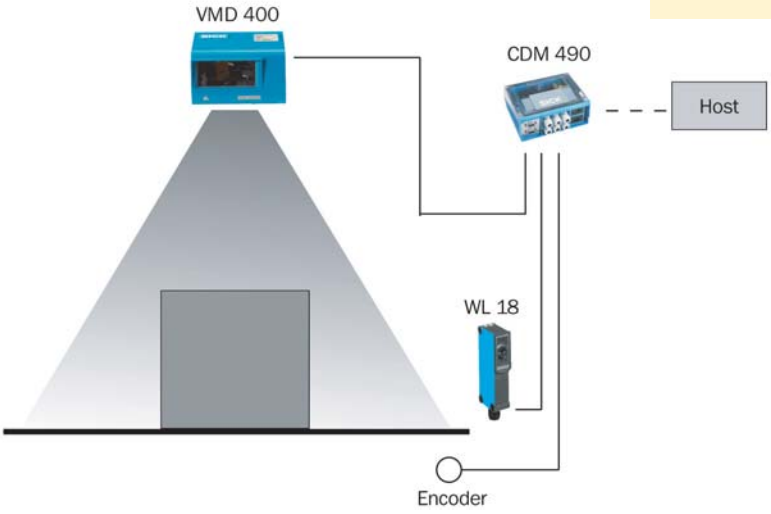
	VMS 420/520	VMS 410/510
Design	2-scanner solution	1-scanner solution
Light Source	Laser diode, red, wavelength: 650 nm	
Laser Type	Class II	
Aperture Angle	70°	
Detectable Object Shapes	Almost any shape	cuboidal objects
Max. Object Size (L x W x H)	2000 x 1000 1600 mm³	2500 x 1000 x 1000 mm³
Certified Scale Value, d	+/- 5 mm at 2 m/s	+/- 10 mm at 2 m/s, +/- 5 mm at 1.3 m/s
Min. Object Gap at V = 2 m/s	25 mm	
Max. Transport Speed	VMS 420: 3 m/s; VMS 520: 2 m/s constant or variable	up to 2 m/s constant or variable
Host Interfaces	RS 232, RS 422, or Ethernet connection to bus systems on request	RS 232, RS 422, or Ethernet
Optical Indicators	6 LEDs for status indication	
Output Data	Max. dimensions, box volumes, real volumes, index	max. dimensions, box volumes, index
Operating Voltage	24 V DC +/- 15%, max. 2 A	24 V DC +/- 15%, max. 2 V AC (115 V AC)
Housing	Die-cast aluminum	
EMC Tests	Acc. to EN 61000-6-2:2001, EN 61000-6-4:2001	
Vibration/Impact Tests	Acc. to EN 60068-2-65, -27, -29, -64	
Weight Per Scanner	2.3 kg	
Temperature (Operation/Storage)	32…104°F/-4…158°F (0…40°C/-20…70°C)	

	VMS 200
Design	2-scanner solution
Light Source	Laser diode, infrared, wavelength: 650 nm
Laser Type	Class I
Aperture Angle	80°
Detectable Object Shapes	Almost any shape
Max. Object Size (L x W x H)	7500 x 3000 x 3000 mm³
Certified Scale Value, d	+/- 10 mm at 2 m/s, +/- 5 mm at 1.3 m/s
Accuracy	+/- 20 mm at 2 m/s
Min. Object Gap at V = 2 m/s	≥ 100 mm
Max. Transport Speed	Up to 2 m/s constant or variable
Host Interfaces	RS 232, RS 422, connection to bus systems on request
Optical Indicators	3 LEDs for status indication
Output Data	Max. dimensions, box volumes, real volumes, angle of rotation, index
Operating Voltage	24 V DC +/- 15%, max. 2 A, 230 V AC (115 V AC)
Housing	Die-cast aluminum
EMC Tests	Acc. to EN 61000-6-2:2001, EN 61000-6-4:2001, etc.
Vibration/Impact Tests	Acc. to EN 60068-2-65, -27, -29, -64
Weight Per Scanner	4.5 kg
Temperature (Operation/Storage)	32…104°F/-4…158°F (0…40°C/-20…70°C)

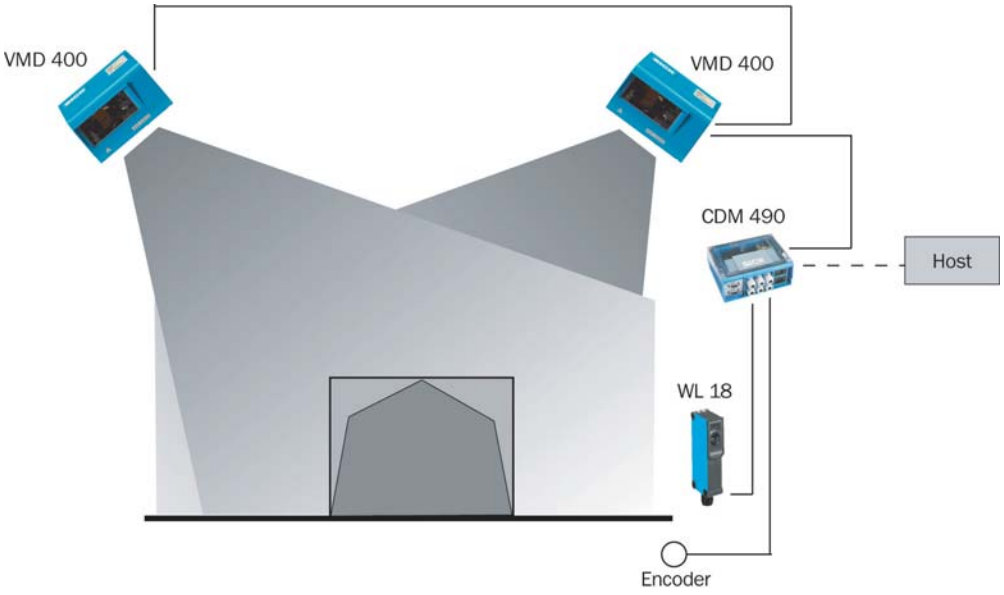
* For complete LMS specifications, please see page 64.

Drawings

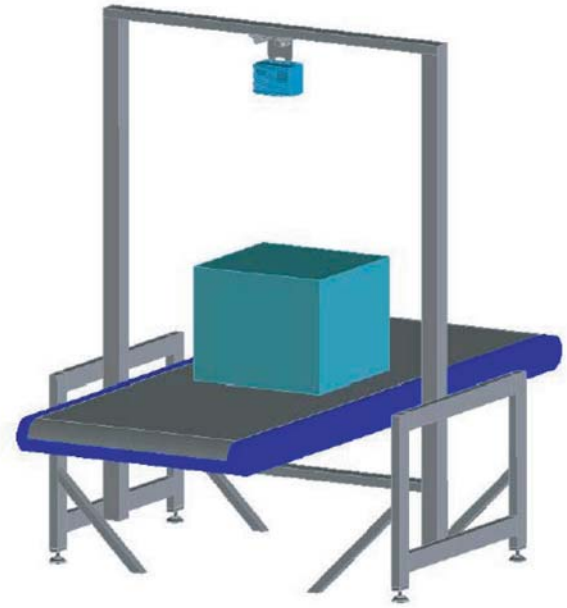
VMS 410/510



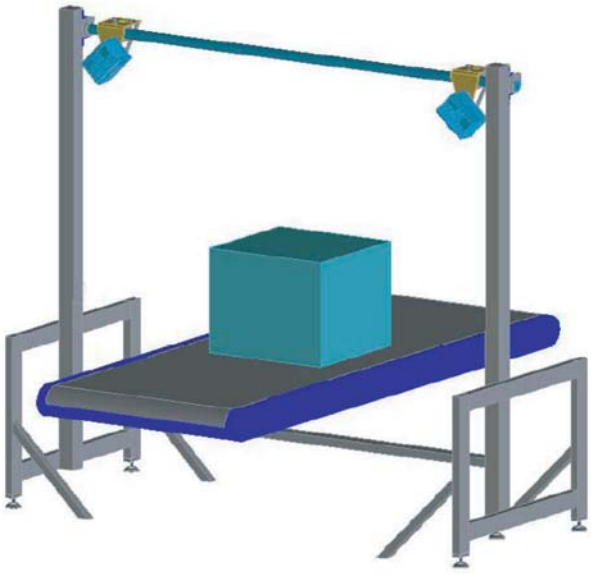
VMS 420/520



Drawings



VMS 410/510



VMS 420/520

CLX 490

CLX 490 Bar Code Scanner

Part Number	Model	Description
1 019 318	CLX 490-0010	Omni Directional / Software Selectable RS 232/422/485
1 019 319	CLX 490-0011	Omni Directional w/Heater / Software Selectable RS 232/422/485

Power Supplies

Part Number	Model	Description
7 027 805	CDB 420-001 KIT	24 V DC required, for use with CLV 420-490, CLX 490, includes Null Modem connector, Y-cable required
1 025 365	CDM 490-0101 DC	For use with CLV 48x-49x, 24 V DC required
1 026 264	CDM 490-0102 AC	For use with CLV 48x-49x, includes 115/230 V AC power, 6 ft US line cord, cannot be used in conjunction with CMD display module
7 028 870	CDM 490-1101 KIT DC	For use with CLV 48x-49x, 24 V DC required, includes CMC cloning module
7 028 871	CDM 490-1102 KIT AC	For use with CLV 48x-49x, includes 115/230 V AC power, 6 ft US line cord, CMC cloning module, cannot be used in conjunction with CMD display module
2 029 466	CMD Display Module	Use with CDM 420 or 490, must be used with a CMC cloning module
1 023 850	CMC 400-101	Cloning module for use with CDx 420-490
7 028 943	CMF 400-1001 Profibus Kit	Profibus communication module kit, use with CDM 410/420/490
7 028 942	CMF 400-2101 Dnet Kit	DeviceNet communication module kit, use with CDM 410/420/490
7 029 481	CDM 490-3101 KIT AC	Ethernet TCP/IP communication module kit, use with CDM 410/420/490
2 030 091	CMP 490 Power Supply	Use with CDM 490
7 020 634	6 ft Line Cable	Power cord for use with CDM 4x0 connection device

Brackets

Part Number	Description
2 022 996	CLX 490 Mounting Bracket

Cables

Part Number	Model	Description
7 026 219	KP-DB15H-3E	15-pin F to 15-pin M, straight through 3 m long cable (PS 56)
7 021 851	KP-DB09-2E	Programming cable, 2 m
2 020 307	KP-DB15/2-DB15-3M-EE	Cloning plug cable, 3 m long, two High Density DB15 connectors
2 020 981	KP-DB15/LEADS-3M-EE	Cloning plug cable, 3 m long, two 15 conductor bare lead cables
2 021 044	KP-DB15-15M-EE	Cloning plug cable, 15 m long, single cable to bare leads (Limited pins)
2 021 298	KP-DB15/DB15-3M-IP65-COLD	Low Temperature cable, 3 m long without EEPROM - use w/ AMV 100
2 021 299	KP-DB15/DB15-10M-IP65-COLD	Low Temperature cable, 10 m long without EEPROM - use w/ AMV 100
2 021 689	KP-DB15/DB15-3M-EE-COLD	Low Temperature cable, 3 m long with EEPROM - use with AMV 100
2 021 208	KP-DB15/BareLeads-10M-COLD	Low Temperature cable, 10 m long bare leads, without EEPROM

Setup Software

Part Number	Model	Description
7 026 126	CLV Setup Software-CD	Windows™-based CLV programming software

OPS Tire

Cables and Connectors

Part Number	Description
2 014 054	OTS/OPS Programming Cable 2m

OTS Components - sold as spares only

Part Number	Description
1 017 866	OTC 400 Tracking Controller
6 020 875	Power Supply (24 V / 10 A) for OTS

OTS Communications Modules and Accessories

Part Number	Description
6 024 931	Ethernet TCP/IP Module - UDS 100 (1 x serial inout to 1 x TCP/IP output)
6 020 893	Profibus DP Module - BMH100111
6 021 188	DeviceNet Module - BMH10-0311
4 037 002	Ethernet Module Bracket (for UDS 100 to mount in OTS cabinet)
2 025 894	Ethernet Module Cable (for UDS 100 to OTC Aux)

Light Bar and Accessories

Part Number	Description
7 029 656	Light Bar (LED) - 4 color (amber, blue green, red) for OTS (24 V DC, 100 mA)
7 029 657	Light Stack (LED) Mounting Bracket

Trigger Devices

Part Number	Description
2 034 693	Light switch WL 18-3P430 incl. reflector, bracket and cable

Encoders *

Part Number	Description
7 029 511	Incremental encoder* (1-10 mm selectable for OPS/ALIS/VMS) RH-240AJ type
7 029 510	Incremental encoder* (8-12 mm selectable for OPS/ALIS) RH-P144AJ type

* Note: Encoder ships with spring tension mounting bracket, 20 ft QD cable

OPS 400

OMNI Directional Scanners

Part Number	Model	Description
1 019 691	OPS400-00	OPS 400 - integrated omni scanner (standard density)
1 019 692	OPS400-20	OPS 400 - integrated omni scanner (high-density)
1 019 693	OPS400-60	OPS 400 - integrated omni scanner (low-density)

Cables and Connectors

Part Number	Description
2 014 054	OTS/OPS Programming cable, 2m

Trigger

Part Number	Model	Description
2 034 693	WL18-3P430	Light switch WL 18-3P430 incl. reflector and cable (1 included with each system)

Encoders *

Part Number	Description
7 029 511	Incremental encoder* (1-10 mm selectable for OPS/ALIS/VMS) RH-240AJ type
7 029 510	Incremental encoder* (8-12 mm selectable for OPS/ALIS) RH-P144AJ type

* Note: Encoder ships with spring tension mounting bracket, 20 ft QD cable

OPS 290/490/360/560

Cables and Connectors

Part Number	Description
2 014 054	OTS/OPS Programming Cable 2m

Mounting Hardware

Part Number	Description
2 032 070	CLV 480/490/OPS Folding Mirror

OTS Components - sold as spares only

Part Number	Description
1 017 866	OTC 400 Tracking Controller
6 020 875	Power Supply (24 V / 10 A) for OTS

OTS Communications Modules and Accessories

Part Number	Description
6 024 931	Ethernet TCP/IP Module - UDS 100 (1 x serial inout to 1 x TCP/IP output)
6 020 893	Profibus DP Module - BMH100111
6 021 188	DeviceNet Module - BMH10-0311
4 037 002	Ethernet Module Bracket (for UDS 100 to mount in OTS cabinet)
2 025 894	Ethernet Module Cable (for UDS 100 to OTC Aux)

Light Bar and Accessories

Part Number	Description
7 029 656	Light Bar (LED) - 4 color (amber, blue green, red) for OTS (24 V DC, 100 mA)
7 029 657	Light Bar (LED) Mounting Bracket

Trigger Devices

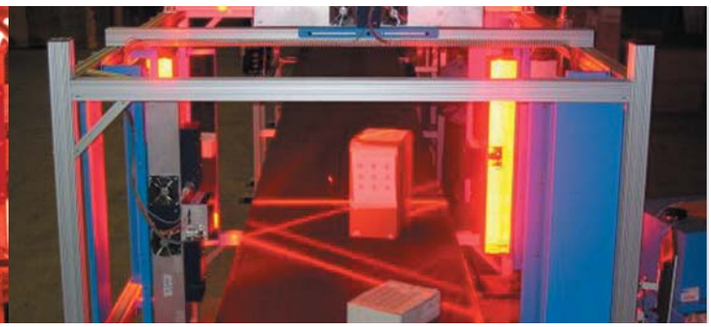
Part Number	Description
2 034 693	Light switch WL 18-3P430 incl. reflector, bracket and cable

Encoders*

Part Number	Description
7 029 511	Incremental encoder* (1-10 mm selectable for OPS/ALIS/VMS) RH-240AJ type
7 029 510	Incremental encoder* (8-12 mm selectable for OPS/ALIS) RH-P144AJ type

* Note: Encoder ships with spring tension mounting bracket, 20 ft QD cable

Modular Vision Systems and Multi-Sided Tunnel Arrays



Features

- Up to six-sided tunnel array configurations
- Linear, 2D codes and OCR decoding capability
- Conveyor speeds up to 600 ft/min
- Constant 150 dpi resolution
- Fiber optic connectivity
- Long life LED illumination
- Dynamic surface tracking
- Sealed for virtually maintenance-free operation – no fans or filters
- No contact dimensioning

SICK's Modular Vision Systems are designed for enterprises requiring complete high-speed scanning and dimensioning capabilities in their warehouses and distribution centers. These systems can be configured for overhead or up to six-sided reading applications.

Modular Vision Systems from SICK are comprised of multiple sealed cameras, LED illumination modules and SICK's LMS 200 non-contact Laser Measurement System for fully automatic dimensioning on singulated items. Each component is virtually maintenance-free and can be replaced within 15 minutes. Reliable fiber optic connectivity between the decoder PC and camera provides greater application flexibility with a range up to 1500 feet. And, since the system operates over a network, no multiplexing PC is required when using multiple cameras.

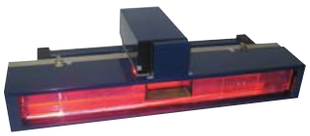
Flexible configuration options provide depth of field up to 55 inches on conveyors up to 44 inches. High, constant image resolution (150 dpi) and the industry's highest line rate in a linear CCD (up to 23 kHz) provide the highest possible read rates in high-speed applications. Modular Vision Systems are OCR and VCS ready and reliably decode the toughest linear and 2D codes.

For more information about Modular Vision Systems contact your SICK Sales Representative or authorized agent.

Product Overview

MVS 5500
Top and Side Read Cameras

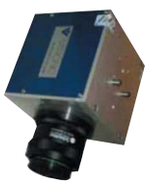
pg. 150



- Low-power solid state design
- Luxeon LED illumination modules
- Fresnel lens design
- 600+ ft/min speed
- OCR quality images
- Exceptional lifetime
- Low annoyance factor
- No fans or filters

MVS 5100
Bottom Read Camera

pg. 148



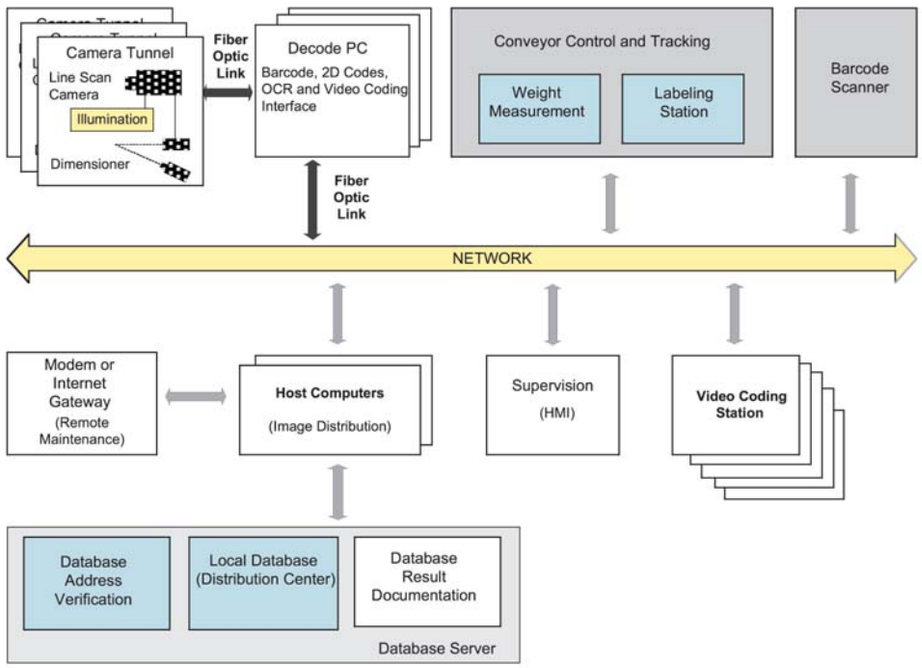
- Bottom Read camera
- Fixed Focus camera system
- Depth of focus of +/- 1”
- Image is digitized in camera
- Digital fiber optic interface to decode PC (up to 1500 ft)
- Virtually maintenance free - sealed
- Line scan frequency up to 23 kHz
- Bandwidth to PC: 2 x 125 MB/s

LMS 200
Dimensioning System

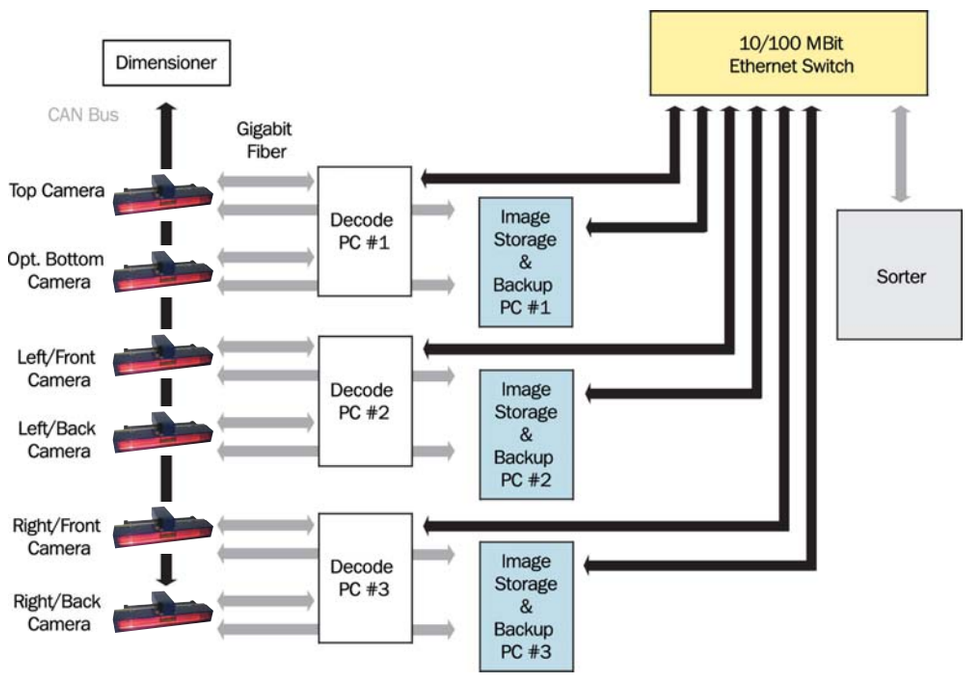
pg. 154

- Non-contact measurement technology
- Real-time processing for all transport speeds
- Effective on all surfaces, textures and colors
- Self-monitoring functionality
- No human supervision required
- Virtually maintenance-free
- IP 65 sensors, SICK standard components
- Laser Class 1 (eye-safe)
- Optional certified version (OIML R129)

Open System Architecture



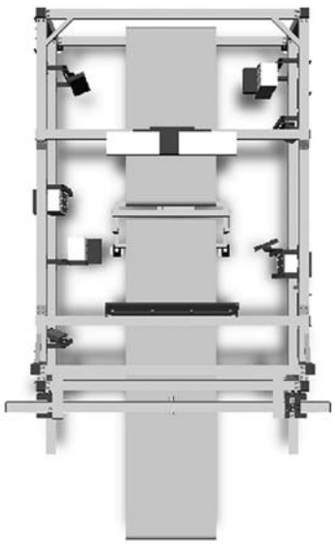
Camera Tunnel Block Diagram



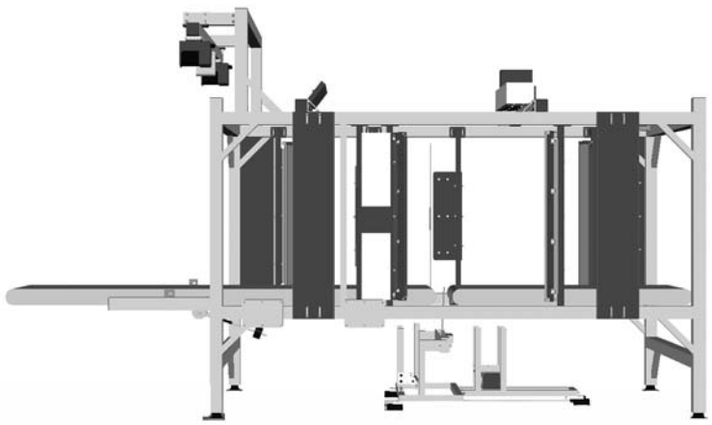
Standard 5-Sided System Drawings

front view

top view



side view



MVS 5100
Modular Vision System

Features

- Bottom Read camera
- Fixed Focus camera system
- Depth of focus of +/- 1 inch
- Digital fiber optic interface to decode PC (up to 1500 ft)
- Sealed for virtually maintenance-free operation – no fans or filters
- Line scan frequency up to 23 kHz
- Bandwidth to PC 2 x 125 MB/s
- Image is digitized in camera

The MVS 5100 from SICK is a Modular Fixed Focus camera system designed for most linear bar code, 2D code and OCR applications requiring a limited depth of field. It offers unsurpassed scanning speeds and image quality in a compact design.

Equipped with Fixed Focus and a fiber optic interface, these cameras can be used in a variety of installations, including simple scan applications (parcels, smalls, flats, letters, etc.) and cutting edge OCR and Telecoding solutions.

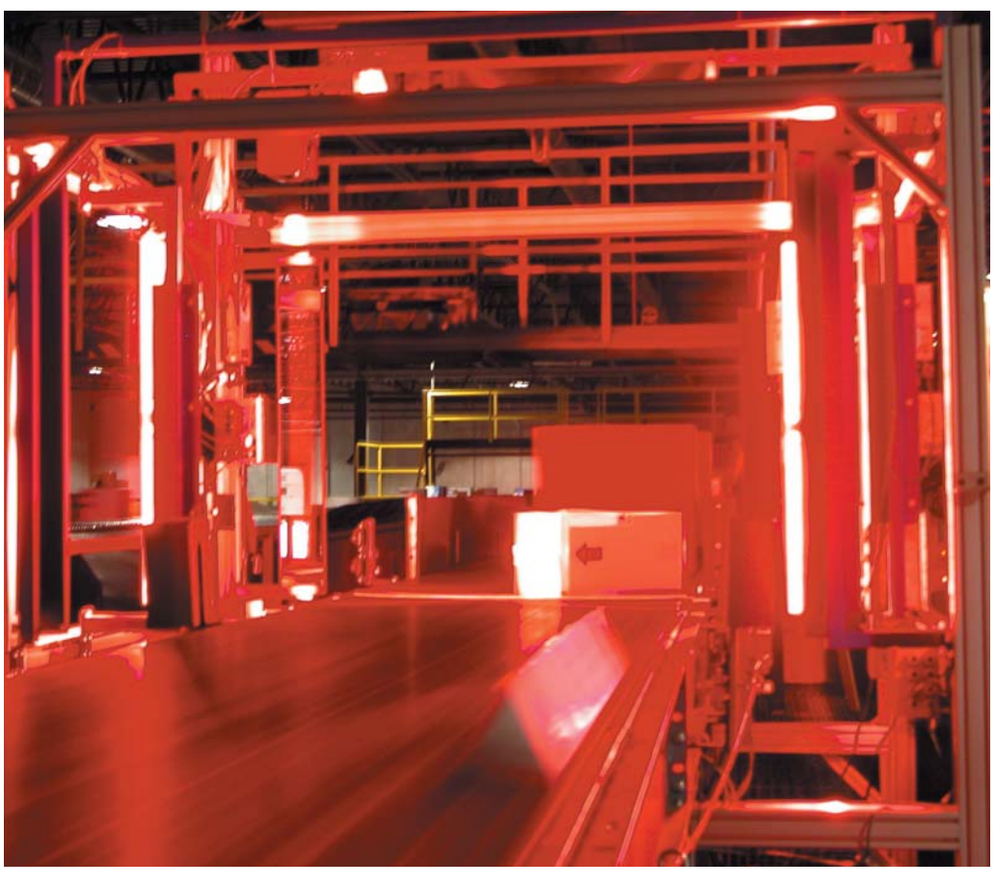
With Fixed Focus, the camera is able to continuously cover a depth of field up to 6 inches, allowing it to scan singulated parcels of similar heights. It is the ideal solution for sophisticated OCR applications, providing resolution up to 250 dpi. Illumination for the MVS 5100 is provided by available LEDs.

In contrast to other cameras, the pixel digitization takes place inside the camera. The image is then digitally transmitted to the processing unit (“Decode PC”) through a fiber optic interface to maintain image integrity. In addition, the Decode PC can be located up to 1500 feet away in a remote, secured environment, for optimal system control.

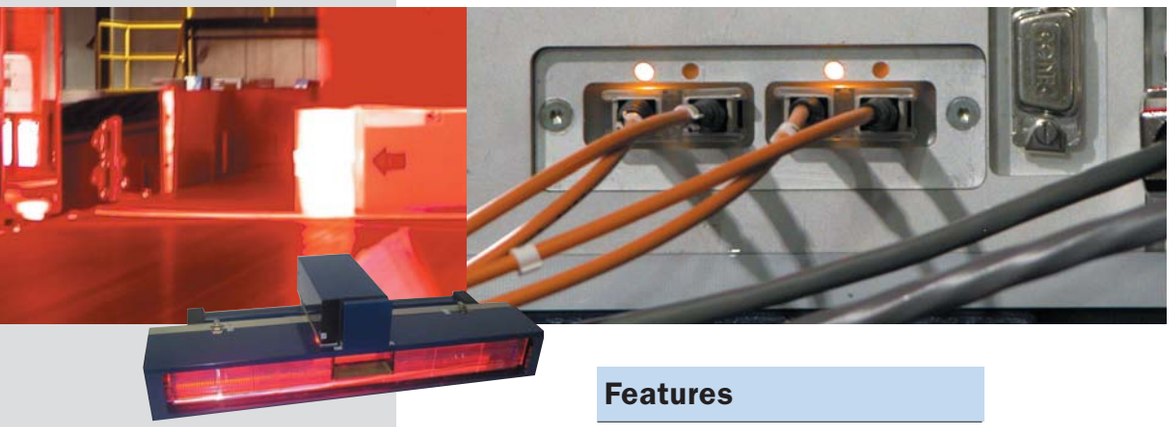
With no moving parts and a durable case, the MVS 5100 cameras are virtually maintenance-free. In fact, the camera housing is completely sealed (no fan or vents) so it can be installed in the harshest environments with confidence.

Technical Specifications

	MVS 5100
Lens	2.0 in (50 mm)
Pixel Frequency	Up to 160 MHz
Line Scan Frequency	min: 2 kHz; max: 23 kHz
Sensor Sensitivity	130 klux
Image Width	Application dependent
Resolution	Up to 250 dpi (0.10 mm, 4 mil)
Interfaces	CAN bus, Parallel I/O port, Gigabit Interface (fiber optic)
Bandwidth GigaBit Interface	Single port: 125 MB/s; Dual port: 250 MB/s or 2 x 125 MB parallel
Power Consumption	115 V AC / 1 A
Dimensions (L x W x H)	6.1 x 5.1 x 4.0 in (155 x 130 x 110 mm)



MVS 5500
Modular Vision System



Features

- Low-power solid state design
- Luxeon LED illumination modules
- Fresnel lens design
- Conveyor speeds up to 600 ft/min
- OCR quality images
- Exceptional lifetime
- Low annoyance factor
- No fans or filters

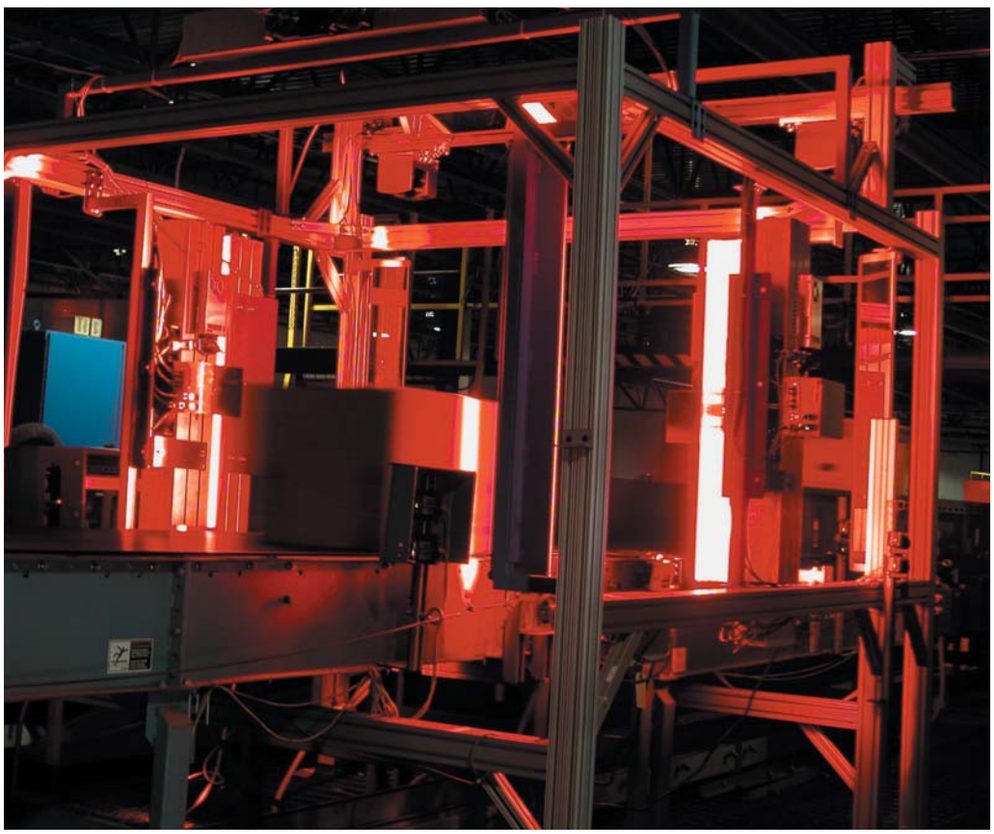
The MVS 5500 Modular Auto Focus Vision System from SICK is designed for most linear bar code, 2D code and OCR applications. The camera offers unsurpassed performance and image quality in a compact design, even at the highest conveyor speeds. One- to six-sided tunnel configurations are available for virtually any type of parcel sorting application.

Equipped with Auto Focus, LED illumination and a fiber optic interface, these cameras can be used in a variety of installations, from simple scan applications (parcels, smalls, flats, letters, etc.) to volume measurement and clear area detection to cutting-edge OCR and Telecoding solutions.

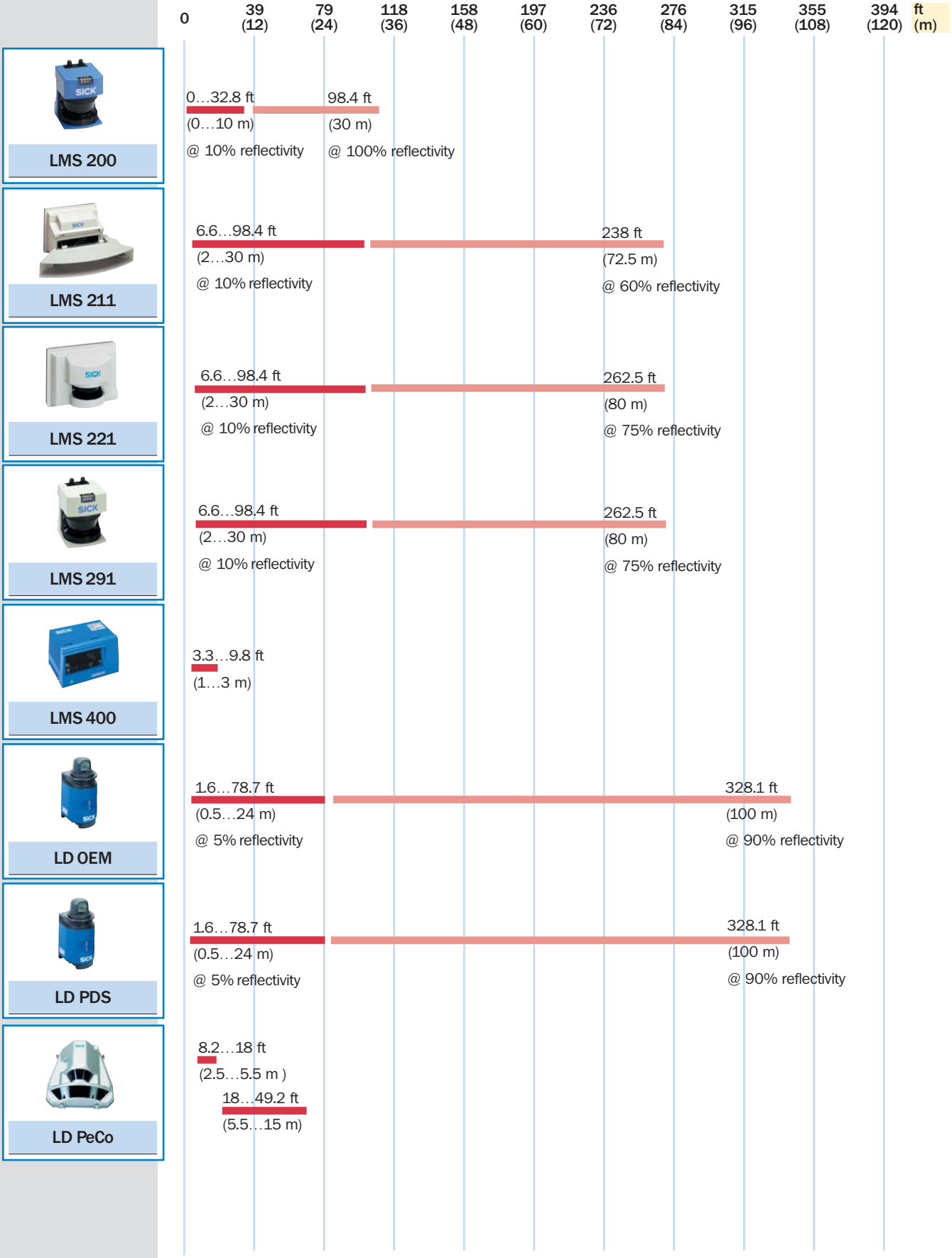
The fast Auto Focus unit of the camera is able to quickly cover a large depth of field (up to 55 inches) within milliseconds, allowing it to scan singulated parcels of different heights. In multi-sided tunnel applications, our delivered solutions are capable of providing industry leading image resolution. Further, the MVS system architecture offers the advantage of reliable bar code reading independent of package rotation. This unique capability increases throughput and reading accuracy to boost productivity in any environment.

Technical Specifications

	MVS 5500
Auto Focus Region	63…110 in (1600…2794 mm)
Lenses	41 in (105 mm); 5.3 in (135 mm) (optional)
Pixel Frequency	Up to 160 MHz
Line Scan Frequency	min: 2 kHz; max: 23 kHz
Sensor Sensitivity	130 klux
Image Width	At 110 in (2794 mm): 33.5 in (851 mm) At 74 in (1880 mm): 22.5 in (572 mm)
Resolution	At 110 in (2794 mm): 180 dpi (0.14 mm, 5.5 mil) At 74 in (1880 mm): > 250 dpi (0.10 mm, 4 mil)
Interfaces	CAN bus, Parallel I/O port, Gigabit Interface (fiber optic)
Bandwidth GigaBit Interface	Single port: 125 MB/s; Dual port: 250 MB/s or 2 x 125 MB parallel
Power Consumption	115 V AC / 3 A
Dimensions (L x W x H)	40 x 8.5 x 9.5 in (1016 x 215.9 x 241.3 mm)



Introduction



	Aperture Angle (Field of View)	Measurement Resolution	Accuracy (System Error)	Enclosure Rating	Data Interface	Scanning Frequency	Page
LMS 200	180°	10 mm	±0.6 in (±15 mm)	IP 65	RS 232, RS 422 (up to 500)	75 Hz	154
LMS 211	100°	10 mm	±1.38 in (±35 mm)	IP 67	RS 232, RS 422 (up to 500)	75 Hz	154
LMS 221	180°	10 mm	±1.38 in (±35 mm)	IP 67	RS 232, RS 422 (up to 500)	75 Hz	154
LMS 291	180°	10 mm	±1.38 in (±35 mm)	IP 65	RS 232, RS 422 (up to 500)	75 Hz	154
LMS 400	70°	1 mm	0.16 in (4 mm)	IP 65	RS 232, RS 422, Ethernet TCP/IP	150…500 Hz	162
LD OEM	360°	3.9 mm	0.99 in (25 mm)	IP 40/IP 65	RS 232, RS 422, CAN, Ethernet TCP/IP (up to 115)	5…20 Hz	168
LD PDS	360°	3.9 mm	0.99 in (25 mm)	IP 40/IP 65	RS 232, RS 422 (up to 19.2)	5…20 Hz	168
LD PeCo	90°	N/A	N/A	IP 40	RS 232, RS 422 (up to 19.2)	10 Hz	168

LMS 200/211/221/291
Laser Measurement System Sensor

Features*

- Wide 180° field of view
- Long range – up to 262 ft (80 m)
- Contact-free measurement
- Target objects require no reflectors or markings
- High (75 Hz) scanning frequency
- Transfer of measurement data in real-time
- Active system, no illumination of target objects necessary
- Measurements possible over long distances
- IP 67 enclosure
- Three programmable monitoring fields
- RS 232/RS 422 (up to 500 kBd)
- Three internally or externally powered relay outputs

Our non-contact Laser Measurement System LMS Sensors can be used for standard applications involving measurement of objects and position determination, monitoring areas, vehicle guidance and collision control.

The technology used in the LMS Sensor is based on time-of-flight measurement. An extremely short pulse of light (infrared laser beam) is transmitted towards an object. Part of the light is reflected back to the unit a fraction of a second later. A rotating mirror deflects the pulsed light beam across the entire field of view. The precise direction is given by an angular sensor on the mirror (laser RADAR).

The primary function of the LMS 200 series is to offer accurate distance measurement throughout the 180° scanning field. Within this field, the LMS can be programmed to monitor multiple zones. These zones can then be assigned to three solid state relay outputs of the LMS or the LMS can transmit distance values via an RS 232 or high-speed RS 422 serial port. The receiving host system can then use this data for specific applications.

The LMS 200 Series Sensors can be used in various industries. Using the three relay outputs, crane collisions can be prevented or open spaces can be monitored for building security. Typical measurement applications include determining the volume and position of objects or autonomous robot navigation.

*not all features available on all models

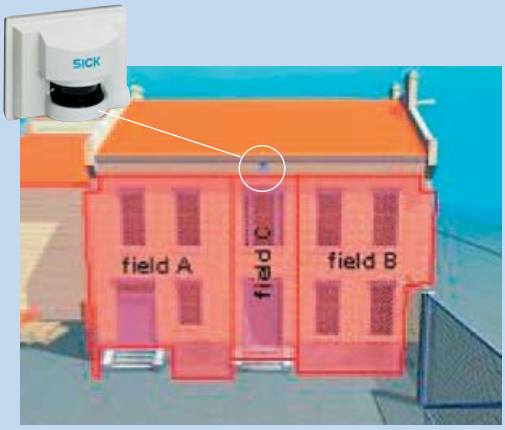
Application: Facade Surveillance

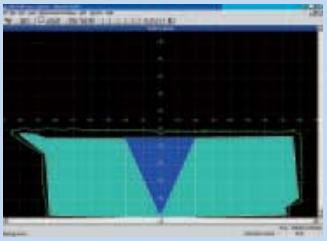
The LMS 2xx Series Sensor is used successfully in several applications throughout the world, to provide continuous 24/7 surveillance of building facades, roofs and perimeters against intrusions.

Government offices, historical sites, jails and museums are examples of buildings, which must be protected against intrusions.

When protecting a facade using the LMS 2xx Series, users are relying on a relentless guardian, which will never lower its level of attention to preventing unauthorized intrusion to the premises. One LMS 2xx Series Sensor can monitor a 31,000 square foot area.

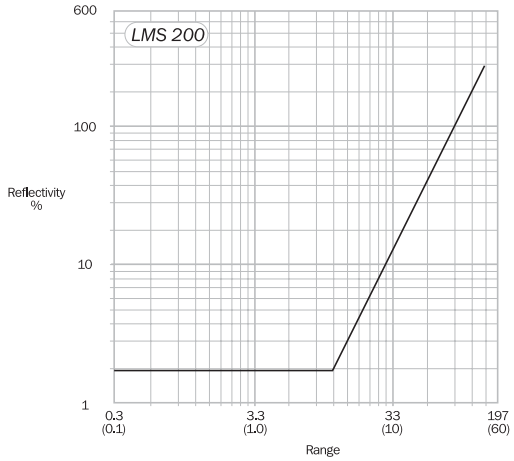
The configuration software allows three alarm fields to be defined, so that in case of intrusion, the infiltrated zone can be determined immediately. The ground level or another fixed feature can be used by the LMS to continuously monitor the functionality of the scanning system.



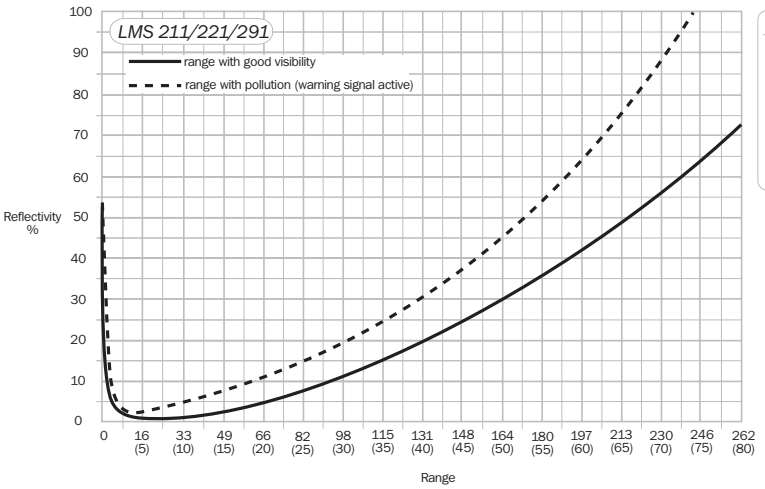


Measurement Ranges

Dimensions in feet (m)



Material	Reflectivity
Cardboard, matte black	10%
Cardboard, grey	20%
Wood (raw pine, dirty)	40%
PVC, grey	50%
Paper, matte white	80%
Aluminum, anodized, black	110…150%
Steel, rust-free shiny	120…150%
Steel, very shiny	140…200%
Reflectors	> 2000%



Material	Reflectivity
Cardboard, matte black	10%
Cardboard, grey	20%
Wood (raw pine, dirty)	40%
PVC, grey	50%
Paper, matte white	80%
Aluminum, anodized, black	110…150%
Steel, rust-free shiny	120…150%
Steel, very shiny	140…200%
Reflectors	> 2000%

Technical Specifications

	LMS 200	LMS 211	LMS 221	LMS 291
Scanning Characteristics				
Range @ 10% reflectivity	0…32.8 ft (0…10 m)	6.6…98.4 ft (2…30 m)	6.6…98.4 ft (2…30 m)	6.6…98.4 ft (2…30 m)
Scanning Frequency	75 Hz			
Angular Resolution (user-selectable)	0.25°[1]/0.5°/1.0°			
Response Time (at user-selected angular resolution)	53 ms @ 0.25°/26 ms @ 0.5°/13 ms @ 1.0°			
Measurement Resolution	0.4 in (10 mm)			
System Error (environmental conditions good visibility, Ta = 73°F (23°C), reflectivity 10…10,000%)	Typ. ± 0.6 in (15 mm) (mm-mode), range 3.2…26.2 ft (1…8 m) Typ. ± 1.57 (4 cm) (cm-mode), range 3.2…65.6 ft (1…20 m)[2]	Typ. ± 1.37 in (35 mm) (mm-mode), range 3.2…65.6 ft (1…20 m) Typ. ± 1.96 in (5 cm) (cm-mode), range 3.2…65.6 ft (1…20 m)		
Statistical Error, Standard Deviation (1 sigma)	Typ. 0.2 in (5 mm) (mm-mode) (at range ≤ 8 m/≥ 10% reflectivity/≤ 5 klux)[2]	Typ. 0.4 in (10 mm) (mm-mode) (at range 1…20 m/≥ 10% reflectivity/≤ 5 klux)		
Mechanical/Electrical				
Data Interface	RS 232/RS 422 (configurable)			
Transfer Rate	9.6/19.2/38.4/500 kBd (RS 422 only)			
Switching Outputs	3 x PNP; typ. 24 V DC; OUT A, OUT B max.250 mA, OUT C max. 100 mA			
- S07 relay variants	OUT A, OUT B (relay) max. switching voltage 48 V DC/26 V AC (protected low voltage, safe isolation from mains) max, switching current 0.7 A; max. switching power 30 W OUT C/weak (PNP) typ. 24 V DC, max. 100 mA			
Supply Voltage (scanner-electronics)	24 V DC ± 15% (max. 500 mV ripple) current requirement max. 1.8 A (including output load)			
with integral heater	24 V DC ± 15 % (max. 6 V ripple) current requirement max. 6 A (cyclic)			
Power Consumption	Approx. 20 W (without output load), approx. 140 W (with heater)			
Enclosure Rating	IP 65	IP 67	IP 67	IP 65
Weight	Approx. 9.9 lb (4.5 kg)	approx. 19.8 lb (9 kg)	approx. 19.8 lb (9 kg)	approx. 9.9 lb (4.5 kg)
Electrical Protection Class	Safety insulated, protection class 2			
Laser Protection Class	Class 1 (eye-safe)			
Interference Resistance	Acc. to IEC 801, part 2-4; EN 50081-1/50082-2			
Environmental				
Ambient Operating Temperature	32…122°F (0…50°C)	-22…122°F (-30…50°C)	-22…122°F (-30…50°C)	32…122°F (0…50°C)
Storage Temperature	-22…158°F (-30…70°C)			
Vibration Fatigue Limit	Acc. to IEC 68 part 2-6, table 2c, frequency range 10…150 Hz, amplitude 0.35 mm or 5 g single impact IEC 68 part 2-27, table 2, 15 g/11 ms permanent vibration IEC 68 part 2-29, 10 g/16 ms Shock absorbers are recommended for heavy vibration and impact demands			

1) Angular resolution 0.25° not possible in the monitoring fields mode

2) Also applicable to -30106 suffix variants

Models and Part Numbers

	LMS 200	LMS 211[1]	LMS 211	LMS 211[1]
Model	LMS 200-30106	LMS 211-30106	LMS 211-30206	LMS 211-S07
Part Number	1 015 850	1 025 629	1 018 023	1 018 966
Enclosure Rating	IP 65	IP 67	IP 67	IP 67
Range	0…32.8 ft	0…32.8 ft	0…98.4 ft	0…98.4 ft
Field of View	180°	100°	100°	100°
Integral Heater		■	■	■
Fog Correction			■	■
Fast Variant[3]				
Relay Output Variant				■

	LMS 211[1]	LMS 211[1] [2]	LMS 221	LMS 221
Model	LMS 211-S14	LMS 211-S15	LMS 221-30106	LMS 221-30206
Part Number	1 025 487	1 026 225	1 015 945	1 018 022
Enclosure Rating	IP 67	IP 67	IP 67	IP 67
Range	1…98.4 ft	1…98.4 ft	0…32.8 ft	1…98.4 ft
Field of View	90°	100°	180°	180°
Integral Heater	■	■	■	■
Fog Correction	■	■		■
Fast Variant	■			
Relay Output Variant				

	LMS 221[1]	LMS 221[1]	LMS 221[1] [2]	LMS 291
Model	LMS 221-S07	LMS 221-S14	LMS 221-S15	LMS 291-S05
Part Number	1 018 965	1 025 328	1 026 224	1 018 028
Enclosure Rating	IP 67	IP 67	IP 67	IP 65
Range	1…98.4 ft	1…98.4 ft	1…98.4 ft	1…98.4 ft
Field of View	180°	90°	180°	180°
Integral Heater	■	■	■	
Fog Correction	■	■	■	■
Fast Variant		■		
Relay Output Variant	■			

	LMS 291[1]	LMS 291[1]
Model	LMS 291-S14	LMS 291-S15
Part Number	1 025 359	1 026 226
Enclosure Rating	IP 65	IP 65
Range	1…98.4 ft	1…98.4 ft
Field of View	90°	180°
Integral Heater		
Fog Correction	■	■
Fast Variant	■	
Relay Output Variant		

1) Non-standard product

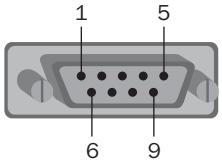
2) For use with LMI 400 product only

3) Fast variants have a fixed 90° field of view and 13.3 ms timebase and no field detection capabilities

NOTE: Accessories information is located on pages 186 - 187.

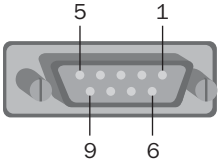
Electrical Connections

LMS 200/291 interface plug



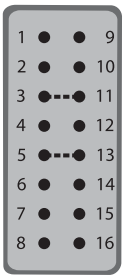
Pin	Signal RS 232	RS 422
1	NC	RxD-
2	RxD	RxD+
3	TxD	TxD+
4	NC	TxD-
5	GND	GND
6	NC	NC
7	NC	jumpered
8	NC	RS 422
9	NC	NC

LMS 200/291 power supply plug



Pin	Signal
1	GND_EXT (earth)
2	Restart
3	VCC_EXT (24 V DC ± 15%)
4	NC
5	OUT C/weak signal
6	NC
7	NC
8	OUT B
9	OUT A

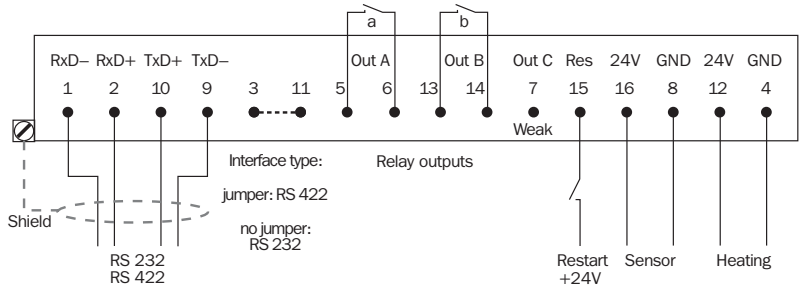
LMS 211/221
16-pin connector



Pin	Function
1	RxD- RS 232, RS 422
2	RxD+ RS 232, RS 422
3	RS 422 interface jumper[1)]
4	Heater/motor flap GND
5	Flap controls
6	Not wired
7	Weak/out c
8	Scanner GND
9	TxD- RS 232, RS 422
10	TxD+ RS 232, RS 422
11	RS 422 interface jumper[1)]
12	Do not use
13	OUT A
14	OUT B
15	Restart
GND	Sensor 24 V DC

1) If no jumper is present, communication is RS 232

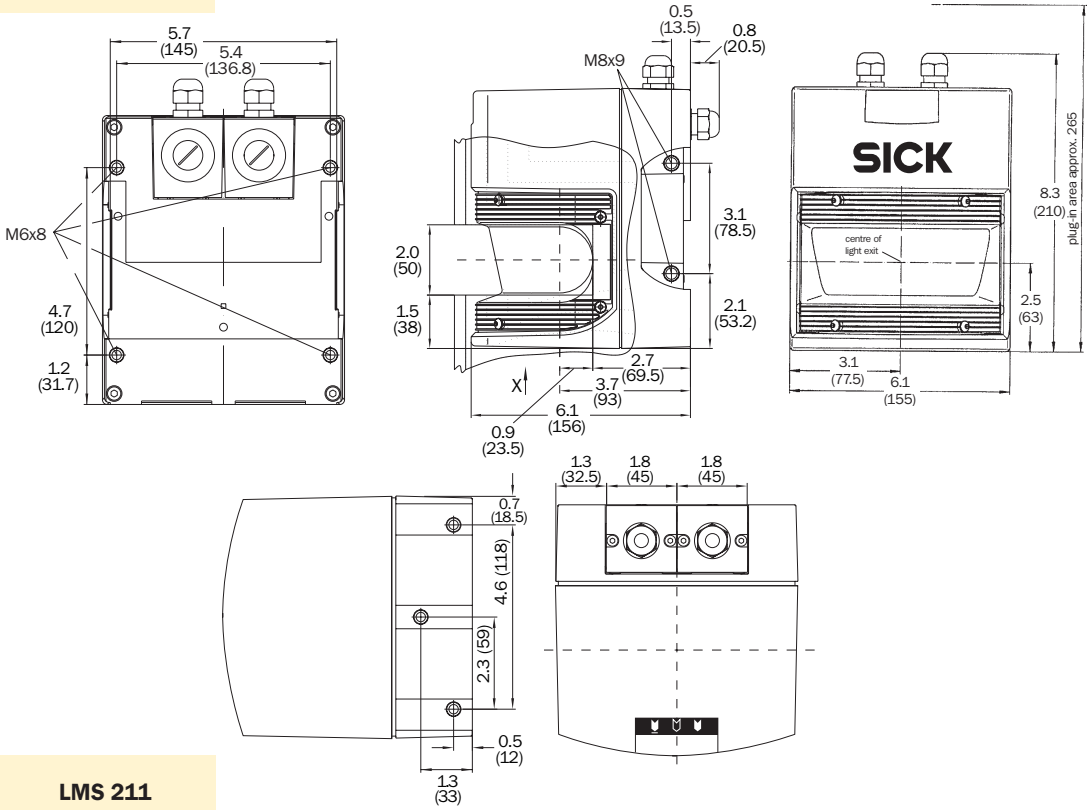
LMS 211/221 relay output variant
(-S07 suffix)



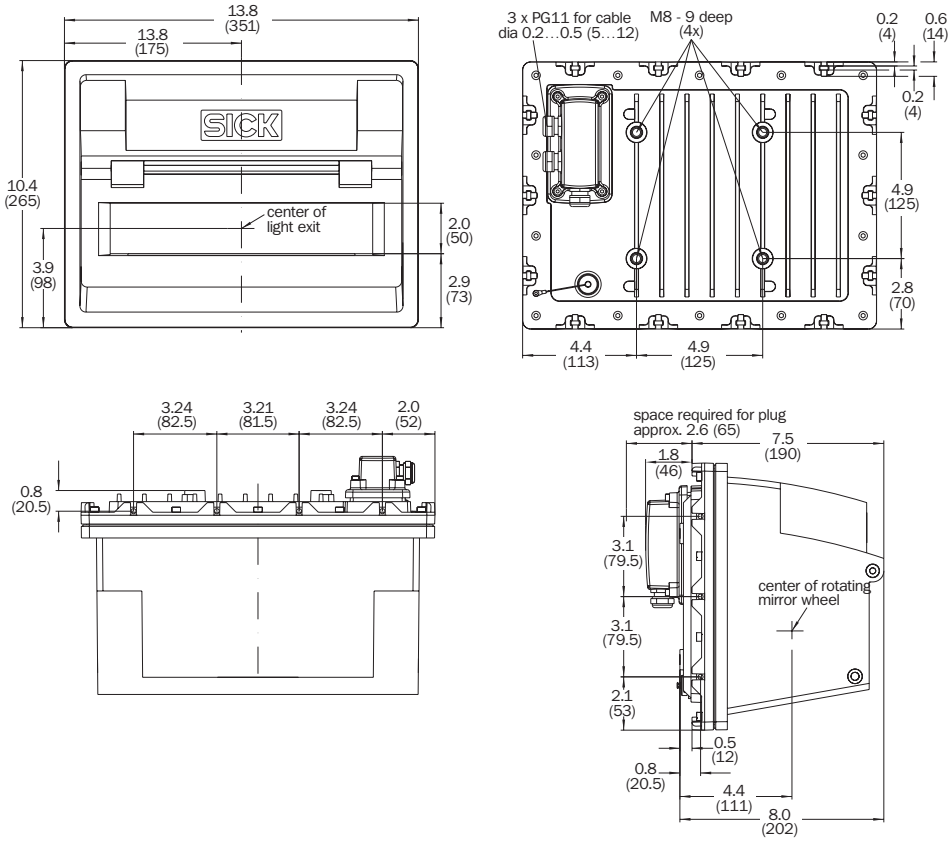
Drawings

Dimensions in inches (mm)

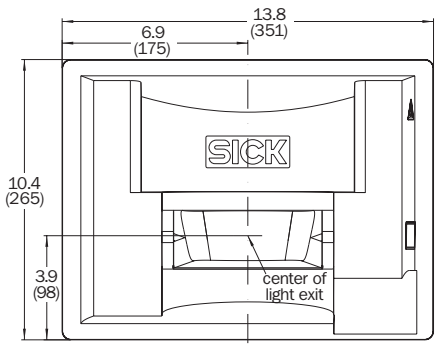
LMS 200/291

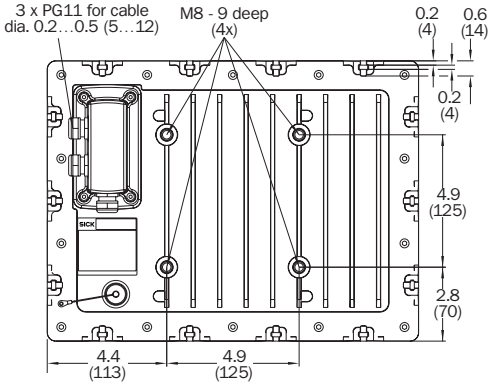


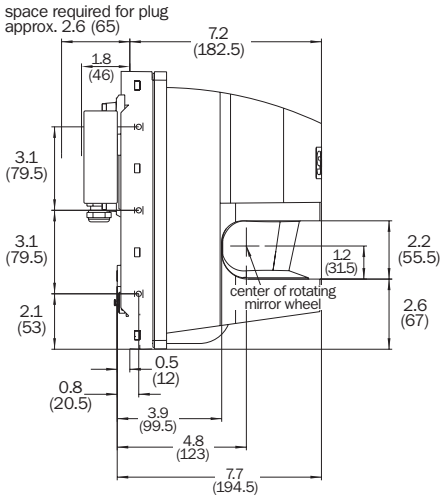
LMS 211

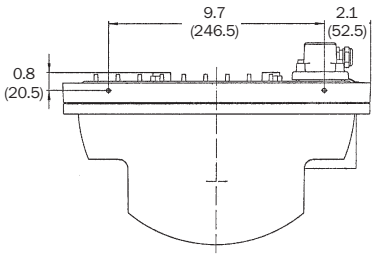


LMS 221


13.8
(351)
6.9
(175)
10.4
(265)
3.9
(98)
center of
light exit


3 x PG11 for cable
dia. 0.2…0.5 (5…12)
M8 - 9 deep
(4x)
0.2
(4)
0.6
(14)
0.2
(4)
4.9
(125)
2.8
(70)
4.4
(113)
4.9
(125)


space required for plug
approx. 2.6 (65)
7.2
(182.5)
1.8
(46)
3.1
(79.5)
3.1
(79.5)
2.1
(53)
1.2
(31.5)
2.2
(55.5)
2.6
(67)
center of rotating
mirror wheel
0.5
(12)
0.8
(20.5)
3.9
(99.5)
4.8
(123)
7.7
(194.5)


9.7
(246.5)
2.1
(52.5)
0.8
(20.5)

LMS 400
Laser Measurement System Sensor

Features

- 70° field of view
- Highly precise measurement up to 9.8 ft (3 m)
- Rapid processing and short cycle times
- Simple installation and configuration
- High resolution
- Reflectivity information available
- IP 67 construction
- Ethernet output connectivity

The world of material handling, logistics and manufacturing faces new challenges every day. Increasing quantities of goods must be transported and processed in quick turnaround times. The LMS 400 provides a measurement solution with high scanning rates, comprehensive process reliability and improved measurement resolution for close range applications.

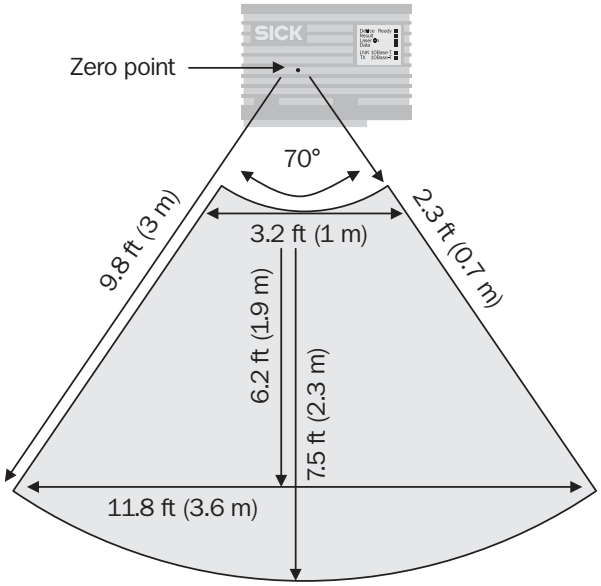
The LMS 400 Sensor is designed for applications with high resolution demands for measuring ranges up to 9.8 feet. High scanning rates enable the measurement of objects moving at high speeds.

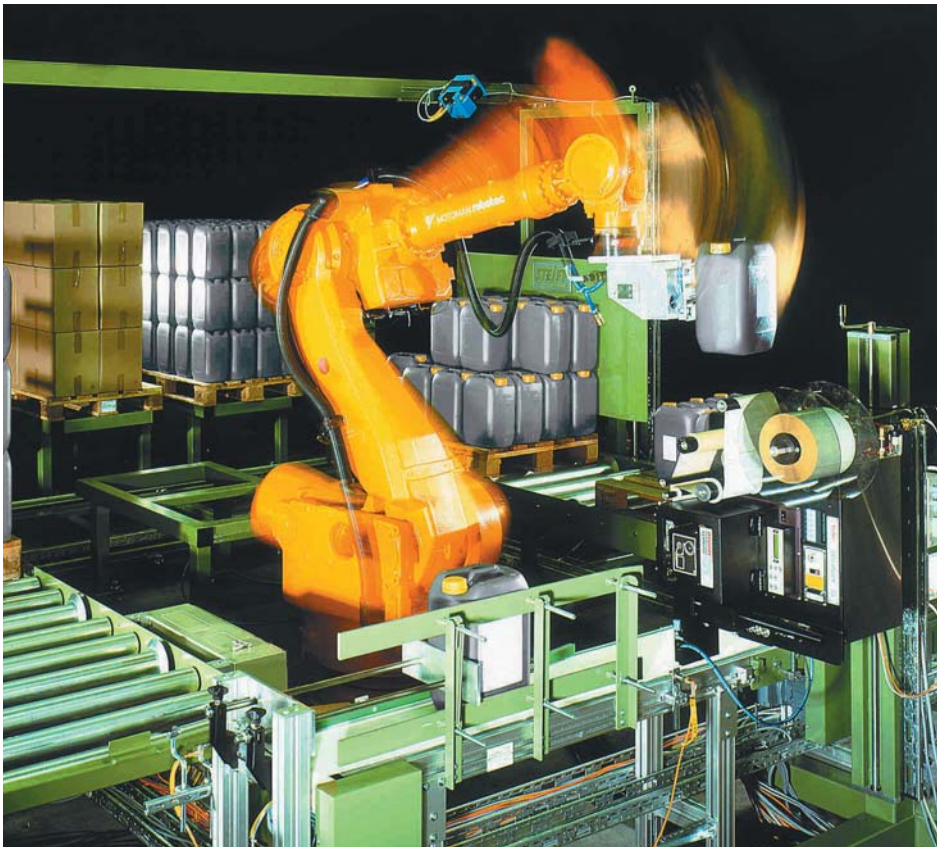
With the use of patented Frequency Signal Processing (FSP), which uses phase-shift (continuous wave) measurement, the LMS 400 is capable of detecting even the smallest of details at high speed. The propagation time of the light and the wavelength used, result in a phase shift between the beam sent and the beam received. This phase difference is converted to a frequency. The sensor determines the distance of the object from the origin based on this frequency.

System Requirements

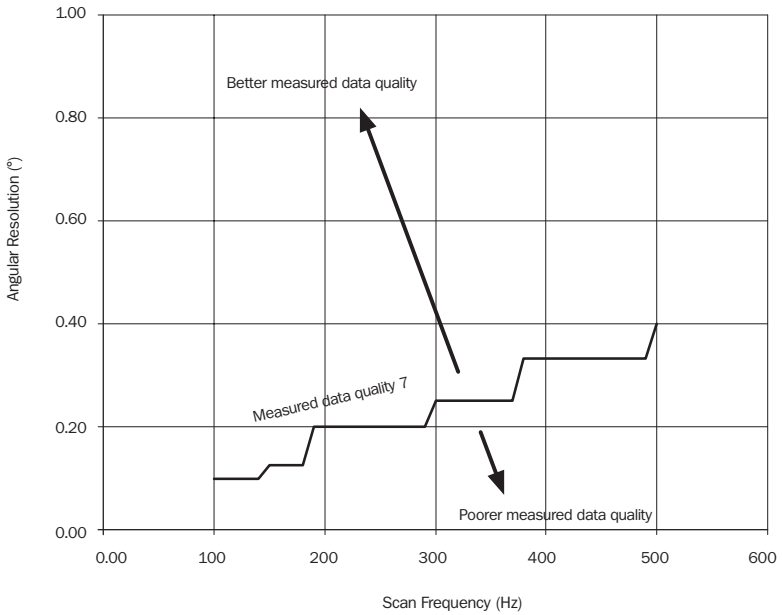
The maximum working range of the LMS 400 is 9.8 ft (3 m). The closest permitted distance of the measurement object from the zero point of the LMS 400 is 2.3 ft (0.7 m). The zero point is marked both on the top and underside of the housing.

The working area of the LMS 400 covers an angle of 70° and must have a clear view of the object to be measured.





Measurement Ranges



Note: The LMS 400 SOPAS configuration software helps users to effectively balance angular resolution and scan frequency requirements. A minimum measured data quality value of seven is required to perform at published technical specifications. For any application, lower angular resolution and higher scan frequency values are desired.

Technical Specifications

	LMS 400-0000	LMS 400-1000
Scanning Characteristics		
Range	2.3…9.8 ft (0.7…3 m)	
Angular Resolution	0.1…1° (user-selectable)	0.25…1° (user-selectable)
Angular Error	± 0.1°	
Field of View	Maximum 70°	
Scan Frequency	150…500 Hz	360…500 Hz
Required Object Remission[1)]	10…200%	6.5…200%
Display Indicators	6 x LED	
Laser Diode (wavelength)	Visible light (λ = 650 nm)	
System Error [2)]	± 0.15 in (4 mm)	
Statistical Error [2)]	± 0.23 in (6 mm) (depending on remission and distance)	
Mechanical/Electrical		
Host Data Interface	RS 232, RS 422, Ethernet	
Supply Voltage	24 V DC ± 15%	
Power Consumption	Maximum 25 W	
Electrical Protection Class	IP 65 (with plug cover)	
Laser Protection Class	Class II	
Enclosure Rating	IP 20 (according to DIN 40050)	
Housing	Aluminum die cast	
Environmental		
Ambient Operating Temperature	32…104°F (0…40°C)	
Storage Temperature	-4…158°F (-20…70°C)	
EMC	In compliance with EN 61000-6-2:2001, EN 61000-6-4:2001	
Vibration/Shock	In compliance with EN 60068-2-6, -27, -29, -64	
Weight	Approx. 5 lb (2.3 kg)	

1) The information applies with the following boundary conditions:
• Room temperature. The LMS has been switched on for at least two hours
• Measuring distance, operating temperature and object remission must be inside the specified range
• The intensity of light from external sources is ≤ 2 kLux

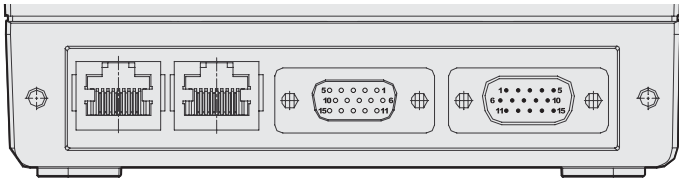
2) The remission is the capability of a material to reflect the light back. The remission value expresses the signal strength with different object surfaces

Models and Part Numbers

Model	LMS 400-0000	LMS 400-1000
Part Number	1 023 925	1 027 897
Scan Frequency	150…500 Hz	360…500 Hz
Required Object Remission	10…200%	6.5…200%

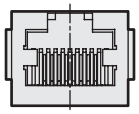
NOTE: Accessories information is located on page 188.

Electrical Connections



Connection	Type	Function
Ethernet	RJ-45	TCP/IP communication, exchange of messages
System	RJ-45	Synchronization master/slave
I/O	D-Sub	Connection of external sensors, supply voltage
Serial	D-Sub	Serial communication, exchange of messages, supply voltage

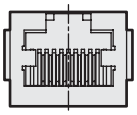
Ethernet Connection



Pin	Signal	Function
1	TPOP	Ethernet interface
2	TPON	Ethernet interface
3	TPIP	Ethernet interface
4	Not assigned	-
5	Not assigned	-
6	TPIN	Ethernet interface
7	Not assigned	-
8	Not assigned	-

A common Cat.5 patch cable is suitable for the connection

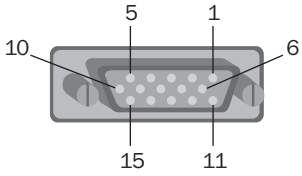
System Connection



Pin	Signal	Function
1	FSIOP	Synchronization master/slave
2	FSION	Synchronization master/slave
3	FSIIP	Synchronization master/slave
4	Not assigned	-
5	Not assigned	-
6	FSIIN	Synchronization master/slave
7	Not assigned	-
8	Not assigned	-

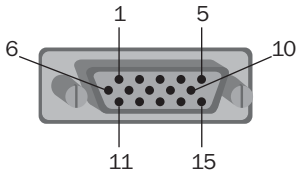
A common Cat.5 crossover cable is suitable for LMS 400 master and slave configurations

I/O Connection



Pin	Signal	Function
1	V_S	Supply voltage LMS 400
2	SENSORS3_EXT In3	Digital input 3 (trigger)
3	SENSOR1_EXT In1	Digital input 1 (trigger)
4	Reserved	Do not use!
5	GND	Ground LMS 400
6	SENSORS2_EXT	Digital input 2 (rotary encoder)
7	SENSORS4_EXT	Digital input 4 (rotary encoder)
8	Reserved	Do not use!
9	SENS_GND	Ground digital inputs
10	Reserved	Do not use!
11	Reserved	Do not use!
12	Reserved	Do not use!
13	Reserved	Do not use!
14	Reserved	Do not use!
15	Reserved	Do not use!
Housing	-	Screen/Earth

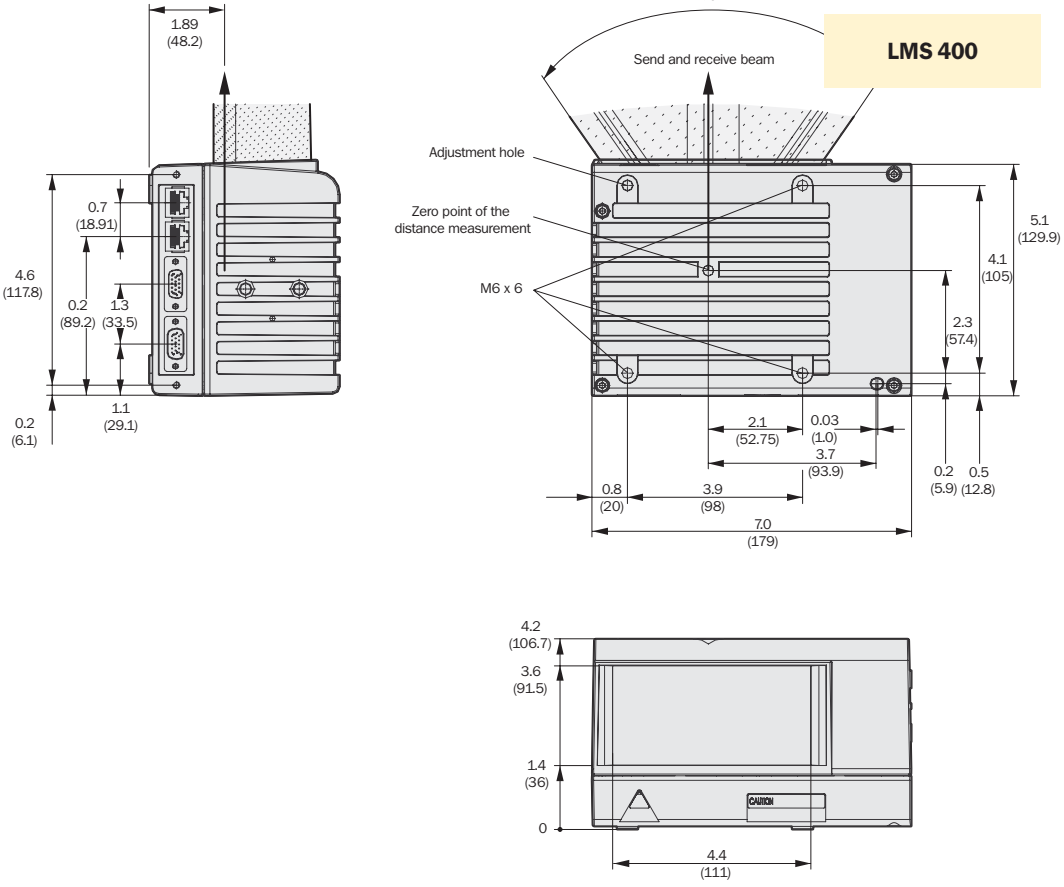
Serial Connection



Pin		Signal			Function
1		V_EXT			Supply voltage LMS 400
2	RS 232	RxD_TRM			Terminal interface (receiver)
3	RS 232	TxD_TRM			Terminal interface (sender)
4		Not assigned			-
5		GND_EXT			Ground LMS 400
6	RS 232	Not assigned	RS 422	RD_HST+	Host interface (receiver)
7	RS 232	RxD_HST	RS 422	RD_HST-	Host interface (receiver)
8	RS 232	Not assigned	RS 422	TD_HST+	Host interface (Sender)
9	RS 232	TxD_HST	RS 422	TD_HST-	Host interface (Sender)
10		Reserved			Do not use!
11		Not assigned			-
12		Reserved			Do not use!
13		Reserved			Do not use!
14		Not assigned			-
15		Reserved			Do not use!
Housing		-			Screen/earth

Drawings

Dimensions in inches (mm)



LD OEM/LD PDS/LD PeCo

Features

- LD OEM/PDS: 360° field of view
- LD PeCo: 90° field of view
- 14,400 Hz scan rate
- Class 1 (eye-safe laser)
- RS 232/RS 422 output
- 4 static outputs
- 5…20 Hz programmable scan frequency
- LD OEM: the basic platform to provide customized software programs on board and offers the possibility of incorporating your own application experience
- LD PeCo: people counting in public areas
- LD PDS: surveillance and security of buildings

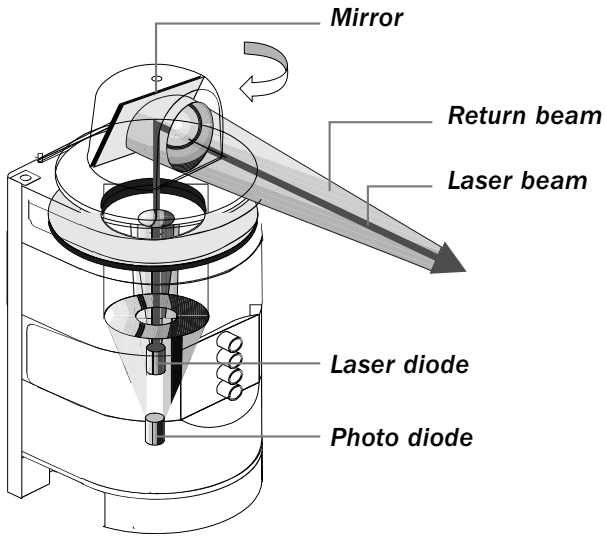
Using time-of-flight technology, SICK provides solutions throughout the world. Even the most demanding applications are being served: anti-collision for large harbor cranes, automatic parking of planes, vehicle profiling in free-flow traffic tolling, guidance and protection of autonomous vehicles, intrusion detection in building security, and people counting in public areas.

The foundation of the LD family is the LD OEM Laser Scanner. This powerful and flexible device is based on a dual-processor hardware structure. The first DSP (Digital Signal Processor) controls the laser measurement and the I/O data flow, while a second DSP is dedicated to run application programs, such as positioning algorithms for autonomous vehicles. The two processors are connected by means of a high-speed bus which enables efficient real-time data collection and processing.

The DSP in the LD PDS Scanner secures areas from intrusions. With the user-friendly configuration software, any selectable area can be monitored.

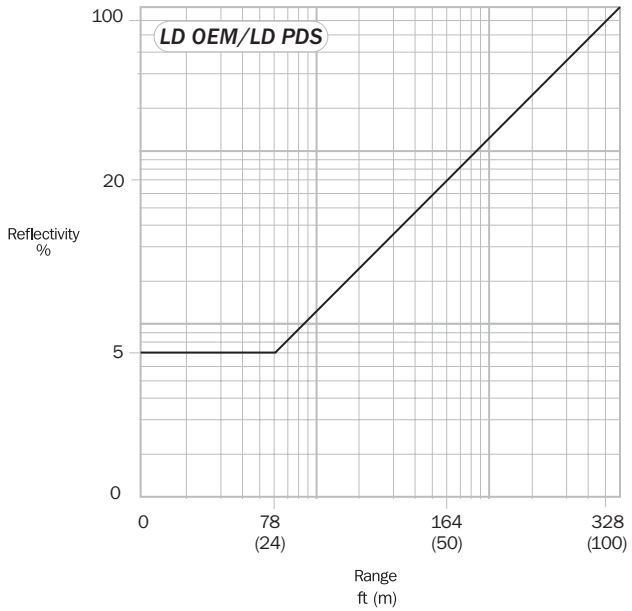
The DSP in the LD PeCo Scanner is programmed to count people in public areas, such as train stations, museums and shopping malls, to manage traffic flow for multiple commercial purposes.

LD Laser Scanner



Measurement Ranges

Dimensions in feet (m)



Technical Specifications

	LD PeCo
Scanning Characteristics	
Mounting Height	8.2…49.2 ft (2.5…15 m), depends on type
Passage Width	3.3…85.3 ft (1…26 m)
Speed of Passage	Maximum 7.9 ft/s (2.4 m/s)
Scanning Angle	90°
Scanning Frequency	10 Hz ± 5%
Light Emission	Via rotating scanner head and light emission windows
Laser Diode (wavelength)	Infrared light (λ = 905 nm)
Pulse Frequency	8 kHz ± 5%
Laser Class	Class I (to DIN EN 60825-1), eye safe
Mechanical/Electrical	
RS 422 Data Interface	Serial
Transfer Rate	19,200 Bd
Data Format	8 data bits, 1 stop bit, no parity, fixed output format
Switching Outputs	2 x (Count IN, Count OUT)
Optical Indicators	4 x LED (status displays)
Power Consumption	
when switched on:	Max. 36 W (1.5 A) at 24 V DC
operation:	12 W (0.5 A) at 24 V DC, additional max. 0.5 A for each switching output
Enclosure Rating	IP 40 (to DIN 40 050)
Connectivity	1 x 10-core terminal block on an internal terminal board 2 x conduit thread 11 cable connection (cross section 8…10 mm (0.32…0.39 in)
Housing	Polystyrene
Weight	Approx. 13.2 lb (6 kg)
Ambient Operating Temperature	32…104°F (0…40°C)
Storage Temperature	-4…176°F (-20…80°C)
Relative Humidity	5…85%, non-condensing
Housing Color	White aluminum (RAL 9006)
Attachment	Pivot on the device, pipe clamping system with second pivot, safety cord

Technical Specifications

	LD OEM/LD PDS
Scanning Characteristics	
Range (condition: full spot strike	1.64…78.8 ft (0.5…24 m) on 5% black
on the object)	1.64…328 ft (0.5…100 m) with 90% reflection
	1.64…164 ft (0.5…50 m) with 20% reflection
Scanning Angle	360°
Angular Resolution	0.125°
Scanning Frequency	5…20 Hz ± 5% in increments of 1 Hz
Measurement Resolution	0.15 in (= 1/840 ft) (3.9 mm (=1/256 m))
System Error (environmental conditions:	± 0.98 in (25 mm) with 20…90% reflection, from 1.64 ft (0.5 m)
good visibility, Ta = 73°F (23°C),	(as a result of temperature and drift)
reflectivity 10…10,000%)	
Statistical Error	1 sigma ± 0.98 in (25 mm) with 20…90% reflection, from 1.64 ft (0.5 m)
Beam Divergence	5 mrad (0.286°)
Light Emission	Via rotating scanner head
Laser Diode (wavelength)	Infrared light (λ = 905 nm)
Pulse Frequency	Maximum 14.4 kHz (10.8 kHz with mean across 360°)
Laser Class	Class I (to DIN EN 60825-1), eye safe
Mechanical/Electrical	
RS 232/422 Data Interface	Serial
Transfer Rate	4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 Bd
Data Format	8 data bits, 1 stop bit, no parity, fixed output format
CAN Data Transfer Rate	10 Bit/s…1 MBit/s
ARCnet Data Interface (optional)	
Data Format	CAN to CAN standard 2.0A
Transfer Rate	156.25 kBit/s…5 MBit/s
Switching Outputs	4 x (Alarm 1, Alarm 2, Safe 1, Safe 2) Highside semi-conductor, max. output current as a result of load per 0.5 A at 24 V DC”
Optical Indicators	4 x LED (status displays)
Connectivity	1 x 6-pole terminal block via conduit thread 7 cable bushing (Ø max. 5.6 mm (0.22 in), for power supply and switching outputs 1 x 9-pin D-Sub plug for data interfaces
Display Indicators	4 x LED status
Operating Voltage	24 V DC ±20% to IEC 364-4-41 (VDE 0100, Part 410)
Current Consumption	
when switched on:	Maximum 36 W (1.5 A) at 24 V DC
operation:	12 W (0.5 A) at 24 V DC, additional max. 0.5 A for each switching output
Housing	Die cast aluminum
Weight	Approx. 7 lb (3.2 kg)
Enclosure Rating	IP 40 (to DIN 40 050)
Electrical Protection Class	Class III
Environmental	
EMC	EN 61000-6-3, EN 61000-6-2
Vibration	EN 60068-2-6
Ambient Operating Temperature	32…113F° (0…45°C)
Storage Temperature	-4…176F° (-20…80C°)
Relative Humidity	5…85%, non-condensing
Housing Color	SICK blue (RAL 5012) black
Attachment	8 x securing threads M6x12mm (0.47 in)

Models and Part Numbers

	LD PeCo	LD PeCo	LD PDS	LD PDS
Part Number	1 023 382	1 023 383	1 025 993	1 026 440
Data Interface	RS 422	RS 422	RS 232	RS 422
Range	18 ft (5.5 m)	49.2 ft (15 m)	78.7 ft (24 m)	78.7 ft (24 m)

	LD OEM
Part Number	1 028 698
Data Interface	RS 232/422, CAN TCP/IP Ethernet
Range	78.7 ft (24 m)

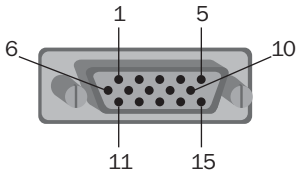
NOTE: Accessories information is located on pages 188 - 189.

Electrical Connections

LD OEM/LD PDS
Terminal Block

Terminal	Signal	Function
1	+24 V DC	Power supply
2	GND	Signal ground
3	Alarm 1	Switching output 1 (application-dependent function)
4	Alarm 2	Switching output 2 (application-dependent function)
5	Safe 1	Switching output 3 (application-dependent function)
6	Safe 2	Switching output 4 (application-dependent function)

D-Sub Plug
(Data Interface)



Pin	Signal				Function
1	24 V DC				Voltage supply, sensor (24 VDC)
2	CAN L				CAN bus (IN/OUT)
3	CAN H				CAN bus (IN/OUT)
4	GND_Data				Ground
5	GND				Ground, sensor
6	RS-422	RD+-	RS-232	Not occupied	Host interface (receiver)
7	RS-422	RD -	RS-232	RxD	
8	RS-422	TD+	RS-232	Not occupied	Host interface (transmitter)
9	RS-422	TD-	RS-232	TxD	
10	OUT 1				Output 1
11	TPIP				Ethernet interface IN
12	TPIN				Ethernet interface IN
13	TPOP				Ethernet interface OUT
14	TPON				Ethernet interface OUT
15	OUT 2				Output 2

LD PeCo
10-core Terminal Block

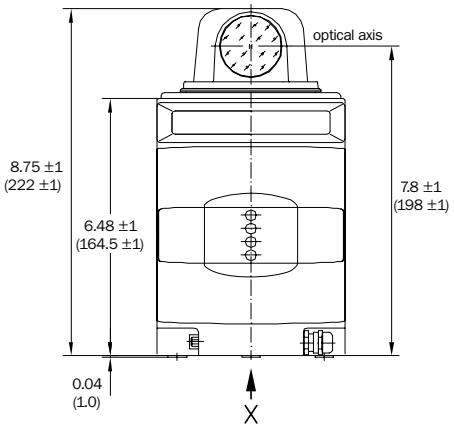
Pin	Signal	Interface
1	+24 V DC	Power Supply
2	GND	Ground
3	Count IN	Ground
4	Count OUT	Switching Output[1)]
5	RX_Hi	Switching Output[1)]
6	TX_Hi	RS-422
7	TX_Lo	RS-422
8	RX_Lo	RS-422
9	Signal GND	RS-422
10	S-GND	Signal ground

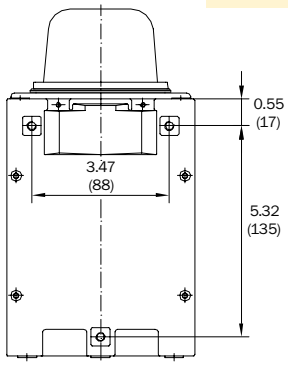
1) Function depends on the selected count direction

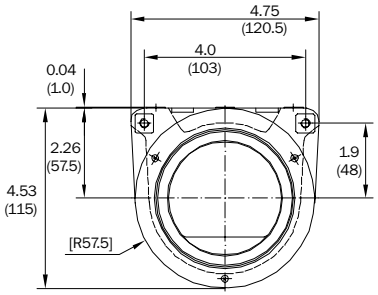
Drawings

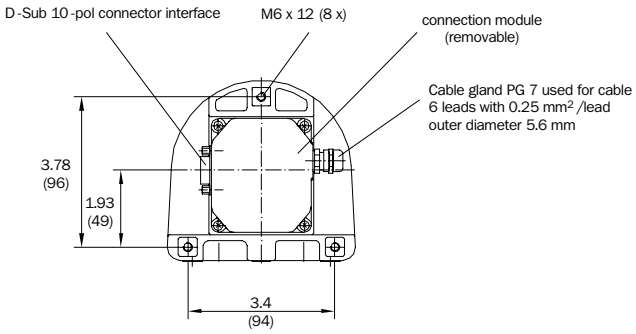
Dimensions in inches (mm)

LD OEM/LD PDS

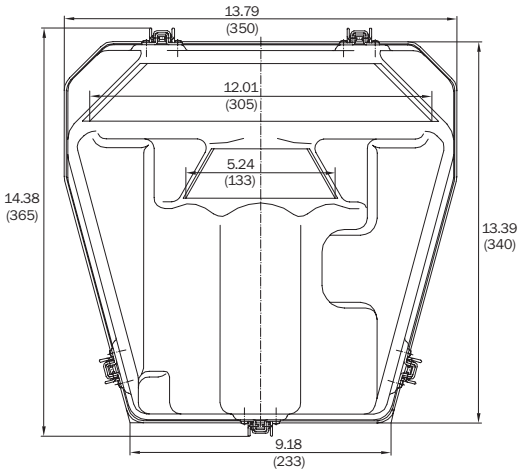


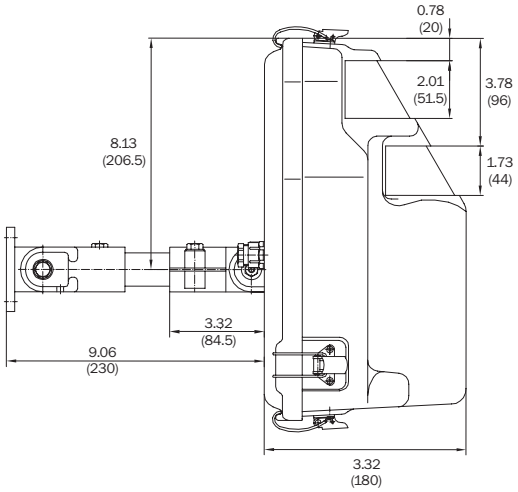


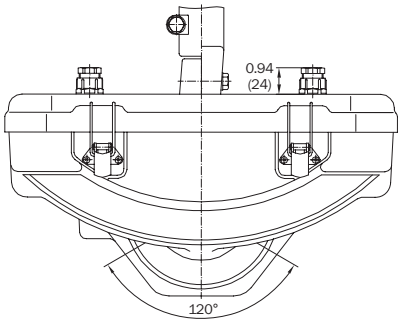


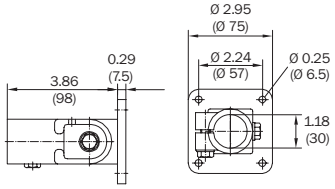


LD PeCo









LMI 200/MST 200 Software

Features

- **MST 200 Measurement Software Tool**
  - Transfer of configurations
  - Define measurement range
  - Check settings
  - Monitor fields
  - Receive, save, edit configurations
  - System diagnosis
  - Performs measurement functions for LMS Sensors
  - Pre-installed drivers for real-time communication with up to two laser scanners
- **LMI 200 Measurement Software Tool**
  - All features of the MST plus:
    - Two SICK 2xx Series Sensor inputs
    - Two analog inputs
    - Four analog outputs
    - Four digital inputs
    - 8 digital outputs
    - Two shaft encoder inputs
    - RS 232/RS 422/RS 485 interfaces

LMS Measurement Systems operate without contact and as a result of their high scanning rates are particularly suitable for measurement tasks involving dynamic operational processes. Rapidly changing object geometries are detected quickly and reliably. Varying surface properties of the target material have no influence on the measurement result.

The LMI 200 Laser Measurement Interface is a high-performance, multifunctional evaluation unit for carrying out customer-specific measurement tasks with SICK's LMS Sensors. The LMI 200 integrates all the process data of typical measurement setups by means of the digital and analog interfaces.

It combines the contour data provided by the LMS Sensors with other measurement data such as, the speed of the measured objects, according to how it has been configured. The resulting measurement data is processed in real-time by the application-specific software.

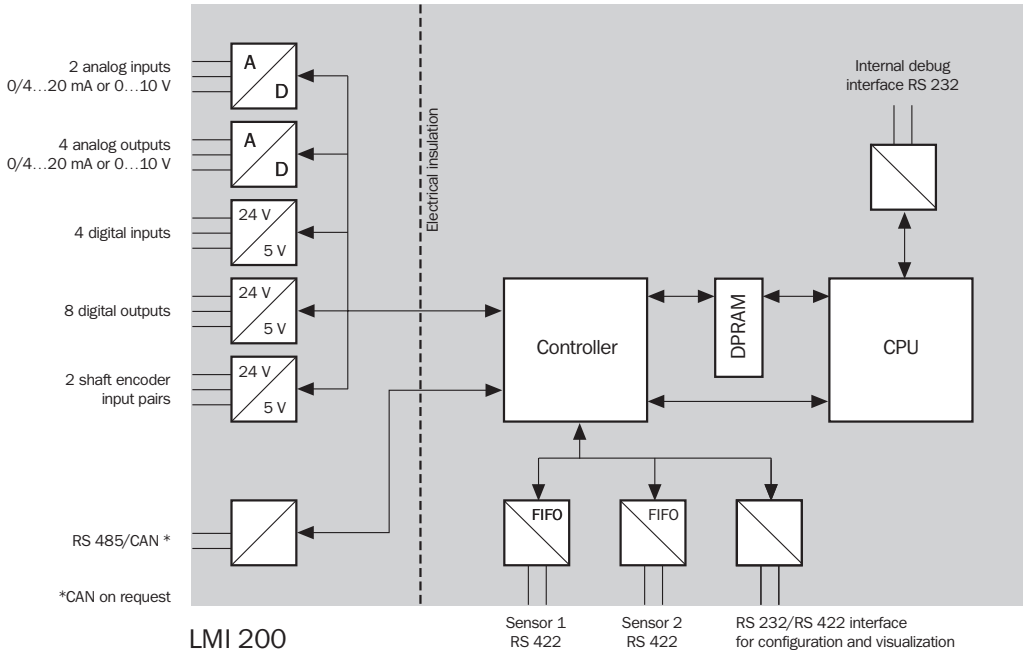
LMI 200 Laser Measurement Evaluation Unit

The LMI 200 Laser Measurement Interface consists of the evaluation unit as a hardware component and the MST 200 Measurement Software Tool.

The LMI 200 is a high-performance, 2-processor system with the following structure:

1. A controller (Siemens C167) for communication with the SICK LMS Sensors and for the pre-processing of measurement data; technically integrated by SICK Firmware.
2. A CPU (Intel i960Jx 32-bit RISC processor) for processing application-specific measurement data. Configuration and software implementation is programmable with the help of SICK's MST 200 Measurement Software Tool.

The exchange of data between the two processors takes place via a DPRAM and is a component part of SICK Firmware.



LMI 200

MST Measurement Software Tool

The MST 200 contains a software function library for carrying out customer-specific measurement tasks with LMS Sensors and the LMI 200 Evaluation Unit. The following function blocks are implemented and available:

- Function for the definition and configuration of the LMS Laser Scanners
- Function for the polar/cartesian conversion of LMS measurement data
- Function for data output via the host interface
- Function for the definition of a customer-specific co-ordinate system
- Function for the division of the co-ordinate system into individual measurement columns with maximum value output
- Function for transmitting measurement results at digital and analog outputs
- Function for the combination of the measurement values from two LMS Sensors

The MST is a software tool for carrying out measurement functions using the LMS Sensors. This toolbox can be used to handle customer-specific measurement functions quickly and efficiently, and therefore cost-effectively.

Drivers for real-time communication with several LMS Sensors are already installed. Handling of the actual application can be started directly after the simple transformation of co-ordinates and the definition of an application-specific measurement framework. The functions library already includes important filter functions such as, cutting out irrelevant measurement zones. In addition, the MST 200's tiered structure allows the simple integration of new function blocks (objects) or software drivers for later applications.

Customer 20-30%	**Application-specific component**
SICK 70-80%	**MST 200** **Software tool for a standard PC or SICK-specific hardware, the LMI 200** **Software library:** ■ Integrated software and hardware communications driver ■ Definition of an application-specific measurement zone ■ Transformation of co-ordinates ■ Combination of measurement data from 2 sensors ■ Pre-processing of sensor measurement data: √ Plausibility check √ Averaging of measured values √ Suppression of irrelevant measurement zones √ Pixel-oriented evaluation of measurements (filtering out rain. snow, etc) √ And many more ■ Visualization √ Display of measurement data in application-specific co-ordinate system

System Requirements

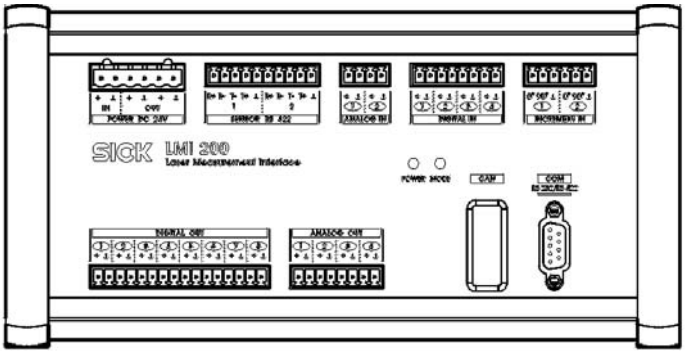
	MST 200/LMI 200
Computer	Pentium 133 MHz
Hard Disk Space	4 MB of available disk space
Disk Drive	One CD ROM drive
Memory Requirements	16 MB RAM
System Software	Windows™ 98, NT, 2000, XP, ME
Development Medium	MS Visual Basic C++ 5.0 or higher
Mouse	Optional but recommended

Models and Part Numbers

	LMI 200-1210031	LMI 200-1210041
Model	Standard Version	Development Version
Part Number	1 018 930	1 018 931
Includes MST 200	■	■
Software Library	■	■
C++ Compiler		■
Debugger		■

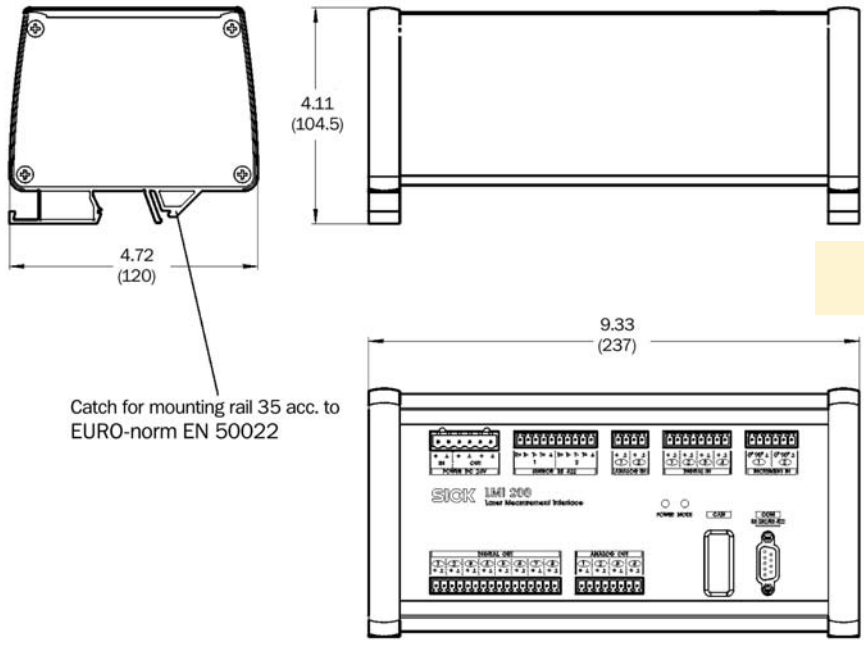
NOTE: Accessories information is located on page 189.

Drawings

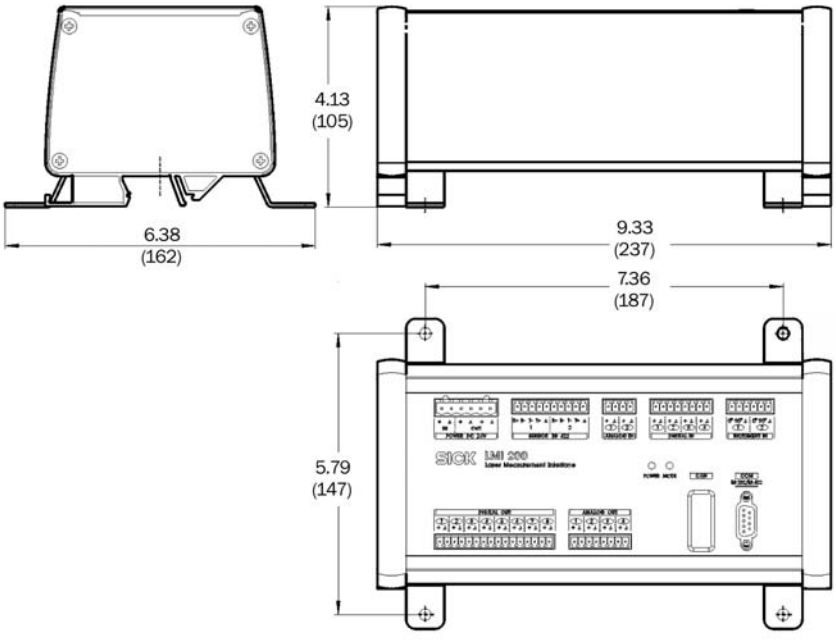


Drawings

Dimensions in inches (mm)



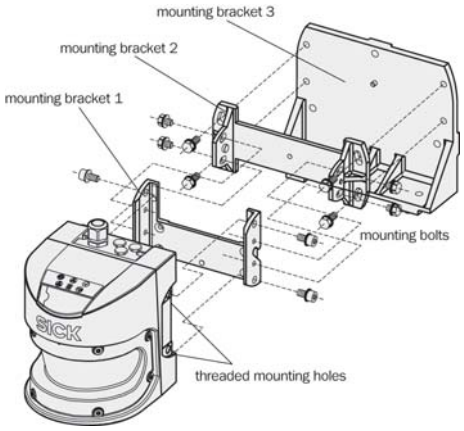
LMI 200



LMI 200
with wall mounting

Mounting Brackets

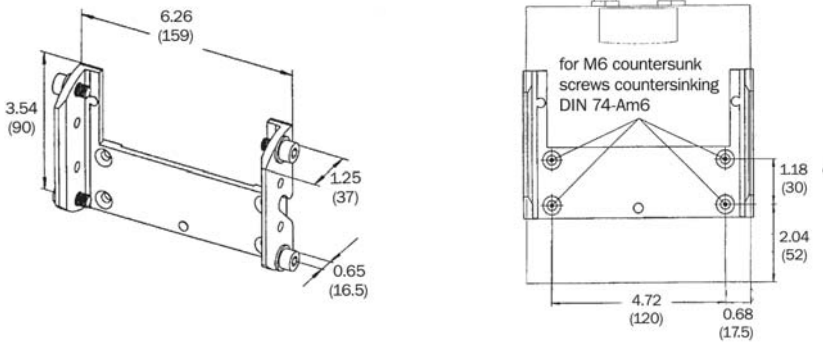
LMS 200/291



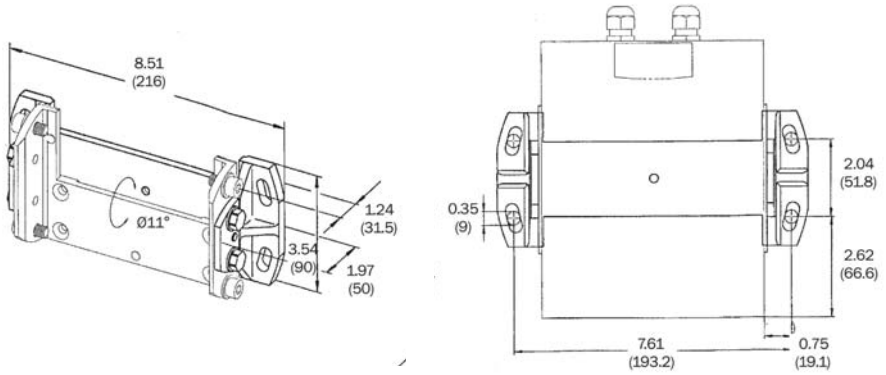
Part Number	Model
2 015 623	PLS LMS 200/291 Mtg Set 1
2 015 624	PLS LMS 200/291 Mtg Set 2
2 015 625	PLS LMS 200/291 Mtg Set 3

Dimensions in inches (mm)

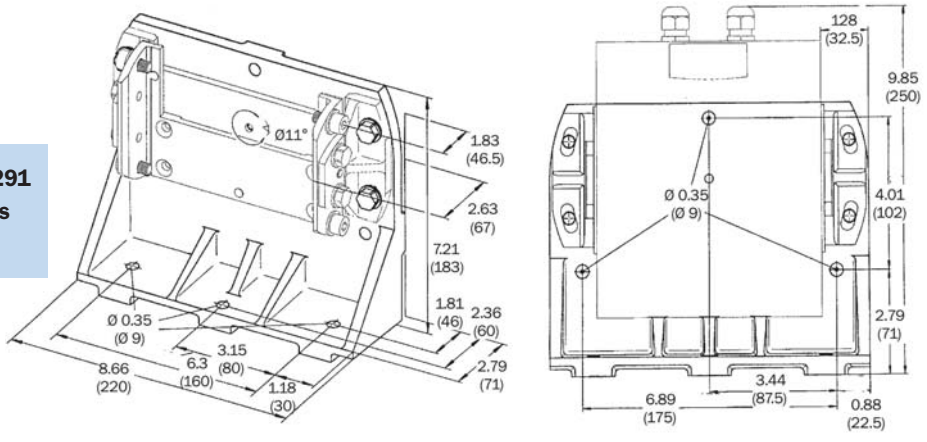
PLS LMS 200/291 Mounting Set 1



PLS LMS 200/291 Mounting Sets 1 and 2



PLS LMS 200/291 Mounting Sets 1, 2 and 3

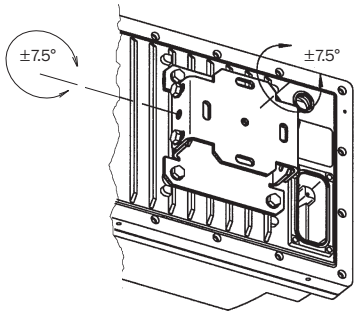


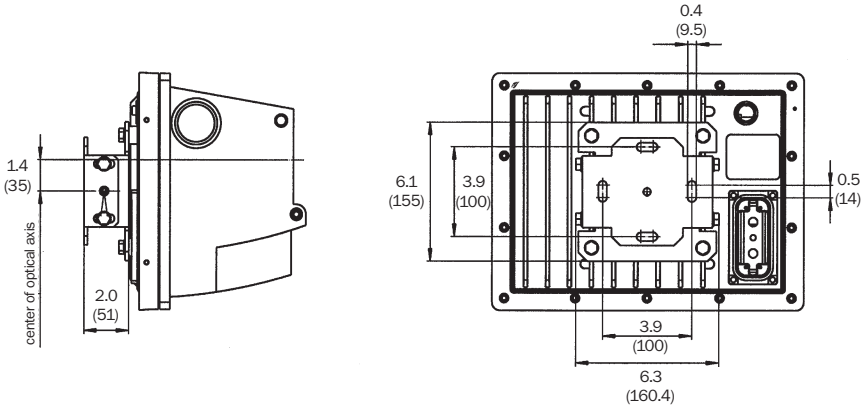
Mounting Brackets

LMS 211/221

LMS 211/221
Mounting Set
Part number
2 018 303

Dimensions in inches (mm)

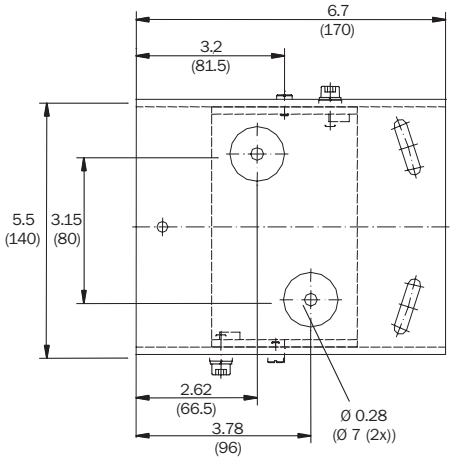


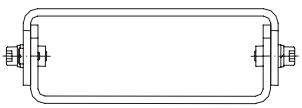


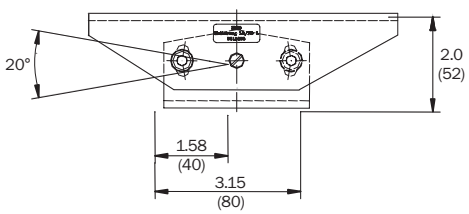
LD OEM/PDS

LD OEM/PDS
Mounting Set
Part number
5 311 055

Dimensions in inches (mm)





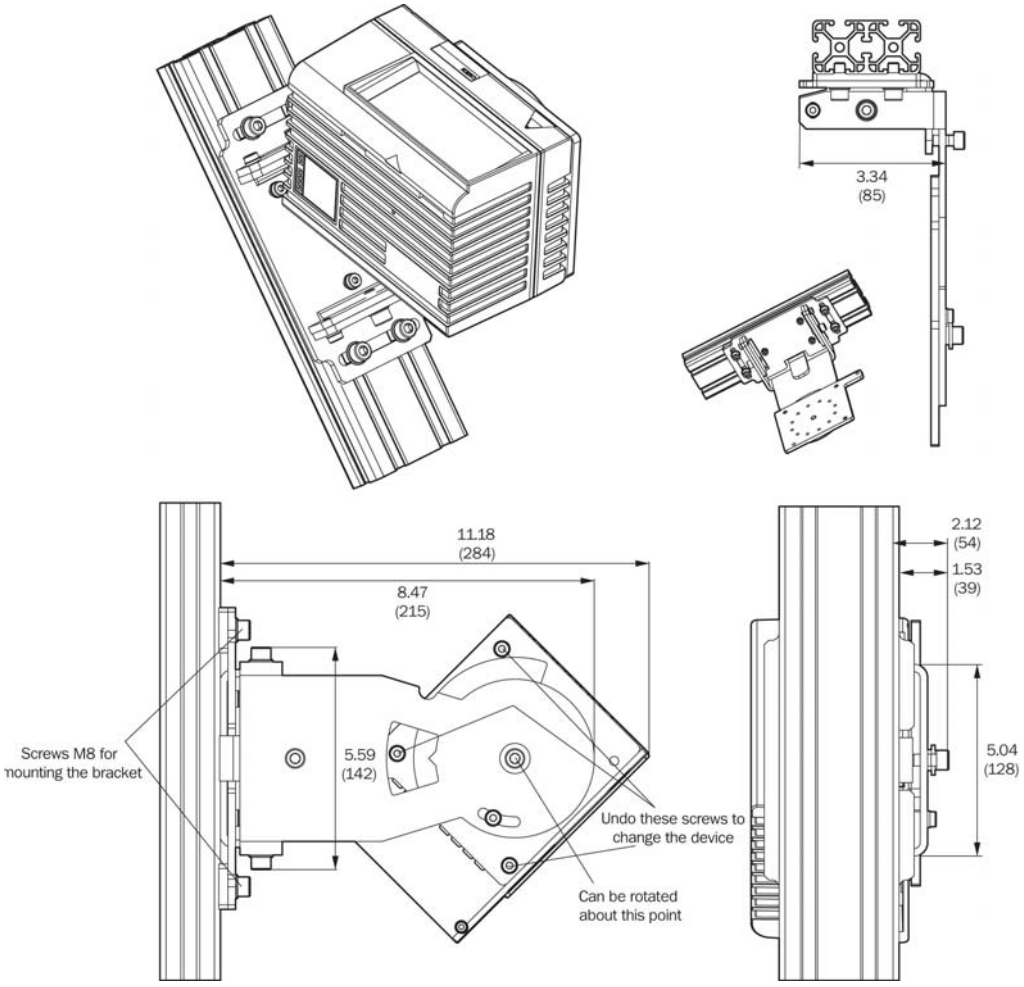


Mounting Brackets

LMS 400

LMS 400
Mounting Set
Part number
2 030 421

Dimensions in inches (mm)

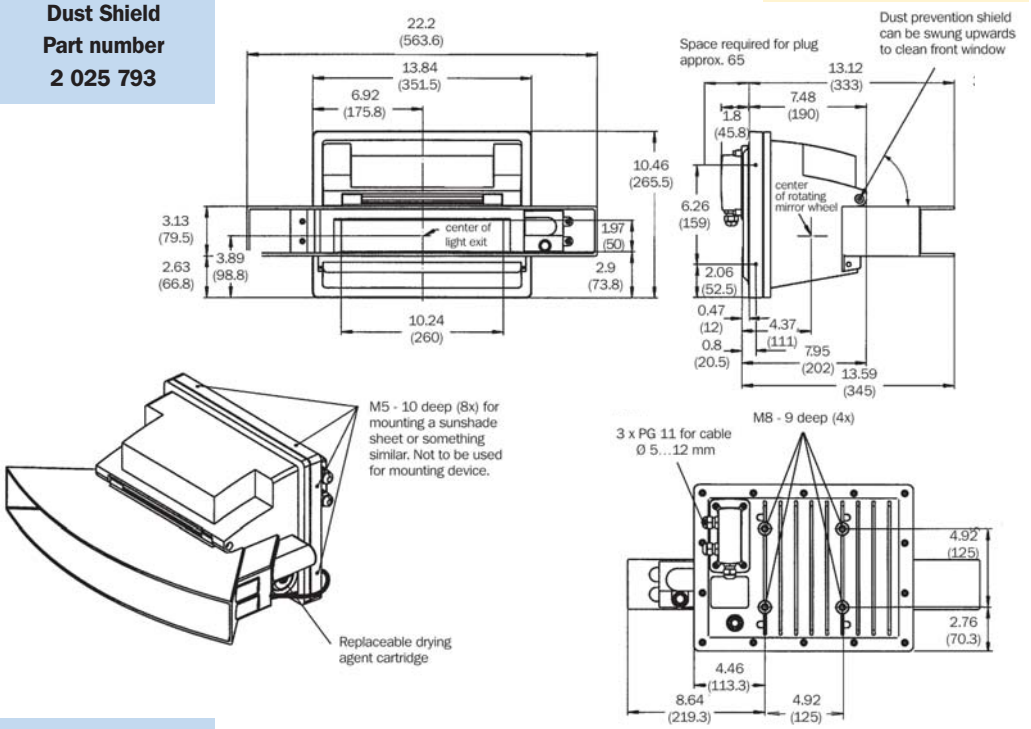


Spare Parts/Accessories

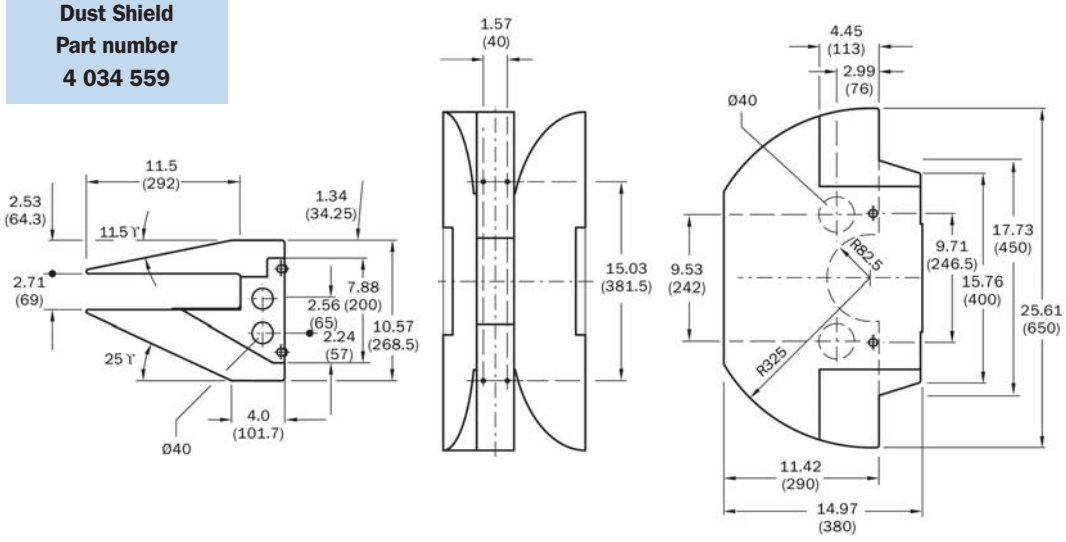
LMS 211/221

LMS 211
Dust Shield
Part number
2 025 793

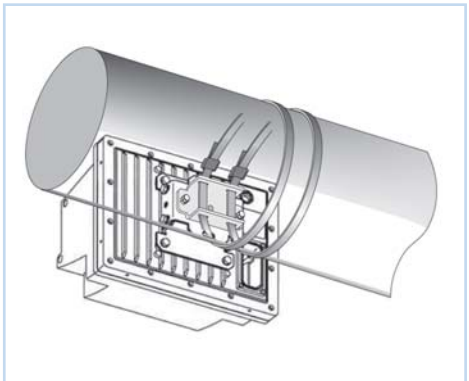
Dimensions in inches (mm)



LMS 221
Dust Shield
Part number
4 034 559



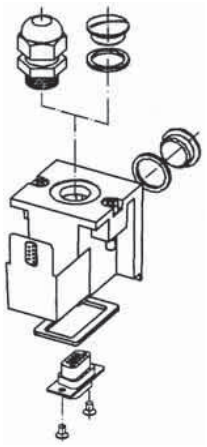
LMS 211/221
Tightening Straps
Part number
5 306 222



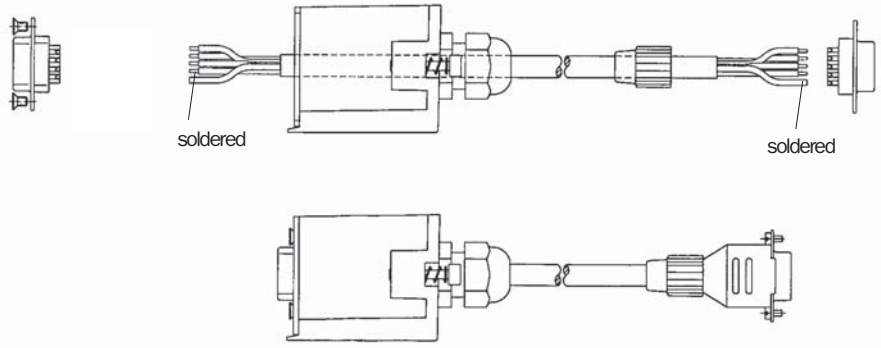
Cables

LMS 200/291

PLS LMS 200/291
Connection Blocks
Part number
2 018 963

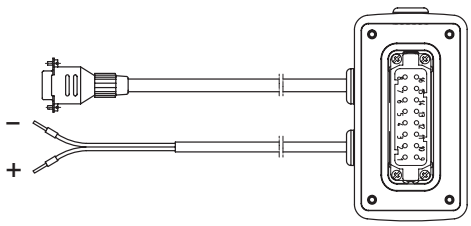


LMS 200/291
RS 232
5 m Cable
Part number
2 027 786



LMS 211/221

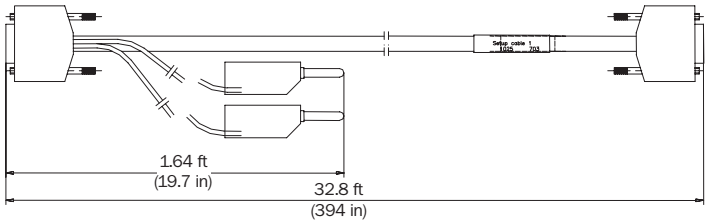
LMS 211/221
5 m Interface Cable
Part number
2 019 561



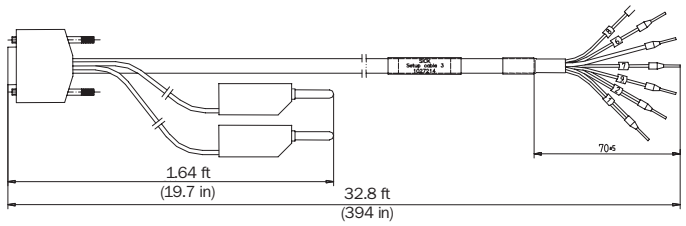
Cables

LD PeCo

LD PeCo
Setup Cable 1
Part number
1 025 703



LD PeCo
Setup Cable 3
Part number
1 027 214



LMS 200/291

Scanners

Part Number	Model	Description
1 015 850	LMS 200-30106	0-10 m range, 180° field of view, IP 65 enclosure rating
1 018 028	LMS 291-S05	1-30 m range, 180° field of view, IP 65 enclosure rating, fog correction
1 025 329	LMS 291-S14	1-30 m range, 90° field of view, IP 65 enclosure rating, fog correction, fast version
1 026 226	LMS 291-S15	1-30 m range, 180° field of view, IP 65 enclosure rating, fog correction

Cables

Part Number	Model	Description
2 106 401	LMS 200/291 3 m Inter Cable	Interface programming cable only
2 016 402	LMS 200/291 5 m Inter Cable	Interface programming cable only
2 016 403	LMS 200/291 10 m Inter Cable	Interface programming cable only
2 018 963	LMS 200/291 Connect Blocks	Connector blocks only, no cables
2 027 786	LMS 200/291 RS 232 5 m Cable	Serial Port interface and power cables, with connector blocks
2 027 787	LMS 200/291 RS 232 10 m Cable	Serial Port interface and power cables, with connector blocks
2 027 788	LMS 200/291 500kB 5 m Quat	Interface and power cables, with connector blocks, connects with interface cards p/n 6022515

Mounting Brackets

Part Number	Model	Description
2 015 623	PLS LMS 200/291 Mounting Set 1	Non adjustable bracket mounts to flat vertical surfaces
2 015 624	PLS LMS 200/291 Mounting Set 2	2 axis movement, requires LMS 200/291 mounting set 1 (p/n 2015623)
2 105 625	PLS LMS 200/291 Mounting Set 3	Mounts to flat horizontal surfaces, requires LMS 200/291 mounting set 2 (p/n 2015624)
2 020 925	LMS 200/291 2 Axis Fine	2 axis fine adjustment mounting set
2 020 926	LMS 200/291 3 Axis Fine	3 axis for fine adjustment, requires LMS 200/291 2 axis fine adjustment (p/n 2020925)

LMS 211/221

Scanners

Part Number	Model	Description
1 025 629	LMS 211-30106	0-10 m range, 100° field of view, IP 67 enclosure rating, integral heater
1 018 023	LMS 211-30206	1-30 m range, 100° field of view, IP 67 enclosure rating, integral heater, fog correction
1 018 966	LMS 211-S07	1-30 m range, 100° field of view, IP 67 enclosure rating, integral heater, fog correction, relay output variant
1 025 487	LMS 211-S14	1-30 m range, 90° field of view, IP 67 enclosure rating, integral heater, fog correction, fast version
1 026 225	LMS 211-S15	1-30 m range, 100° field of view, IP 67 enclosure rating, integral heater, fog correction, for use with LMI 400 only
1 015 945	LMS 221-30106	0-10 m range, 180° field of view, IP 67 enclosure rating, integral heater
1 018 022	LMS 221-30206	0-30 m range, 180° field of view, IP 67 enclosure rating, integral heater, fog correction
1 018 965	LMS 221-S07	0-30 m range, 180° field of view, IP 67 enclosure rating, integral heater, fog correction, relay output variant

Scanners

Part Number	Model	Description
1 025 328	LMS 221-S14	0-30 m range, 90° field of view, IP 67 enclosure rating, integral heater, fog correction, fast version
1 026 224	LMS 221-S15	0-30 m range, 180° field of view, IP 67 enclosure rating, integral heater, fog correction

Cables

Part Number	Model	Description
2 019 561	LMS 211/221 Interface Cable	Interface cable, 5 m long, connector with 2 cables for configuration and power

* To connect a LMS 211/221 sensor, a data cable (Lapp p/n LI2YCY or equal), a power cable (Lapp p/n 601402 or equal), and one 9-pin Sub-D connector is required.

Mounting Brackets

Part Number	Model	Description
2 018 303	LMS 211/221 Mounting Set	LMS 211/221 mounting set (alignment bracket)
2 018 304	LMS 211/221 Mast Bracket	Mast bracket, requires LMS 211/2211 mounting set (p/n 2018303)
5 306 222	LMS 211/221 Tighten Strap	Strap, requires LMS 211/221 mast bracket (p/n 2018304)
5 306 221	LMS 211/221 Strap Lock	Lock, requires LMS 211/221 strap (p/n 2018304)

Spare Parts/Accessories

Part Number	Model	Description
2 018 301	LMS 211/221 Plug w/Housing	Replacement outdoor LMS connection plug with housing
6 004 379	LMS 211/221 Plug w/o Housing	Replacement outdoor LMS connection plug without housing
5 306 179	LMS 211/221 Drying Cartridge	Replacement drying cartridge for LMS 211/221
2 025 793	LMS 211 Dust Shield	100° Dust shield for LMS 211
4 034 559	LMS 221 Dust Shield	180° Dust shield for the LMS 221

LMS 200 Series

Spare Parts/Accessories

Part Number	Model	Description
6 022 515	LMS PCI PC Interface Card	Serial, high speed proprietary 500 kB Quatech DSC 200/300 interface card RS 422, connects with LMS 200/291 500 kB Quat cable, connects with (p/n 2027788)
7 026 897	LMS PCMICIA Interface Card	Serial, high speed proprietary 500 kB CSM GmbH interface card RS 422, connects with LMS 200/291 500 kB MOXA cable (p/n 2022655)
7 028 789	PS50W-24V Power Supply	PS50W-24V power supply, capable of powering one indoor LMS
7 028 790	PS95W-24V Power Supply	PS95W-24V power supply, capable of powering two LMS 200, two LMS 291
6 020 756	Scanfinder LS70B	Topcon model LS70B receiver for locating scanner beams
7 025 784	LMSIBS Configuration Software	LMS/LMI user configuration software, included with LMS order. Available free online

LMS 400

Scanner

Part Number	Model	Description
1 023 925	LMS 400-0000	0.7-3 m range, 70° field of view, IP 67 enclosure rating 150…500 Hz scan frequency, 10…200% required object remission
1 027 897	LMS 400-1000	0.7-3 m range, 70° field of view, IP 67 enclosure rating 360…500 Hz scan frequency, 6.5…200% required object remission

Cables

Part Number	Model	Description
1 025 363	CDM 490-0001	Connection module CDM, connection possibility for a LMS 400 (the terminal surface is inside the housing)
1 025 365	CDM 490-0101	Connection module CDM/CMP, connection possibility for LMS 400 (the terminal interface is at the outside of the housing)
2 020 302	LMS 400 CDM 3 m Cable	Connection cable to the CDM, 3 m, 15 cores, screened, D-Sub-HD plug/socket (15 poles)
2 021 815	LMS 400 CDM 10 m Cable	Connection cable to the CDM, 10 m, 15 cores, screened, D-Sub-HD plug socket (15 poles)
2 014 054	LMS 400 RS 232 3 m Cable	Connection cable from the terminal interface to the serial interface of the PC, 3 m, 3 cores, with two 9-pole D-Sub sockets
1 023 850	LMS 400 CMC	Parameter memory module for installation in CDM
2 031 372	LMS 400 Term 3 m Cable	Communication cable to the terminal interface in the plug cover, 3 m
2 032 821	LMS 400 Crossover Cable 10 m	Crossover connection cable LMS 400 with connection hood and PC
2 030 467	LMS 400 Ethernet Cable 10 m	Connection cable LMS 400 with connection hood and Ethernet hub or switch

Mounting Brackets

Part Number	Model	Description
2 030 421	LMS 400 Mounting Bracket	Mounting bracket for mounting the LMS 400 to ITEM aluminum profiles

Spare Parts/Accessories

Part Number	Model	Description
2 030 439	LMS 400 Plug	Plug cover, M-fitting
2 030 535	LMS 400 Plug with Cable	Plug cover, M-fitting, two connection cables D-Sub 15 poles, 3 m

LD OEM/LD PDS

Scanners

Part Number	Model	Description
1 028 698	LD OEM-1000	0-24 m range, 360° field of view, IP 40 enclosure rating, on-board DSP
1 025 993	LD PDS with RS 232	0-24 m range, 360° field of view, IP 40 enclosure rating, embedded zone protect software
1 026 440	LD PDS with RS 422	0-24 m range, 360° field of view, IP 40 enclosure rating, embedded zone protect software

Cables

Part Number	Model	Description
6 032 508	LD OEM RS 232 Cable	Commissioning cable RS 232 15-pin to RS 232
6 032 509	LD OEM TCP/IP Cable	Commissioning cable Ethernet 15-pin HD to RJ45
2 039 087	LD OEM Install CD	CD-ROM LD-OEM/LD-LRS
6 025 934	LD OEM Spare Fuse	Spare fuse with holder T5A0 125V SMD

Mounting Brackets

Part Number	Model	Description
5 311 055	LD OEM/PDS Mounting Brackets	Assembly bracket, complete with securing material and tool

Spare Parts/Accessories

Part Number	Model	Description
2 039 087	LD OEM Install CD	CD-ROM LD-OEM/LD-LRS
6 025 934	LD OEM Spare Fuse	Spare fuse with holder T5A0 125V SMD

LD PeCo

Scanner

Part Number	Model	Description
1 023 382	LD PeCo 5.5 m (maximum height)	2.5-5 m range, 90° field of view, IP 40 enclosure rating, embedded people counting software
1 023 383	LD PeCo 15 m (maximum height)	5-15 m range, 90° field of view, IP 40 enclosure rating, embedded people counting software

Cables

Part Number	Model	Description
1 025 703	LD PeCo Setup Cable 1	Setup cable 1, with 9-pin D Sub socket / 9-pin D Sub plug and two power supply lines, pin assignment designed for the RS 422/RS 232 interface converter B&B model 4WSD9R
1 027 214	LD PeCo Setup Cable 3	Setup cable 3, with 9-pin D Sub connector / open leads and two lines for power supply, aligned on the RS 422/RS 232 interface converter B&B model 4WSD9R

Spare Parts/Accessories

Part Number	Model	Description
5 311 055	LD PeCo Pipe	Aluminum installation pipe, L = 130 mm, Ø = 30 mm
1 025 633	LD PeCo Fall Arrester	Mechanical fall arrester including safety cord, thimble and snap hook
4 039 006	LD PeCo Pivot	For mounting LD PeCo on the wall or roof

LMI 200

Laser Measurement Interface

Part Number	Model	Description
1 018 930	LMI 200-1210031	LMI 200 standard variant, inc. MST software library
1 018 931	LMI 200-1210041	LMI 200 development system, inc. MST software library, C++ compiler and debugger

Cables

Part Number	Model	Description
2 016 401	LMS 200/291 3 m Inter Cable	Interface programming cable only
2 016 402	LMS 200/291 5 m Inter Cable	Interface programming cable only

Mounting Bracket

Part Number	Model	Description
2 021 228	LMI 200 Mounting Set	LMI mounting set for wall mounting

Radio Frequency Identification Interrogator

Features

- High level reading security in high-speed conveyor applications
- Simultaneous reading of up to 50 tags per second
- Compliance to ISO 15693 enables reading of transponders from a variety of sources
- Variable antenna configurations that meet application requirements
- Interrogator trigger mode for object presence detection
- RS 232 data interface
- 13.56 MHz RFID system

The RFI341 Interrogator is an ISO 15693 standard compatible 13.56 MHz transponder read/write unit. Based on its high output and high input sensitivity – dependent on the antenna and transponder type used – a reading performance with a single antenna of up to 1.2 meters can be achieved. The anti-collision feature enables the detection of up to 50 tag IDs simultaneously within one second.

The Interrogator contains an internal splitter, which enables the use of two antennas simultaneously. Because of this feature, the Interrogator is well suited for use in high-speed conveyor belt applications (e.g. in combination with totes).

Technical Specifications

	RFI341-1520
Air Interface	
Frequency	13.56 MHz
Standard	ISO 15693 (others on request), ISO 18000-3 “Mode 1”
Antenna	
Sending Performance	2 x 2 W (at 50 Ohm), splitter configuration
Optical Indicators	2 (Power, Tag Data)
Data Interface	RS 232 (Ethernet via CDM 420 with CMF 400-3101)
Data Transfer Rate	9,600 / 19,200 / 38,400 / 57,600 / 115,200 Bd
Protocol	STX/ETX
Switching Inputs	2 x, V_{in} = 24 V DC, for e.g. triggering via photoelectric switches
Switching Outputs	2 x, open collector (R_i - 100 Ohm), V_{OUTmax} = 36 V, I_{OUTmax} = 30 mA
Electrical Connections	Terminal strip, BNC connectors (antenna)
Power Supply Voltage	230 V AC, 50 Hz (115 V AC, 50…60 Hz)
Current Consumption	< 1 A
Housing	Metal
Dimensions	400 x 200 x 120 mm
Enclosure Rating	IP 65
CE Approval	Acc. to EN 301489-1, -3 / acc. to EN 60950 / acc. to EN 50364 / acc. to EN 50357
Radio Approval	Acc. to EN 300330 (with released antennas), FCC Part 15 in preparation
Operating Temperature	32…122°F (0…50°C)
Storage Temperature	-4…158°F (-20…70°C)

Accessories

Antennas	
RFA331-1020	200 x 200 mm, range max. 550 mm (2 W, Tag ISO card size), IP 40
RFA341-3520	400 x 400 mm, range max. 750 mm (2 W, Tag ISO card size), IP 65

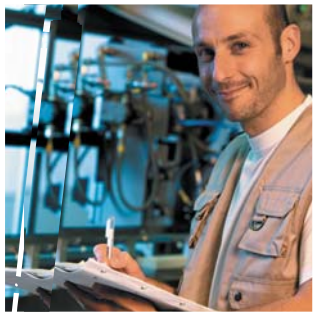
RANGE OF EXPERTISE

INDUSTRIAL SENSORS

SICK is one of the world's leading manufacturers of sensors, safety systems, and automatic identification products for industrial applications. SICK holds more than 450 patents for its innovative products. Through its Industrial Sensors, Safety Systems, Automatic Identification, and Environmental and Process Analysis divisions, the company has operations in 65 countries. SICK North America is headquartered in Minneapolis, MN.

SAFETY SYSTEMS

Products from SICK provide comprehensive safeguarding of both workers and machinery. As experts in sensor technology, SICK develops and manufactures pioneering products that provide protection in hazardous zones, dangerous locations and for safeguarding access points. By providing services, which encompass all aspects of machine safety and security, SICK is setting new standards in safety technology.



AUTOMATIC IDENTIFICATION

Our wide range of sensors provides solutions to suit any application in the field of automation. Even under rugged ambient conditions, objects are reliably detected, counted and positioned regardless of their form, location and surface finish.

ANALYZERS AND PROCESS INSTRUMENTATION

Whether the tasks involve identification, handling, classification or volume measurement, innovative automatic identification systems and laser measurement systems from SICK function reliably, even under rapid cycle times. Products from SICK conform to the latest standards and can be easily integrated in all industrial environments and external applications.

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