PRODUCT CATALOG




# Industrial Safety Systems

safety PLUS

## Comprehensive Safety Products, Systems and Services


- ➜ Contents
- ➜ List of product families
- ➜ Product selection based on risk assessment


SICK

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| **Safe control solutions** | **Safety relays** |  | Enable electromechanical and optoelectronic safety components to be simply integrated into a machine or system: From emergency stop to laser scanner | N |
| | **Safety controllers** |  | From medium to more complex applications enables you to integrate safety-rated control into your machines or systems | O |
| **Safety software** | **Safexpert:**<br>**Risk Assessment Software and Documentation Tool** |  | Software for safety engineering. This software provides step-by-step guidance towards CE certification, support during risk analysis, and simplifies the process of documentation. | P |
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# List of product families


## Optoelectronic protective devices

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| S3000 Advanced | C-10 |
| S3000 Standard | C-17 |
| S3000 Remote | C-24 |
| S3000 Professional CMS | C-31 |
| S300 Professional | C-38 |
| S300 Advanced | C-48 |
| S300 Standard | C-57 |
| S200 | C-65 |
| **Safety camera system** | |
| V4000 Press Brake | D-2 |

| Safety light curtains | |
|---|---|
| C4000 Advanced | E-3 |
| M4000 Advanced Curtain | E-18 |
| C4000 Standard | E-34 |
| C4000 Micro | E-50 |
| C4000 Micro in IP 67 Housing | E-59 |
| C4000 Basic Plus | E-64 |
| C4000 Basic | E-73 |
| C4000 Eco | E-83 |
| C4000 Entry/Exit | E-92 |
| C4000 Palletizer | E-99 |
| C2000 Standard | E-106 |
| C2000 Standard in IP 67 Housing | E-119 |
| C2000 RES/EDM | E-124 |
| C2000 Cascadable | E-137 |
| LGT | E-147 |

| Multiple light beam safety devices | |
|---|---|
| M4000 Advanced / UE403 | F-2 |
| M4000 Advanced A/P / UE403 | F-2 |
| M4000 Standard | F-17 |
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| M4000 Area | F-29 |
| M2000 Standard | F-38 |
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| M2000 Cascadable | F-59 |
| M2000-A/P Standard | F-67 |
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| Mirror and device columns | F-82 |
| **Single-beam photoelectric safety switches** | |
| L4000 system | G-2 |
| WSU/WEU26/2 | G-11 |
| WS/WE18-3 | G-17 |
| WS/WE27-2 | G-22 |
| VS/VE18-2 | G-27 |

## Electromechanical and non-contact safety switches

| Safety switches with separate actuator | |
|---|---|
| i10 | H-2 |
| i11S | H-7 |
| i12S | H-12 |
| i16S | H-17 |
| i17S | H-21 |
| i100S | H-25 |
| i110S | H-31 |
| i1001 | H-35 |
| i1002 | H-41 |

| Safety locking devices | |
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| i14 Lock | I-9 |
| i200 Lock | I-13 |
| i1001 Lock | I-17 |
| i1002 Lock | I-23 |
| **Safety position switches** | |
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| i10R | J-4 |
| i100P | J-7 |
| i100R | J-10 |
| i110P | J-13 |
| i110R | J-16 |

| Safety hinge switches | |
|---|---|
| i10H | K-2 |
| i110H | K-5 |
| **Non-contact safety switches** | |
| RE300 | L-2 |
| RE4000 | L-7 |
| T4000 | L-12 |
| T4000 Multi | L-17 |
| T4000 Compact | L-23 |
| IN4000 | L-28 |
| **Safety operating devices** | |
| E100 | M-2 |
| i110RP | M-5 |
| i150RP | M-8 |

## Safe control solutions

| Safety relays | |
|---|---|
| UE10-3OS | N-3 |
| UE23-2MF | N-9 |
| UE42-2HD | N-13 |
| UE43-2MF | N-18 |
| UE43-3MF | N-23 |
| UE43-6MF | N-28 |
| UE44-3SL | N-37 |
| UE45-3S1 | N-32 |
| UE48-2OS | N-42 |
| UE48-3OS | N-48 |
| UE49 | N-53 |
| LE20 | N-57 |
| LE20 Muting | N-64 |
| UE10-4XT | N-71 |
| UE11-4DX | N-74 |

| Safety controllers and fieldbus systems | |
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| UE410 Flexi | O-2 |
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| UE470 | O-22 |
| UE4120 | O-30 |
| UE4150 | O-30 |
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→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

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# SICK — a worldwide leader in factory and process automation.




**SICK — one of the world's leading manufacturers of sensors, safety systems and automatic identification solutions for industrial applications.**

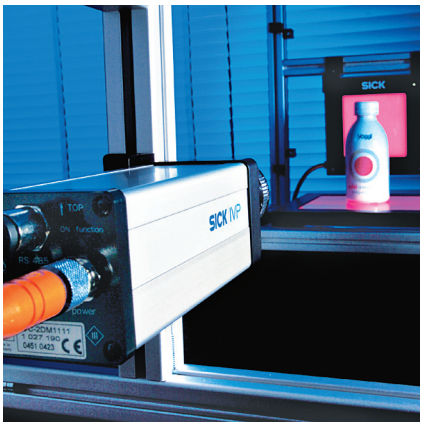
SICK is a technology and market leader in factory and process automation. The company, founded in 1946 and located in Waldkirch, Germany, employs more than 4,000 employees and is active worldwide with subsidiaries, representatives and associated companies.



# Years of strong growth – with continuous expansion of products and services



## Factory automation

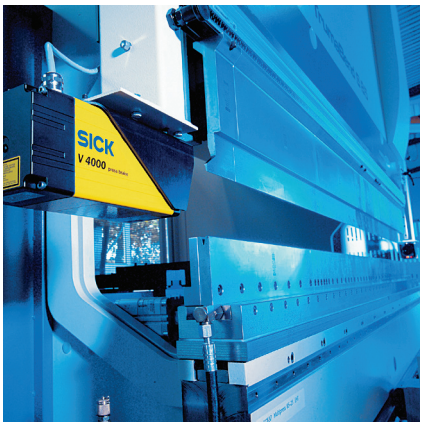



The products and solutions from SICK are as varied as the tasks for controlling production and logistical processes.

SICK sensors detect, count and classify objects and also detect their shape, position, color, and surface differences.

SICK safety technology protects against hazards caused by machines and systems in production and transport processes – and is effective in accident prevention and the protection of people.

SICK bar code readers and bar code reading systems take over sorting and routing in flows of industrial materials, in baggage and package distribution systems and in mail-order companies. 2 D code readers provide identification of laboratory samples, electronic components and bulk printed matter.

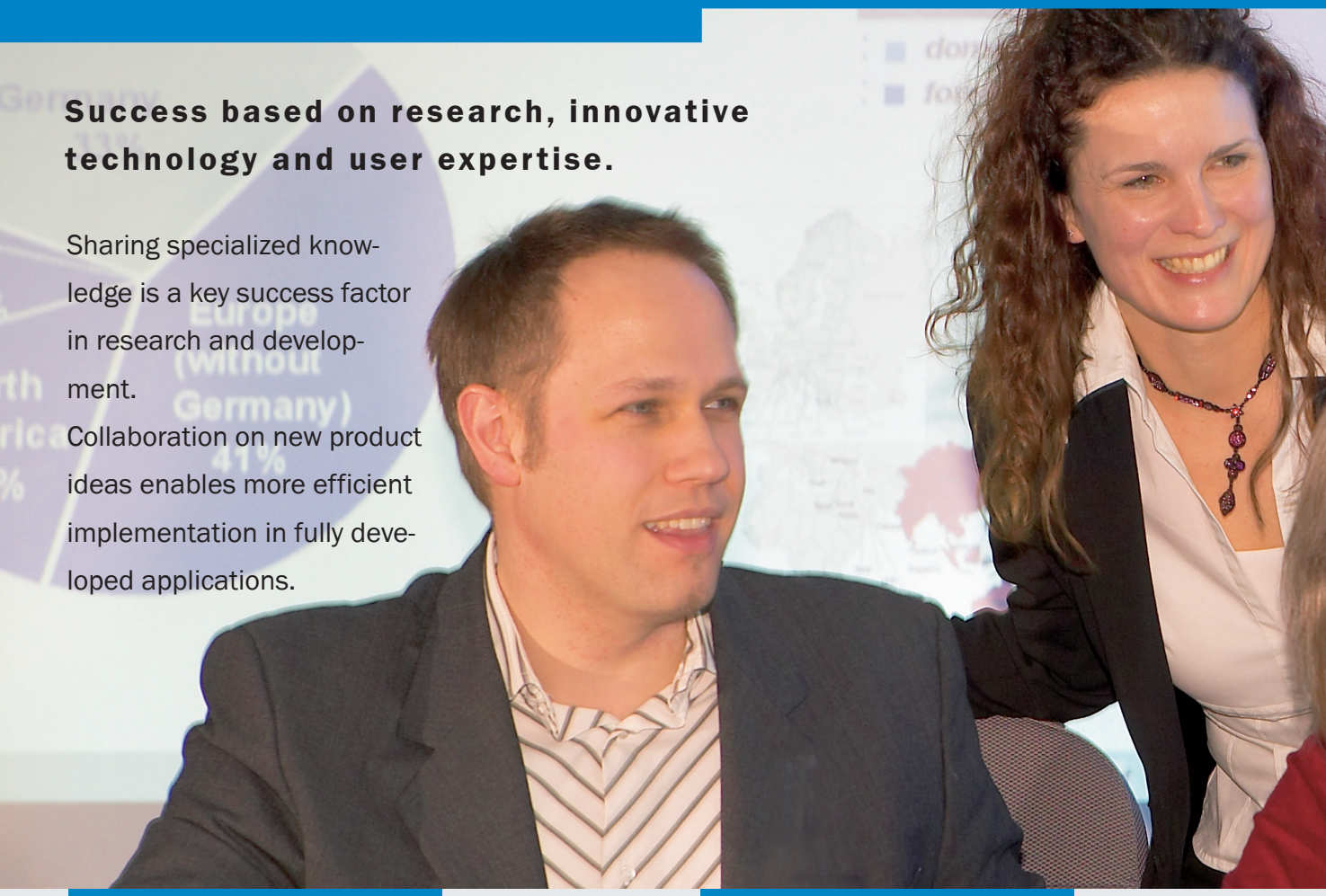



SICK laser measurement systems provide important information on vehicle heights and shapes of loads, and monitor routes for automated guided transport systems.

## Process automation

Components and systems for gas analysis, flow rate and level measurement systems, as well as for effluent systems, are the main analysis and process measurement products from SICK MAIHAK.





## Success based on research, innovative technology and user expertise.

Sharing specialized knowledge is a key success factor in research and development.
Collaboration on new product ideas enables more efficient implementation in fully developed applications.

## Industrial Sensors



Encoders, ultrasonic sensors, inductive, capacitive and magnetic proximity sensors as well as magnetic cylinder sensors, photoelectric switches, contrast, luminescence and color sensors, fork sensors, light grids, distance sensors, data transmission systems, vision sensors, position finders and light section sensors.

## Industrial Safety Systems



Photoelectric safety switches, safety light curtains, safety laser scanners, safety switches and safety software, safety camera systems and safe control solutions.
The range of services provided includes commissioning, safety inspections, repair and exchange service, stoptime measurements, technical advice, education and training.




**SICK is present worldwide with more than 40 national and international subsidiaries, numerous representatives as well as associated companies.**

## Automatic Identification




Stationary 2D code readers and bar code scanners, hand-held scanners for mobile and stationary use, omnidirectional bar code reading systems, indoor and outdoor laser measurement systems, evaluation electronics, bus interfacing technology, software tools and engineering.


KUKA
KUKA

# Solutions for factory automation.



Factory automation places very high requirements on machines and systems so that their potential can be reached, enabling cost-effective manufacturing. For machine construction and systems engineering, SICK provides a wide range of components in the areas:

- **Sensors**
- **Safety systems**
- **Automatic identification**

**Material handling**

**Packaging machines**

**Electronics**

**Automotive**

**Wood processing**

**Food and beverage**

**Printing and paper**

**Machine construction**

Solutions for Factory Automation

Comprehensive advice for the best possible solutions, reliable service for optimal machine and system availability, and training courses run by competent specialists complete the program.

# At home in many industries.

You will find our innovative, powerful products and systems wherever industrial processes require optimizaton. With its comprehensive services, SICK works with its customers to offer efficient solutions for all aspects of factory, logistics and process automation.

## Automotive industry

Competence and extensive experience characterize SICK's worldwide involvement in the automotive industry. With a complete range of industrial sensors, safety systems and automatic identification solutions and services, SICK helps increase the availability of machines and systems, improving productivity, and ensuring that manufacturing processes are safe and cost-effective.



## Material handling/logistics



Solutions from SICK are involved wherever flexible and efficient design of material flow and logistical processes are vital – e.g. in high-bay warehouses or logistics centers.





## Packaging/food

Sensors detect, position, classify and count a very wide range of objects in the beverage, food and semi-luxury industries. As a result, for example, cookies are placed in the right packing, bottles are filled with precision, labels are correctly positioned. SICK sensors, safety systems and automatic identification solutions ensure that production processes run efficiently.

## Electronics



Regardless of whether wafer detection, chip positioning or circuit-board inspections are involved – SICK sensors detect and perform final inspections in high-end applications – cost-effectively and with maximum precision.

## Machine construction

Where effective prevention of accidents and protection of people have the highest priority, safety laser scanners, safety light curtains, photoelectric safety switches and safety switches from SICK provide protection of hazardous areas, hazardous points and access on machines and production systems. SICK has extensive experience based on many thousands of applications.



# safetyPLUS from SICK.

## More innovative technology, unsurpassed services and vast standards and application expertise!

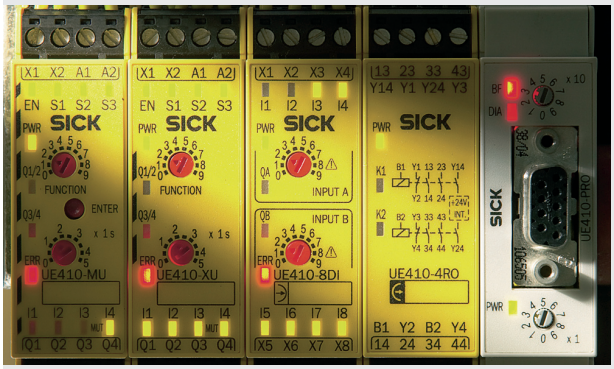
**SICK leads the way to the future: with the world's most comprehensive safety portfolio – and a solution for your challenges!**
**safetyPLUS represents our entire range of safety solutions and reflects our aim to do everything technically possible and economically desirable to help you achieve your goals.**

**safetyPLUS:**
**More inspiration for trailblazing solutions!**

SICK has been developing safety innovations for 60 years. During this time, we have gained an excellent reputation as a complete supplier of trailblazing safety solutions: many of our innovations also set international standards in performance and functionality! Worldwide, SICK is one of the most important trendsetters in the industry – a position that we intend to build upon for our customers.

**safetyPLUS:**
**More competence for each of your individual projects!**

Whether individual solutions or integrated safety concepts, SICK can assist you with project planning from design to implementation, as well as support during operation. Our expertise in ensuring the safe interaction between humans and machines is unique worldwide. Moreover, thanks to our fundamental knowledge of all relevant standards, we help to reduce exposure to liability for machine builders and end users.









**safetyPLUS:**
**More platform-independent solutions for your machines and plants!**

SICK develops innovations and solutions that can be integrated in almost all system architectures. The central core of this philosophy of "system openness" is particularly evident in the case of our powerful control solutions. With SICK, you do not have to commit to any particular system platform, as our solutions can be seamlessly integrated into almost all system environments!

**safetyPLUS:**
**More intelligence for your smooth operations!**

The use of intelligent control technology in combination with dialog-enabled sensors forms the threshold to considerably greater economic efficiency – because optimum productivity demands optimum interplay between humans and machines, just as much as between safety sensors and controllers. Intelligent solutions provide more information on the state of your machines – and, thanks to comprehensive diagnostic information, the security of knowing that you always have everything under control!

**safetyPLUS:**
**More quality in products and services!**

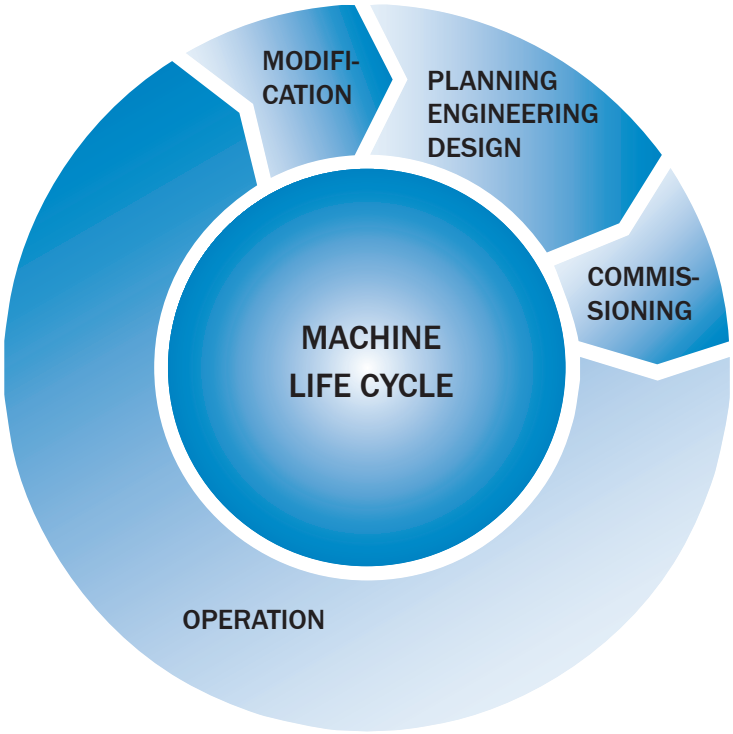
Our first-class product quality reflects our excellent relationship with our customers – with whom we have collaborated with for many years. Safety consultancy, engineering and project planning services, training, product support, and much more, are part of our fixed range of services for all our customers. Our more than 4,000 employees in more than 40 countries are pleased to be of service at any time!





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# International Service Solutions




## Safety during all phases of the machine life cycle

In our highly competitive marketplace we need to fine-tune options to stay ahead of the game. By coordinating our performance with your requirements, SICK's comprehensive safety expertise and our industry partnerships set us apart, offering you a complete support package, which is available to you for the entire service life of your machine. This encompasses planning and commissioning through to maintenance, repair and updating of your system. Service — configured to suit your own requirements.

## Services from SICK-tailored to customer requirements

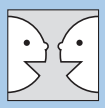
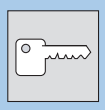
- Increase in machine availability
- Conforms to international technical safety standards
- Documented and traceable results
- Fast, competent and on-time support
- Reduced costs through optimized solutions
- Support of your safety organization



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# Services at a glance



| | | More Information |
|---|---|---|
|  | **Application support**<br>Our specialists will assist you in planning the safe operation of your system and provide help in implementing your safety requirements. We can thus help eliminate any sources of danger from the outset, saving you time and money. | www.sickusa.com/ applications |
|  | **Product support**<br>If a malfunction occurs, we offer competent support. Our device exchange service is rapid and cost-effective to ensure re-commissioning of your production line. And in cases of emergency, we will repair your equipment quickly in our factory or, if appropriate, on site. | www.sickusa.com |
|  | **Stop time measurement**<br>Stop time measurement is a necessity with many machines. The time it takes the machine to stop under worst-case operation determines the mounting location required to ensure that minimum safety distance requirements are met. SICK and our industry partners can assist you with determining the required stop time distance that should be considered in your application. | A-4 |
|  | **Upgrade services**<br>We offer tailor-made upgrade kits to ensure the availability of your plant in future.You achieve safety and optimal productivity with modern protective devices. | Contact your local SICK representative |
|  | **Training & Education**<br>Our comprehensive training program gets your staff “technically fit” to deal with any safety-related technical situations that may arise. We provide support to users and operators on product introductions, and can also offer support regarding efficient and correct use of SICK safety products. | A-5 |

➜ Please contact your local Authorized SICK Distributor to discuss your application needs. Go to www.sickusa.com to locate a SICK sales representative or local distributor in your area.



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A

- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

# Stop time measurement



## Confidence in our quality

If the requirements of the standards and regulations are to be followed, there must be sufficient distance between the safety device and the hazardous area. For its calculation and safety assessment, the stop time for presses and power-driven machinery must be determined. This stop time must be included in the documentation and must, for presses, also be clearly visible on the machine.

Our “stop time measurement” service offers you important advantages:

- Experts and their application experience contribute to meeting your operational safety targets — permanently
- Quality of test methods and competent execution by a service engineer trained to DIN EN ISO/IEC 17020
- Traceable and documented results for quality management
- Quality of measurement assured by calibrated measurement equipment and execution by SICK experts

## Scope of services

Stop time measurement calculates the safety distance according to specific machinery standards (Type C standard) or to EN 999; it is mandatory for a safety inspection.

The safety distance for the safety device is calculated by measuring the stop time and using standardized calculation rules and application-dependent constants.

## Measurement

- Measurement of the stop time on 10 representative samples and determination of the current stop time.
- Computing the minimum safety distance according to the calculation principles of a specific machinery standard (Type C standard) or EN 999.

Note:
For multiple-axis applications, a measurement must be performed for each dangerous movement.

## Documentation

- A measurement report will be provided for your machine documentation.
- A label with the measurement data is attached directly to the machine.

## Preconditions

- The power-driven machinery or press must be equipped with the workpiece/tool for the intended use.
- The system or machine must be freely accessible for the measurement.
- The machine operator must be available for the duration of the measurement, to set up system-specific operations and to start the system.

# Ordering information

Stop time measurements are carried out by SICK or our partner companies.

Contact your local SICK distributor or sales representative for more information.

| Further information | Page |
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# Training & Education



## Increase your skills and knowledge

Would you like to increase your knowledge of safety systems and your ability to solve tough applications by selecting the appropriate solution for your needs? Do you need to better understand the integration of safety products and what it takes to ensure control reliable circuits?

If you answered yes to either of these questions, you should consider attending SICK Safety Systems Product Training.

SICK is a leading manufacturer of industrial sensors, safety systems and automatic identification technology for factory and logistics automation. Our training modules offer the latest technology and developments in industrial safety systems. In addition to providing detailed product information, SICK training blends in real-world application examples and problem solving experiences.

## SICK Training

- Safety Products Training
- Advanced Safety Products Training
- Tech Tuesdays
- Customer-specific Training Programs

➜ For current training schedules and information, go to the training and support pages available at www.sickusa.com/training.





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A

## Seminars



**Enhancing knowledge**

Over time, safety regulations and related standards change. Many of these changes occur due to advances in technology. For example, after decades of traditional hardwire-based safety solutions using safety relays, acceptable technology now includes safety-rated programmable logic controllers and safety fieldbus network technology. These changes drive the need for new understanding about which features and benefits help customers drive innovative application solutions.

SICK safety training emphasizes best use of the principles of current safety technology, including the following topics:

- Essential information on relevant regulations regarding machine safety
- Standard-orientated selection of suitable safety devices
- Integration of safety equipment in the general control system
- Correct assessment of safety procedures based upon currently applicable directives, standards and legislation/regulations

**Target groups**

- Design engineers
- Electrical engineers
- Technical managers
- Those responsible for machine safety

## User training




**More confidence to select the right application**

SICK Training programs offer you an array of qualification measures. The customer training programs are directed towards the products, in order to integrate these effectively into the planned application in an efficient and durable manner. You will receive the necessary tools to facilitate the setting up of any device and also carry out analyses and diagnostic investigations.

The general structure of a customer training program embraces the various phases that arise during the selection and integration of a product:

- Selection
  - Safety aspects
  - Product properties and application possibilities
- Integration
  - Installation into the application and wiring
  - Programming
  - Commissioning
- Operating the system safely
  - Error/fault diagnostics and troubleshooting

**Target groups**

- Employees in:
  - Maintenance
  - Servicing
  - Design
  - Planning

## Customer-specific training programs



On request, SICK will prepare a customized training program for customer application and product needs.
Training can be conducted at SICK's North American headquarters in Minneapolis, MN, on-site at a customer facility or off-site nearby a customer facility.


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# Types of seminars and trainings



If required, we can conduct our seminars and customer training programs on your premises

## Seminars

| Title |
|---|
| ▪ Technical principles on safety |
| Principles of machine related safety |
| Function, selection and application of safety devices |
| Safety technology for power-driven machinery |
| Safety technology for presses |
| Safety technology for power-driven machinery and presses |
| ▪ Specialist seminars |
| CE marking |
| Hazard analysis and risk assessment |
| Safexpert® training |

## User training

| Title |
|---|
| Advanced safety training |
| ▪ Safety light curtains and light beams |
| C4000 light curtain — basic training |
| Advanced functions of the C4000 with UE402 interface — advanced training |
| FGS light curtain with LCU safety interface |
| M4000 multiple light beam safety device – basic training |
| M4000 multiple light beam safety device – advanced training |
| MSL multi-beam photoelectric switch with MSM muting module |
| ▪ Safety scanners |
| S3000 laser scanner — basic training |
| S3000 laser scanner — mobile applications |
| S300 laser scanner — basic training |
| V4000 camera system – integration training |
| PLS proximity laser scanner |
| LSI laser scanner interface |
| Product instruction on PLS proximity laser scanner (on-site) |
| Product instruction on S3000 laser scanner (on-site) |
| ▪ Safety Control Systems |
| UE410 Flexi Controller — configurable safety controller |
| Automation and field bus basics for DeviceNet and DeviceNet Safety |
| SICK safety network solutions with UE44XX |
| UE4100 — bus node for PROFIsafe |
| UE440/470 — multifunctional safety controllers |

➜ Up-to-date detailed information can be obtained at www.sickusa.com/training



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# Regulations and standards

This chapter is intended for designers and users of machines who specify and employ protective devices. On the pages that follow, we show you various ways you can protect machines with SICK protective devices while observing the applicable regulations, directives and standards.
The examples provided are the result of our many years' practical experience and are typical applications.

No legal claims can be made on the basis of the information provided. Each machine requires a specific solution as a result of national and international regulations and standards.


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# General overview

This section serves as a guide for designers and users of machinery who specify and use protective devices for a variety of machine safeguarding applications. For clarity, information is also presented regarding the regulations, standards and directives for the United States, Canada and Europe.

Application examples are also provided at the end of this section. These examples result from SICK's many years of practical experience and should be viewed as typical applications. However, no legal claims should be derived from these examples, as every machine requires a specific solution based on local, regional and national regulations and standards.

## SICK as a global leader in safety and sensor technology

SICK is a worldwide manufacturer of factory and process automation solutions. In 1946, Erwin Sick, inventor and entrepreneur, founded an independent engineering office that became an international leader in sensor manufacturing. He applied his practical knowledge of electronics to the physics of light and the problems facing industry as it moved into a new era of automation. Soon after, SICK unveiled its first photoelectric sensor with overwhelming success. A few years later, SICK developed the first safety light curtain, setting the standard for industrial safety applications. These designs were the first in a long line of patented innovations.

SICK continues to lead the industry with innovations. The company now holds more than 450 patents in industrial sensors, safety systems, bar code scanners and environmental monitors, solidifying its position at the forefront of sensing technology, The diversity of its product line allows SICK to offer solutions at every phase of production in the automotive, machine tools, robotics, packaging, electronics, transportation, food and beverage, security and material handling markets.




SICK automation solutions include a complete range of:

- non-contact sensors used to optimize production and logistical processes in nearly every industry.
- sensors and safety system solutions for accident prevention and personal safety in industrial environments.
- bar code scanners and laser measurement systems used for automatic identification applications from logistic centers to airports, material handling centers and tollbooths.

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| --- | --- |
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SICK's industrial sensors, safety systems and automatic identification solutions touch people's lives every day, making their lives easier, protecting them from danger and providing them with better and cost-effective performance.

**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 providing consultation and support.

**Service**

SICK and our industry partnerships offer a comprehensive range of service options to support your operation. From safety consulting and machine design to repairs and training, SICK's services get your operation and keep it running at maximum efficiency. Our services include safety and engineering consulting, installation, maintenance, repairs and product/application training.

**Solutions**

SICK is a global leader in industrial automation for safety, sensor and automatic identification solutions. Our team of application engineers has the specialized knowledge to assist you in choosing the best solution for your application and helping you to implement that solution. With leading products, expertise and services, SICK is ready to help you reach your goal of lowering cost, increasing quality and improving safety.






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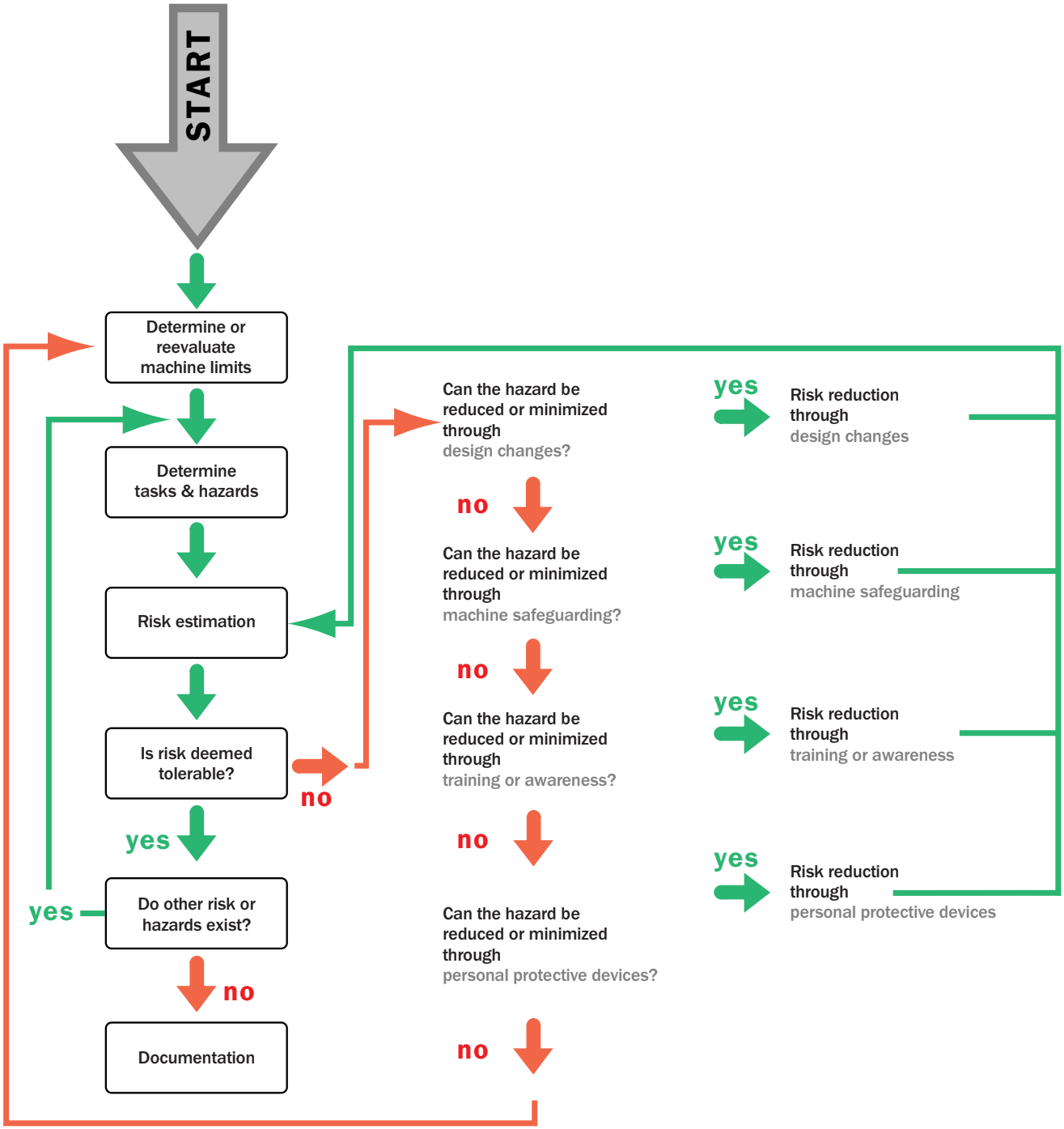
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# Risk assessment and risk reduction

When designing a machine, the potential risks must be analyzed and mediated. Where necessary, additional protective measures must be implemented to protect operators and other individuals from hazards such as crushing, shearing, cutting, snatching, clamping, trapping, perforation, puncturing, risk of shock, and more.

[cf. Title 29 U.S. Code of Federal Regulations, Part 1910 Subpart O, European Standards ISO 12100 and EN 1050 (ISO 14121)]. This process is known as Risk Assessment and Risk Reduction.

The following flow chart provides a basic outline for the process of performing a risk assessment and risk reduction for a machine or system.





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## Defining the machine limits

When performing a risk assessment and risk reduction strategy, it is important to consider input from a variety of information sources. All risk assessment and risk reduction strategies should be a cooperative effort between the supplier of the equipment, the supplier of the safety system and the end user of the equipment as well as other involved parties such as system integrators. Furthermore, a team approach is recommended so that the broader experience of a diverse group of involved individuals that interfaces with the machine / system is taken into account. For example, an operator of the machine or system will have a different perspective than the machine designer.

The process of performing a risk assessment always begins with determining the limits of the machine or system. These machine limits may encompass a variety of aspects including, but not limited to:

| Machine limits | Examples |
|---|---|
| Use Limits | Intended use of the machine, production rates, cycle times, etc. |
| Space Limits | Range of movement, maintenance, etc. |
| Time Limits | Maintenance and wear of tools, fluids, etc. |
| Environmental Limits | Temperature, humidity, noise, location, etc. |
| Interface Limits | Other machines and auxiliary equipment, energy sources, etc. |

## Defining the tasks to be completed on/by the machine

Once the machine/system limits have been defined, the next step in the process is to identify the various tasks and associated hazards of operating the machine. The following list provides some basic task categories that should be considered. It is important to note that this list is not exhaustive and that additional task categories may apply.

- Packing and transportation
- Unloading and unpacking
- System installation
- Start-up and commissioning
- Set-up and try out
- Operation - all modes
- Housekeeping
- Tool change
- Planned maintenance
- Unplanned maintenance
- Major repair
- Recovery from crash
- Troubleshooting
- Decommissioning
- Disposal

## Defining the hazards associated with each task

After the tasks associated with the machine or system have been identified, corresponding hazards should be considered for each task. These tasks and hazards should account for both the intended use of the machine and any foreseeable misuse of the machine.

The next step is to perform a risk estimation for each task and its associated hazard(s). A variety of standards and technical reports have been developed to assist users with this process. Typically, there is a hierarchical approach based on several factors, including: probability of occurrence of harm, exposure to the hazard, ability to avoid injury and the degree of potential injury.

Various risk assessment standards and technical reports utilize different approaches in considering these factors. Based on applicable national, regional and local regulations, please reference one or more of the following standards or technical reports relating to risk assessment and risk reduction categories and associated requirements:

| Standard | Description |
|---|---|
| ANSI / RIA R15.06 | Safety Requirements for Robots and Robot Systems |
| ANSI B11.TR3 | Risk Assessment and Risk Reduction - A Guide to Estimate, Evaluate and Reduce Risks Associated with Machine Tools |
| CAN / CSA Z434 | Safety Requirements for Robots and Robot Systems |
| EN1050 (ISO 14121) | Safety of Machinery - Principles for Risk Assessment |
| ISO 12100 | Safety of Machinery - Basic concepts - General principles of design |


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## Estimate the risks of each task and associated hazard

The following diagram outlines one method for risk reduction in accordance with EN 954-1 (ISO 13849-1) and EN 1050 (ISO 14121). It is important to note that other consensus standards also address the topics of risk assessment and risk reduction strategies. For the purpose of this discussion, we will review some of the requirements associated with EN 954-1 and EN 1050.

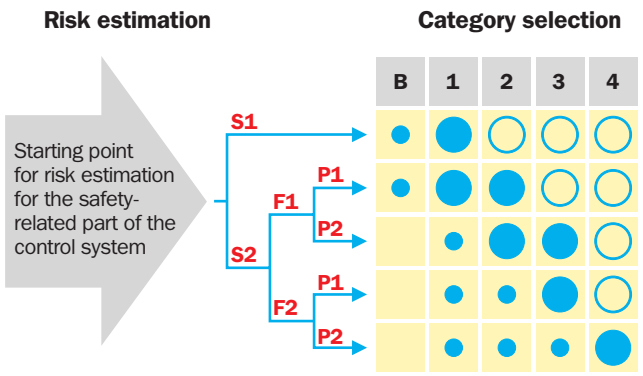
When applying the concepts of risk assessment and risk reduction, the protection of an operator who manually inserts and removes parts at a metal press requires different consideration compared to the protection of an operator who works on a machine on which the maximum risk is the trapping of a finger.

Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different
measures can be adopted for different parts of the safety-related control for a machine. These standards aid designers in the definition of the categories for the various parts of the safety-related control, based on the following parameters:

- The possible severity of injury (S)
- The frequency and/or duration of exposure to the hazard (F)
- The possibility of preventing the hazard (P)

The behaviour of the safety-related control in case of a fault is defined for each category (B, 1, 2, 3, 4, cf. table page A-23). If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies.

The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements. Nevertheless, the AOPDs (Active Optoelectronic Protective Devices) and their interfaces must comply with the requirement of the category for the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).




Preferred category

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 [1)]

S2 Serious injury: normally irreversible, or fatal or requires more than first-aid [1)]

**F FREQUENCY (or duration of exposure to hazard)**

F1 Infrequent: Typical exposure to hazard less than once per hour [1)]

F2 Frequent: Typical exposure to hazard more than once per hour [1)]

**P POSSIBILITY (of avoiding the hazard)**

P1 Likely: Can move out of the way or sufficient warning/ response time or the robot speed is less than 250 mm/s [1)]

P2 Not likely: Cannot move out of the way or inadequate response time or the robot speed is higher than 250 mm/s [1)]

[1)] Note: Additional definitions and criteria information are based on ANSI R15.06-1999, table 1.


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## Risk reduction strategies

According to industry standards, the goal of implementing a risk reduction strategy is to reduce risk to personnel to a "tolerable" level. The definition of a "tolerable" level of residual risk is ultimately the decision of the owner of the equipment.
In general, there is industry agreement that a risk reduction strategy should utilize a hierarchical approach. The following table, based on ANSI/RIA R15.06-1999 Table A.2 - Hierarchy of safeguarding controls, provides an example of this hierarchical approach.
This standard clearly indicates that the most effective solution
*begins with*
1. Elimination or substitution,
*working through to*
2. Engineering controls,
*followed by*
3. Awareness means
*and then*
4. Training and procedures,
*followed by the least effective solution*
5. Personal protective equipment.

A comprehensive approach to risk reduction may include any or all of the risk reduction strategies identified in the following table.

| Risk Reduction Strategy | Examples |
|---|---|
| 1. Elimination or substitution by changes in machine design | ▪ Eliminate human interaction in the process<br>▪ Eliminate pinch points (increase clearance)<br>▪ Automated material handling |
| 2. Engineering controls (safeguarding technology) | ▪ Mechanical hard stops<br>▪ Barriers<br>▪ Interlocks<br>▪ Presence sensing devices<br>▪ Two hand controls |
| 3. Awareness means | ▪ Lights, beacons and strobes<br>▪ Computer warnings<br>▪ Signs<br>▪ Restricted space painted on floor<br>▪ Beepers<br>▪ Horns<br>▪ Labels |
| 4. Training and procedures (administrative controls) | ▪ Safety job procedures<br>▪ Safety equipment inspections<br>▪ Training<br>▪ Lockout |
| 5. Personal protective equipment | ▪ Safety glasses<br>▪ Ear plugs<br>▪ Face shields<br>▪ Gloves |

## Using an iterative process and considering personnel

The process of performing a risk assessment and risk reduction strategy for a machine or system is an iterative process. After the initial risk reduction strategy has been implemented, it is imperative that the task and associated hazard be re-evaluated based on the additional protective measure and new risk estimation is determined.
If the subsequent risk estimation determines that residual risk is viewed as "tolerable", then the next task and associated hazard are evaluated. If the residual risk is not determined to be tolerable, then implementation of additional risk reduction measures should occur followed by a new risk estimation. This iterative process repeats until the residual risk is viewed as tolerable.

Also consider that personnel potentially affected by the tasks and hazards associated with the machine / system could include:

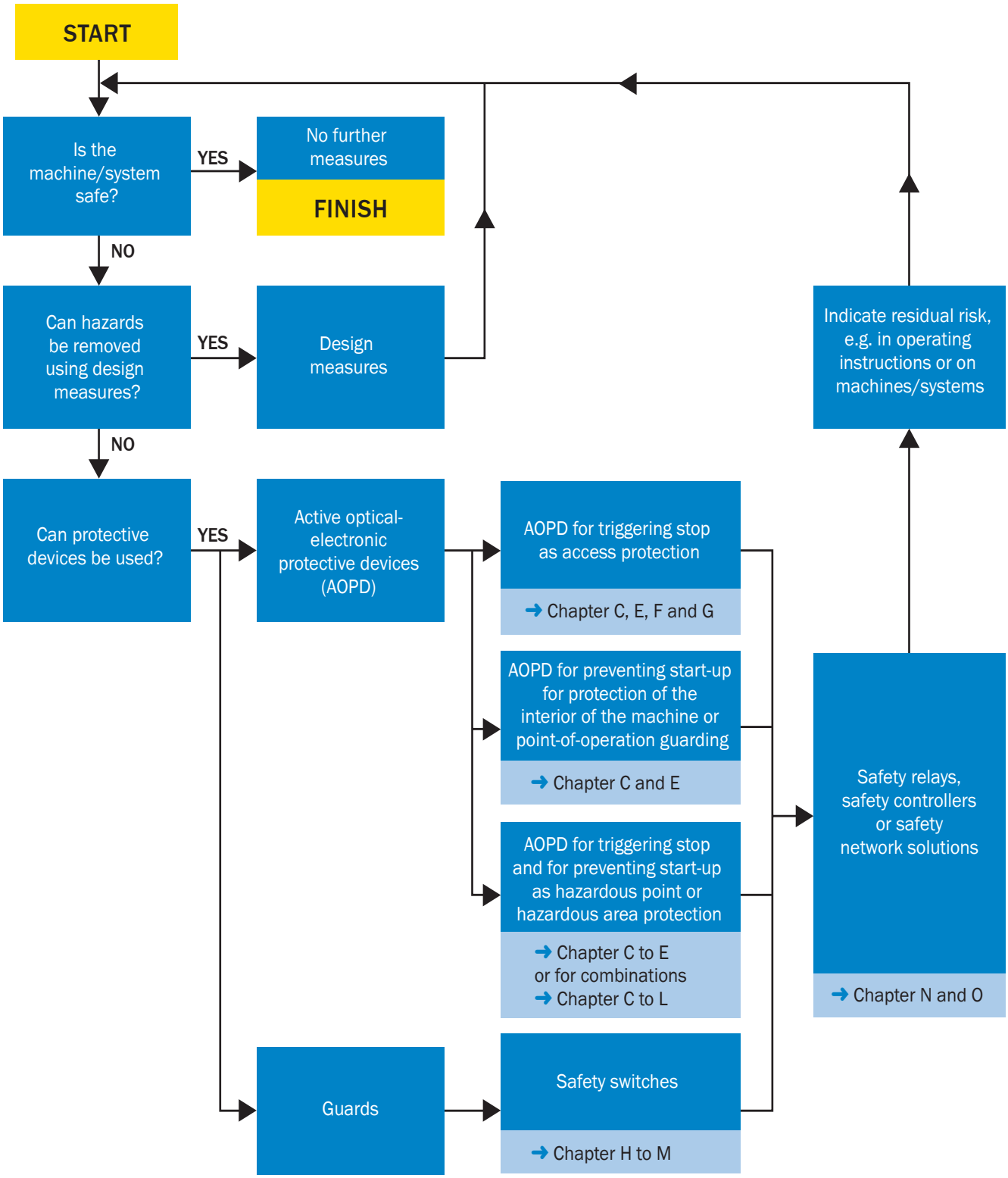
- Operators or helpers
- Maintenance personnel
- Engineers
- Technicians
- Sales personnel
- Installation personnel
- Removal personnel
- Administrative personnel
- Trainees
- Passers-by
- Designers
- Manager
- Supervisors
- Safety personnel
- Safety committees
- Safety consultants
- Loss control administrators
- And others

## Other factors that should be considered

- The level of training and experience of each personnel type shown above
- Machine task history including statistical data, history of harm, history of "near misses"
- Workplace environment related to layout, lighting, noise, ventilation, temperature, humidity, etc.
- The ability to maintain protective measures required to provide adequate level of protection
- Human factors - e.g. errors resulting from omitting steps in the process, adding steps or performing steps out of sequence, personnel interaction, ability to execute required tasks, motivation to deviate from established safety procedures, accumulated exposure, reduced vision, etc.
- Reliability of safety functions including mechanical, electrical, hydraulic, pneumatic control system integrity
- Potential for circumvention of protective measures including incentives to defeat protective measures e.g. protective measure prevents task from being performed, protective measure may slow down production, protective measure may interfere with other activities or may be difficult to use.


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Note:
The simplified risk analysis process shown here is only intended to provide a quick introduction to product selection.
You will find information on the process, in accordance with ISO 12100, on ➜ page A-12 under Regulations and standards as well as ➜ Chapter P, Safexpert.


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# Why optoelectronic safeguarding?

This section discusses the use of optoelectronic protective devices in applications where risks cannot be eliminated through design, and additional safeguarding measures are necessary to reduce the risk to a tolerable level.

When an operator must interact with a machine and during this process is exposed to a hazard, it is advisable to fit a protective device to prevent exposing the operator to the dangerous machine movement.

When installed correctly, a protective device prevents or detects reaching into or entry into a hazardous area. When an entry is detected the protective device, in conjunction with the machine control system, prevents the initiation of hazardous movement or initiates an immediate stop of the machine, thus eliminating the existence of the hazard.

Optoelectronic protective devices are often preferred to other mechanical safeguarding devices such as fixed or movable guards and two-hand controls due to the following advantages:

- 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 protective devices protect the operator, but provide little or no protection for other individuals who may be in or near the hazardous area.

# Selection of optoelectronic protective devices

Once the decision is made to utilize an optoelectronic protective device, the next step in the process is the selection of a specific device. The principle criteria for choosing an optoelectronic protective device are defined in the following four steps. Each step is interdependent and calls for an iterative approach.

**Warning:**
An ESPE can only be used if the operator is not exposed to any risk of injury from splashing material (e.g. molten material) or flying pieces of material. Also, the access time must be greater than the time required to stop the hazard.

## Definition of the function to be performed

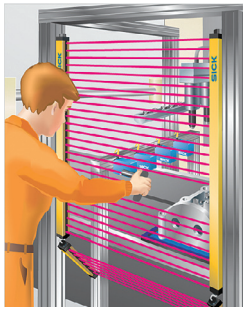
In the first step it is to be defined which function is to be provided by the protective device.

**Hazardous point protection**

Hazardous point protection 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 a finger or hand entering a defined area, during a hazardous motion of the machine.

The primary functions of protective devices generally include, but are not limited to, the following:

- Triggers a stop before the hazardous point is reached
- Prevents unintentional machine starts as long as the protective field is interrupted or there is a person or objects in the protective field

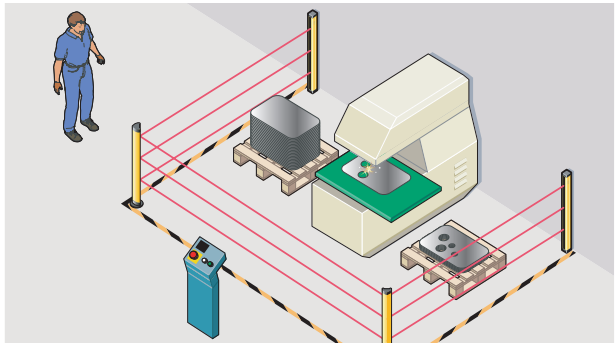


**Access protection/Entry-exit protection**

The access protection or entry-exit protection is used to detect the intrusion of a person in an area.

As soon as entry is detected, a signal is triggered to stop the machine's dangerous movement.

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. The control station, including the ability to restart the machine, must be located well outside of the hazardous area. (The start of the machine shall not be possible from inside of the hazardous area.) The operator must also ensure that there are no people in the hazardous area before actuating a control switch for acknowledging the protective device and restarting the machine.




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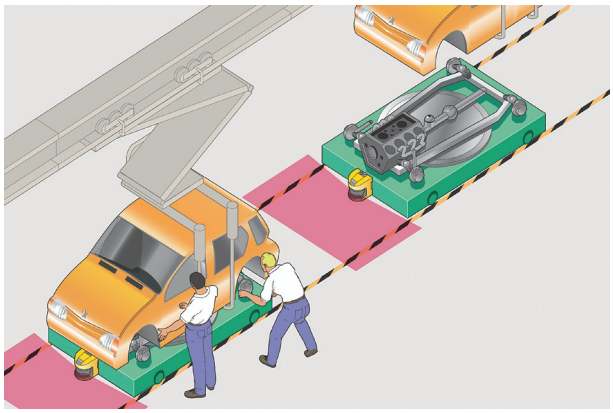
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**Area protection**

The function of area protection is similar to access protection with the added function of sensing the presence of personnel inside the hazardous area. This type of safeguarding is suitable for machines where hazardous areas enclosed by fixed guards are not visible from the control point.

It is also suitable for protecting the approaches to a hazardous area where it combines perimeter and presence sensing safeguarding (permanent detection of personnel throughout the zone).

This type of safeguarding is also suitable for automated guided systems (AGS) to protect operators and/or third persons during vehicle movement.



## Definition of the protective field

The second step in choosing which optoelectronic protective device is to define and assess the risks associated with the machine.

Depending on the installation and configuration, it is necessary to take the following points into consideration:

- The size of the protective field
- Stop triggering/start preventing
- The various access points
- The accessible hazardous areas
- The risk of bypassing the protective device and of the undetected presence of people in the hazardous area

## Selection of the protective device

Several standards address the methods of assessing and estimating risks associated with the tasks and hazards of a machine, e.g. ANSI/RIA R15.06, ISO 14121, ISO 13849, IEC 62061 and others. For the purpose of this discussion, a review of the standard ISO 13849-1 (EN 954-1: 1996) is given here (see table on the following page).

A new version of ISO 13849-1 was adopted in November, 2006 that provides additional requirements related to the performance of safeguarding systems. The "performance level" requirements outlined in this new revision will take effect in 2010. For additional information regarding the new information related to this latest standard revision, please contact your local SICK representative.

While the essential requirements of the directive are aimed at a high level of safety, the resources must nevertheless be proportional to the risk involved.

The protection of an operator who manually inserts and removes parts at a metal press requires different consideration compared to the protection of an operator who works on a machine on which the maximum risk is the trapping of a finger.

Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different measures can be adopted for different parts of the safety-related control for a machine.

The basic criteria for the selection of an optoelectronic protective device depend on a variety of requirements, such as:

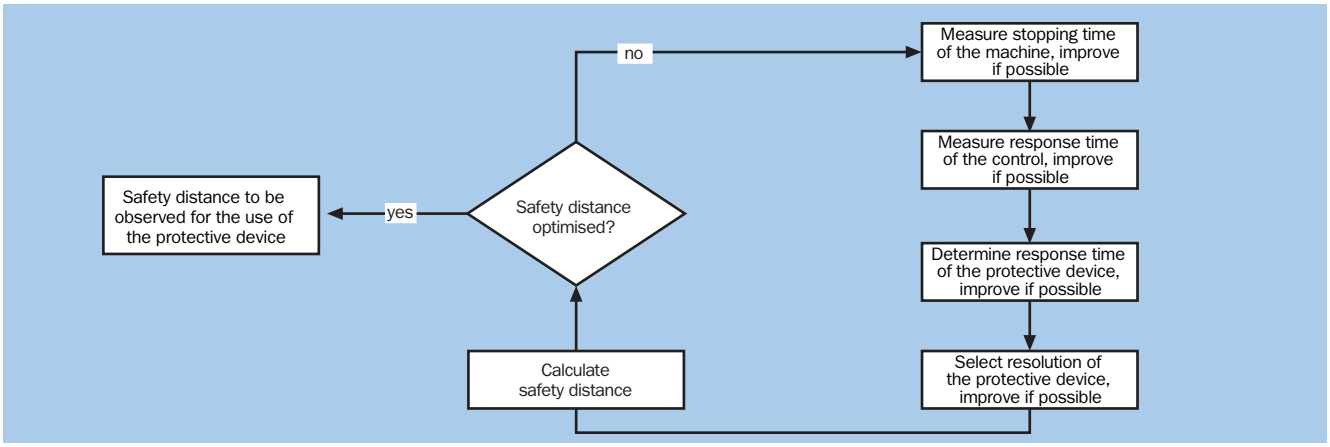
- The standards to be observed (e.g. EN 692 or ANSI B11.1 for mechanical presses)
- The space available in front of the hazardous area
- Commercial criteria
- Ergonomic factors (e.g. periodic insertion of parts, or no need for periodic access)

After definition of the protective area, the safety distance (ESPE to the hazardous point) is defined using the following parameters:

- Stopping time of the machine
- Response time of the controller
- Response time of the ESPE
- Supplements to the safety distance calculated

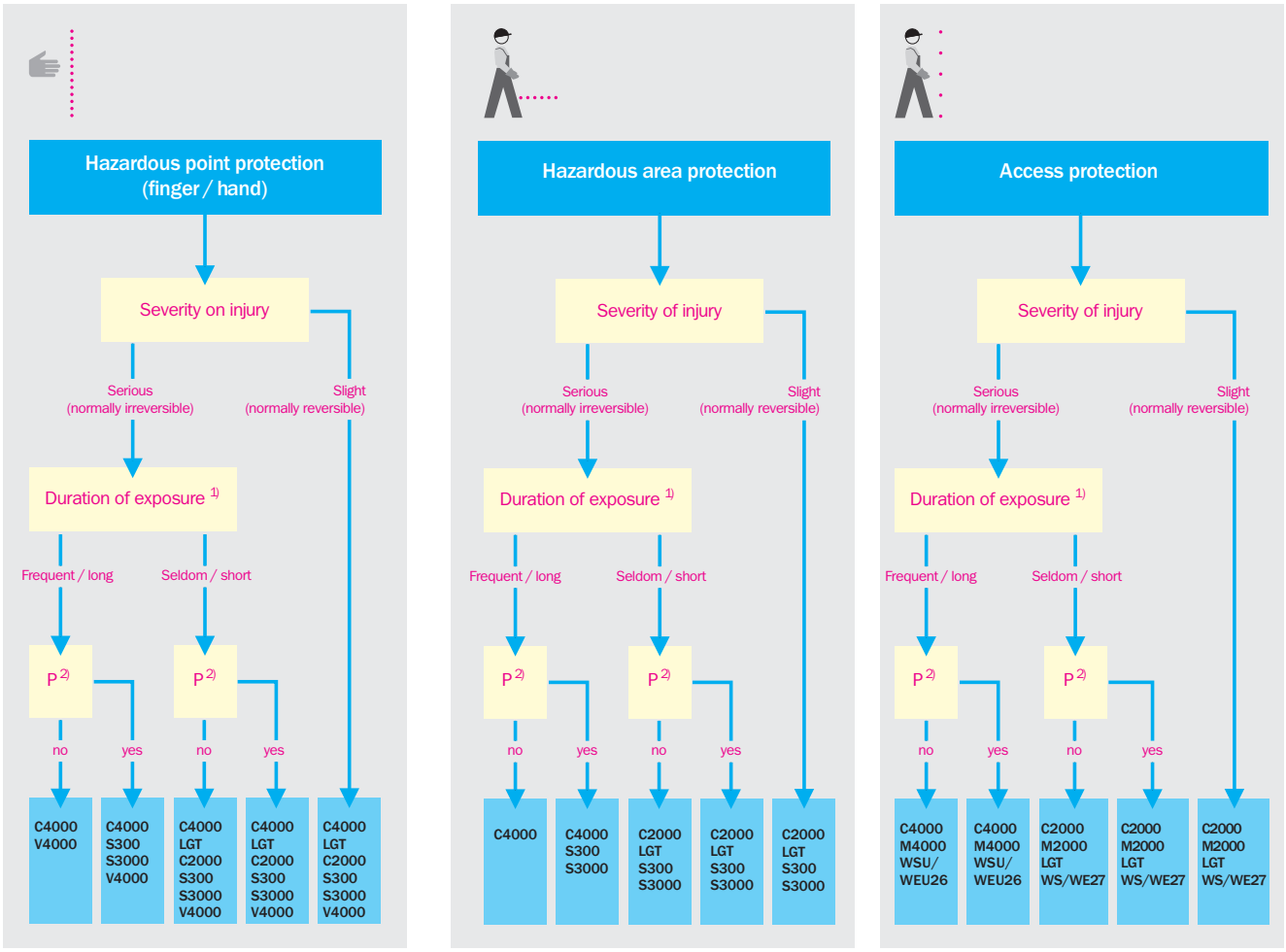

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**Iterative process for the optimisation of the safety distance**




## Choosing a SICK optoelectronic protective device

➜ The selection of a safeguarding device should be in accordance with your risk assessment and risk reduction strategy. Refer to page A-12 for additional information on risk assessment and risk reduction strategies.




1) The duration of the exposure to the hazard (frequency/duration). The expected duration of direct exposure must include the access frequency.
2) Possibility of avoiding the hazard; Yes: means that the operator can avoid the hazard.

Note: If there is a risk of irreversible injuries, we recommend using an safeguarding device (ESPE) with minimum rating type 3 in accordance with IEC 61496.


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# Selection of other safeguarding components

**Requirements are placed on guards are per the following standards:**

- EN 12100 “Safety of machinery — Basic concepts, general principles for design”
- EN 953 “Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards”

## General requirements

- Guards must be designed to be adequately robust and durable to ensure that they withstand the environmental conditions to be expected during operation. These properties must be retained during the entire period of use of the machines
- They must not cause any additional hazards
- It must not be possible to easily bypass the guards or render them ineffective
- The guards must be an adequate distance from the hazardous area if they have openings (see EN 294). This requirement also applies to openings in guards as well as between guard and machine frame, clamping plates, etc.
- Guards must not restrict observation of the working process more than necessary, insofar that observation is necessary
- Guards must be firmly held in place
- They must be retained either by systems that can only be opened with tools, or they must be interlocked when dangerous movement occurs
- As far as possible, they should not remain in the protective position if the fastening is undone

**Ergonomic criteria**

Ergonomic aspects are also significant during the design of guards. Guards will only be accepted by employees if they do not hinder setup, maintenance and other similar activities any more than necessary.

The following aspects affect the use of a guard:

- Easy opening and closing, lifting or moving
- Single-handed opening, closing, lifting and moving of the guard
- Handle to suit function
- Opened guards must allow convenient access
- Opened guards must be secured against slamming shut if slamming shut could cause injuries. Measures against slamming shut could, for example, be:
  - Guards with counterweight
  - Gas struts or helical springs
  - Locking devices that automatically keep the guards open

## Fixed guards and interlocked guards

Guards that are not removed or opened very often or are only removed or opened for maintenance work — provided they are not interlocked with the dangerous movement — must be fastened to the machine such that they can only be undone with tools. Their removal must involve a dismantling process for which tools are required (see also supplementary measures in the related C-type standards).

Guards that are opened frequently, or for setup, must be interlocked with the dangerous movement such that after opening or removing the guard, dangerous movements come to a standstill in good time.
Guards are opened “frequently” if, for example, employees must open them at least once per shift.
Locks are necessary if hazards are to be expected on opening guards (e.g. very long run-down).

| Guards in accordance with EN 12100 and EN 953 | | |
|---|---|---|
| **Fixed** | **Movable** | |
| Fences/barriers | Flaps, gates and doors | |
| Only to be removed with tools or electrically interlocked | With locking device | Without locking device<br>EN 999<br>EN 954 |
| EN 947-5-1<br>EN 1088 | EN 947-5-1<br>EN 1088 | |


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## Position switches with personnel protective function

For the interlocking of a guard, the position switches with a personnel protective function (safety limit switches) must meet special requirements (EN 60204-1, EN 1088 and EN 60947-5-1 “Control circuit devices and switching elements; electromechanical control circuit devices”).

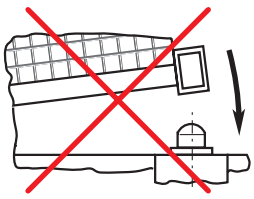
- Their placement and design must protect them against inadvertent operation, changes in position and damage: The switch and the control cam must be secured by shape (not force), e.g. using round holes, pins, stops
- They must be protected by their actuation method, or their integration in the control must be such that they cannot be easily bypassed (manipulated). For this reason, the position switches must have normally closed contacts
- It must be possible to check the switches for correct operation and, if possible, they must be easily accessible for inspection
- The switches must not be used as a mechanical stop
- The position switches must be fitted such that they are protected against damage due to external effects
- The actuation stroke must be set to suit the positive opening travel in accordance with the manufacturer’s instructions. The minimum plunger travel defined by the manufacturer must be observed in order to provide the necessary switching distance for the positive opening

## Design of guards

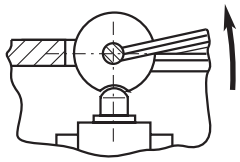
**Interlocks with and without locking**

Interlocks establish a direct dependency between the function of the movable guards and the dangerous machine movements. Guards that are frequently removed or opened, or are removed or opened for setup, must be interlocked with the dangerous movement.

It must not be possible to manipulate the interlock using simple means. Simple means are, for instance: screws, needles, sheets of metal, coins, bent wire.



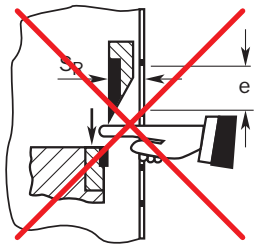
easy to manipulate



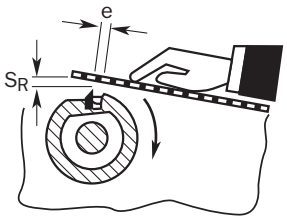
cannot be manipulated

**Protection against reaching through**

The dimensions of the guards are to take into account the physical size of the hazardous point and the size of the human body. The permissible mesh spacing for chain link fencing depends on the distance between the fence and the hazardous point. The greater the gap, the farther the fence must be from the hazardous point (EN 294).




EN 294 not observed




EN 294 observed


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# Safety control and interface requirements

When considering the use of any safeguarding device, it is also imperative to include the safety-relevant control of signals related to safeguarding devices. This means that the part of the machine control responsible for safety (protective device, machine control and main stop elements) must satisfy regulatory requirements as a system.

For example, the sole use of a non-safety-rated programmable logic controller (standard PLC) to control actuator devices related to hazardous motion based on the safety relevant signals fed into the PLC would not generally satisfy regulatory requirements. Rather, a safety-rated programmable logic controller (safety PLC), or other third party certified safety control solution should be used.

Historically, safety-relevant control has been implemented using force guided relays or safety relays. This requires that integration be implemented based using a hard-wired approach to implement logic.

A variety of standards have emerged to determine the suitability of programmable devices in safety-relevant applications. Most notably is the standard IEC 61508 Functional Safety of Electrical / Electronic / Programmable Electronic Safety-Related Systems. This standard provides a means of determining the probability of failure of devices and has become the basis for determining the suitability of programmable devices in safety-relevant control applications based on the associated safety integrity level (SIL).

Users now may utilize programmable safety devices and still comply with the regulations and standards that apply to their application. The following excerpts for industry standards provide support for utilizing devices that have been "listed" (i.e. approved by a nationally recognized testing laboratory) for use in safety relevant applications.

| Standard reference | Text excerpt |
|---|---|
| ANSI / NFPA 79 - 2007 | **9.4.3.4** Use in Safety-Related Functions<br>**9.4.3.4.1** Software and firmware based controllers to be used in safety-related functions shall be listed for such use.<br>**9.4.3.4.2** Control systems incorporating software and firmware based controllers performing safety-related functions shall conform to all of the following:<br>(1) In the event of any single failure, the failure shall not lead to the loss of the safety function. Safety function is the ability to self monitor and stop the application.<br>(a) Lead to the shutdown of the system in a safe state<br>(b) Prevent subsequent operation until the component failure has been corrected<br>(c) Prevent unintended startup of equipment upon correction of the failure<br>(2) Provide protection equivalent to that of control systems incorporating hardwired/hardware components.<br>(3) Be designed in conformance with an approved standard that provides requirements for such systems. |
| ANSI / RIA R15.06 - 1999 | **Section 6.4 Safety related software and firmware based controllers**<br>Software and firmware-based controllers used in place of hardware based components with safety-related devices shall:<br>(a) be designed such that any single safety related component or firmware failure shall:<br>(1) lead to the shutdown of the system in a safe state, and,<br>(2) prevent subsequent automatic operation until the component failure has been corrected;<br>(b) supply the same degree of safety achieved by using hardwired / hardware components per 4.5.4. For sexample, this degree of safety may be achieved by using microprocessor redundancy, microprocessor diversity, and self-checking;<br>(c) be certified by a Nationally Recognized Testing Laboratory (NRTL) to an approved standard applicable for safety devices. |

Based on industry and regulatory acceptance, IEC 61508 has opened up a new realm of safety-relevant control possibilities, including safety relay technology, safety controllers and safety fieldbus networks.

Regardless of which technology is used to satisfy the safety-relevant control requirements, it is important to note that the safety "system" is comprised of more than just the protective device. The control or interface units, as well as any controlling elements (e.g. stop valve) must also be taken into account.

Safety control wiring is typically referenced to safety category in accordance with ISO 13849-1 (EN 954-1: 1996). In North America (USA and Canada) reference to control reliability is also common. Under normal operating conditions e.g., on interruption of the protective field of an optoelectronic safeguarding device, the machine is always stopped (independent of the safety category or control reliability).

A new version of ISO 13849-1 was adopted in November, 2006 that provides additional requirements related to the performance of safeguarding systems. The "performance level" requirements outlined in this new revision will take effect in 2010. For additional information regarding the new information related to this latest standard revision, please contact your local SICK representative.


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## Categories of the safety-related parts of the control system ISO 13849-1 (EN 954-1: 1996)

| Categories | Concise list of requirements | System behaviour | Principles for achieving safety |
|---|---|---|---|
| B | The safety-related parts of controls and/or their protective devices, as well as their components, must be designed, built, assembled and combined in compliance with the applicable standards such that they can withstand the effects expected. | The occurrence of a fault can result in the loss of the safety function. | Predominantly characterised by the selection of components |
| 1 | The requirements of B must be met. Proven components and proven safety principles must be used. | The occurrence of a fault can result in the loss of the safety function, but the probability of occurrence is less than in B. | |
| 2 | The requirements of B must be met and proven safety principles used. The machine control must check the safety function at suitable intervals. | The occurrence of a fault can result in the loss of the safety function between checks. The loss of the safety function is detected by the check. | Predominantly characterised by the structure |
| 3 | The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that:<br>▪ a single fault in each of these parts does not result in the loss of the safety function, and<br>▪ whenever feasible within reasonable limits, the single fault is detected | The safety function is always retained when the single fault occurs.<br>Some, but not all faults are detected.<br>Accumulation of undetected faults may lead to loss of the safety function. | |
| 4 | The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that:<br>▪ a single fault in each of these parts does not result in the loss of the safety function, and<br>▪ the single failure is detected before the safety function is required or when the safety function is required, or if this detection is not possible, an accumulation of failures must not lead to the loss of the safety function. | The safety function is always retained when faults occur.<br>The faults are detected in good time to prevent loss of the safety function. | |

Against this background, the ISO 13849-1 standard aids the designer in the definition of the categories for the various parts of the safety-related control, based on the following parameters:

- The possible severity of injury
- The frequency and/or the duration of the exposure to the hazard
- The possibility of preventing the hazard

The behaviour of the safety-related control in case of a fault is defined for each category (B, 1, 2, 3, 4, cf. table page A-23). If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies.

The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements.

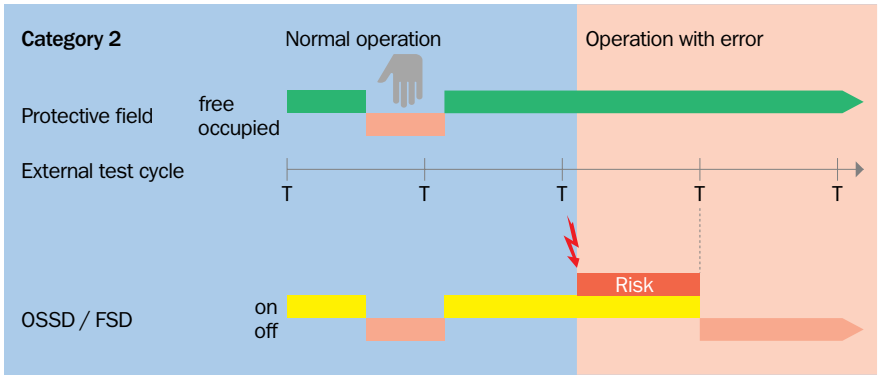
Nevertheless, the type of AOPD (Active Optoelectronic Protective Device) and the interface of the AOPD must comply with the requirement of the category for the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).


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## Connection to the controller

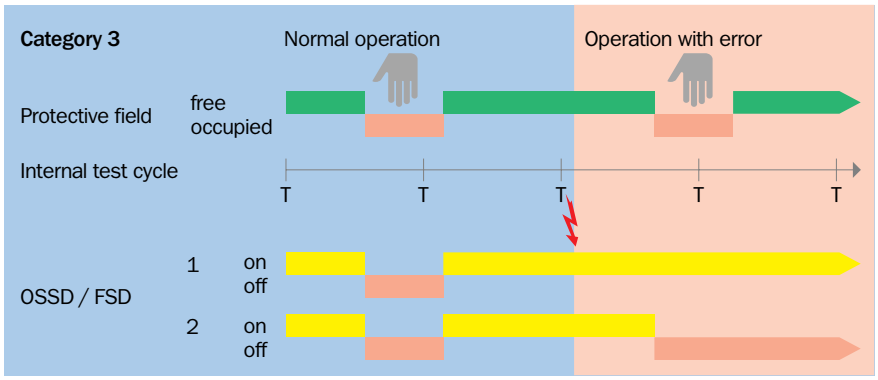
However, if a failure occurs in the protective device, it is dealt with differently, depending on the category of the protective device as defined in the diagrams below.




**Category 2**

Loss of protective function between checking intervals possible.

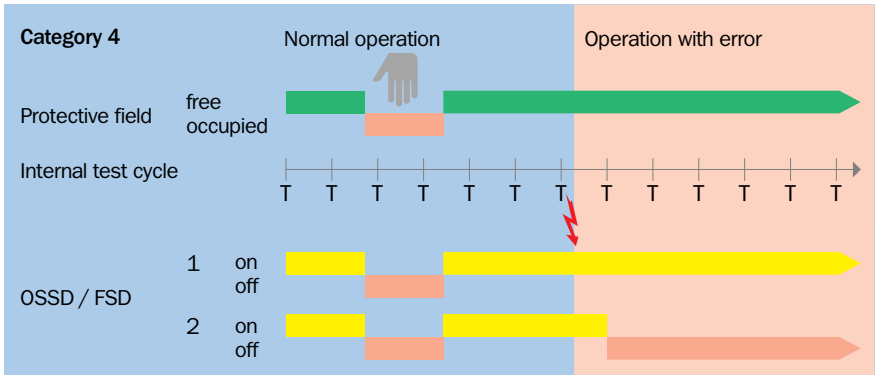
Faults are detected during a check by the external test. In the period between the occurrence of the fault and the next test there is a risk.




**Category 3**

A single failure assures the protective function as an output signal for stopping can still be generated (e.g., if a hand enters the protective field). The failure is detected either when the hand enters the protective field or by internal checking. Accumulation of failures may lead to loss of the protective function.

The system shall be designed so that a single failure in any of its parts does not lead to the loss of protective functions.




**Category 4**

A single failure still assures the protective function. In addition to category 3, the protective function must be assured in case of an accumulation of failures. Therefore, internal tests must be within the response time of the protective device.

The single failure is detected at or before the next demand on the protective function. If the detection is not possible then an accumulation of failures shall not lead to a loss of the protective function.

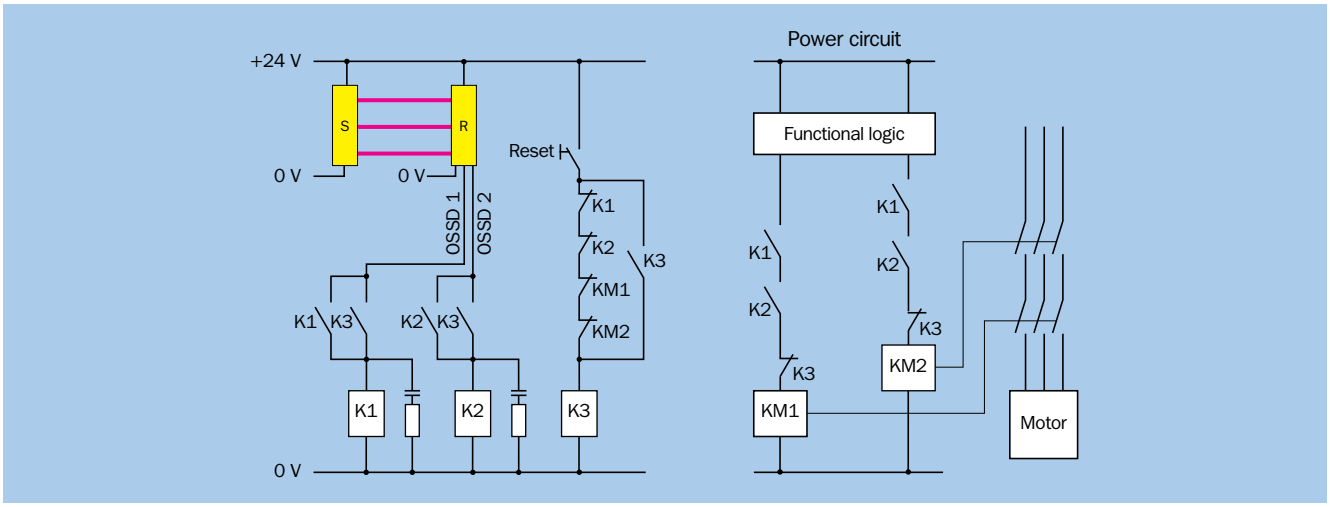

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## Safety light curtain connection examples

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### With external reset

The figure shows a simple machine on which the AOPD reset function can also start the machine.




K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

K1, K2 and K3 are the auxiliary contactors. KM1 and KM2 are main contactors. All contactors are positively guided.

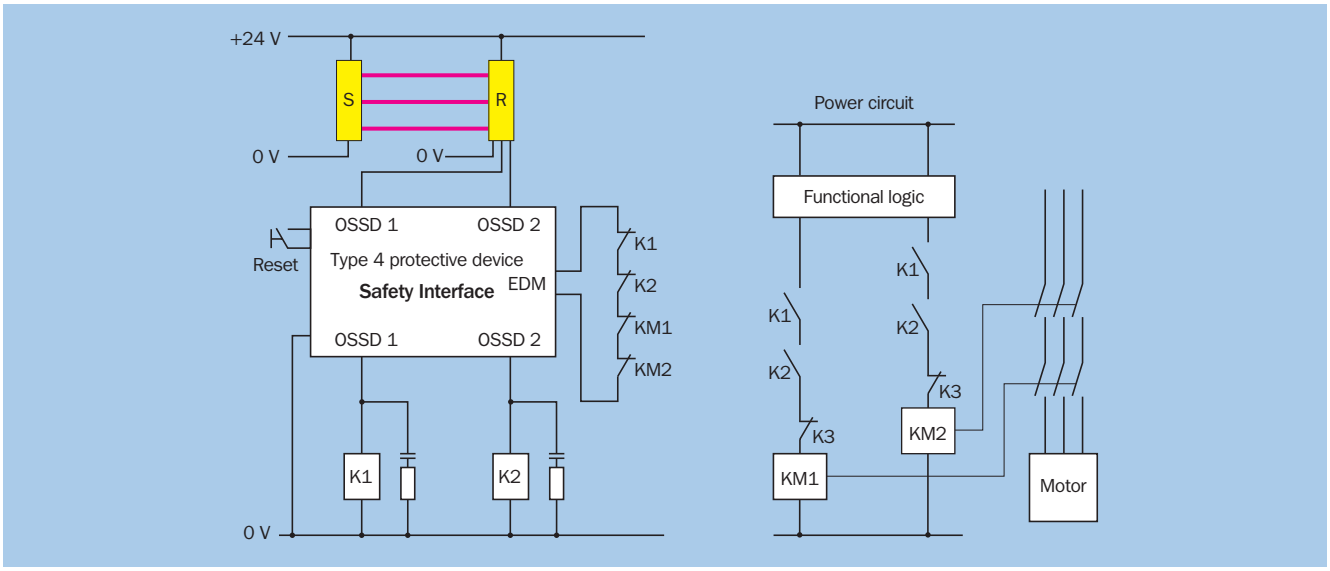
In this case the entire protective system has a redundant (dual-channel) design

- The device safety outputs (e.g. OSSD 1 and OSSD 2)
- The final switching device (e.g. K1 and K2)
- The main primary control elements (e.g. KM1 and KM2)

The contactors K1/K2 are monitored via K3. If one of the normally open contacts K1 or K2 “sticks”, its partner, the normally closed contact cannot close. As a consequence, the coil of K3 cannot be energised and therefore the contactors K1 and K2 can no longer be operated. The control circuit therefore remains open.

### With internal reset

Another connection example of a protective device type 4 ESPE according to IEC 61496 with restart interlock and external device monitoring. Reset and external device monitoring are dynamically monitored by the SICK protective device. Feature of this connection: reduced installation effort.




K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

➜ You will find further examples in the SICK connection diagram finder at www.sickusa.com


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# Calculation of minimum safety distance

Once a protective device is selected, it must be installed in a manner that satisfies the requirement that personnel cannot access the hazard before it ceases to exist. This is true for point of operation safeguarding applications as well as perimeter safeguarding and area safeguarding.

When utilizing protective devices for hazard protection, the ultimate goal is to prevent access to the hazard. In applications involving hazardous motion, this entails using time to allow the hazard to cease before access can be gained. The minimum safety distance is an essential component in this effort.

The minimum safety distance is based on the detection of a person or object entering a safeguarded space as well as the subsequent response times associated with the safety device, the interface to the control system and the actual machine stopping time (which may also include a braking component). It is formula based that varies, to some degree based on national standards.

Additional information regarding minimum safety distance requirements is presented in the subsequent chapters for:

- Regulatory compliance in the United States ➜ page A-27
- Regulatory compliance in Canada ➜ page A-36
- Regulatory compliance in Europe ➜ page A-42


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# Regulatory Requirements

Worker safety regulations in the United States are enforced through the Occupational Safety and Health 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 healthy working conditions for working men and women by:

- Authorizing enforcement of the requirements developed under the Act
- By assisting and encouraging the States in their efforts to assure safe and healthy working conditions
- 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 following table.

**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 presses |
| ▪ 1910.218 — Forging machines |
| ▪ 1910.219 — Mechanical power transmission apparatus |

In addition, Section 18 of the OSHA Act of 1970, OSHA also encourages the States to develop and operate their own job safety and health programs. The following states and territories of the United States have recognized programs:

| | |
|---|---|
| ▪ Alaska | ▪ New Mexico |
| ▪ Arizona | ▪ New York [1)] |
| ▪ California | ▪ North Carolina |
| ▪ Connecticut [1)] | ▪ Oregon |
| ▪ Hawaii | ▪ Puerto Rico |
| ▪ Indiana | ▪ South Carolina |
| ▪ Iowa | ▪ Tennessee |
| ▪ Kentucky | ▪ Utah |
| ▪ Maryland | ▪ Vermont |
| ▪ Michigan | ▪ Virgin Islands |
| ▪ Minnesota | ▪ Virginia |
| ▪ Nevada | ▪ Washington |
| ▪ New Jersey [1)] | ▪ Wyoming |

[1)] The Connecticut, New Jersey 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 internet website at:

➜ www.osha-slc.gov/fso/osp

or

➜ www.osha.gov/index.html



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The key regulations and standards for machines and systems used in the United States are presented in the following pages.

This brief summary cannot replace detailed consideration of other national, regional or local regulations, and standards that may also apply to your specific application.


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## Consensus Standards

In addition to the referenced OSHA Standards above, 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

1. 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
2. was formulated in a manner which afforded an opportunity for diverse views to be considered
3. has been designated as such a standard by the Secretary of Labor, after consultation with other appropriate Federal agencies
4. by an 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 operator to injury, shall be guarded. The protective 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), The National Fire Protection Agency (NFPA) and in some instances Underwriters Laboratories (UL) are examples of 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.


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**Summary of important consensus standards and other technical reports related to machinery safeguarding in the United States**

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| | |
|---|---|
| **American National Standards Institute (ANSI)** | |
| 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 B11 TR.3 | Risk Assessment |
| ANSI B11 TR.4 | Selection of Programmable Electronic Systems (PES/PLC) for Machine Tools |
| ANSI B15.1 | Safety Standards for Mechanical Power Transmission Apparatus |
| ANSI B56.5 | Safety Standard for Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles |
| ANSI B65.1 | Safety Standards for Printing Press Systems |
| ANSI B65.2 | Binding and Finishing Systems |
| ANSI B65.5 | Stand Alone Platen Presses |
| ANSI B151.27 | Safety Requirements for Robots Used with Horizontal Injection Molding Machines |
| ANSI B155.1 | Safety Requirements for Packaging Machinery and Packaging-Related Converting Machinery |
| ANSI R15.06 | Safety Requirements for Robots and Robot Systems |
| ANSI/ALI ALCTV | Automotive Lifts – Safety Requirements for Construction, Testing and Validation |
| ANSI/ALI ALOIM | Automotive Lifts – Safety Requirements for Operation, Inspection and Maintenance |
| **National Fire Protection Agency (NFPA)** | |
| NFPA 70E | Electrical Safety Requirements for Employee Workplaces |
| NFPA 79 | Electrical Standard for Industrial Machinery |
| **Underwriters Labs (UL)** | |
| UL508 | Industrial Control Equipment |

NOTE: This list of standards and technical reports is not comprehensive, but rather a sampling of the more commonly referenced industry standards and practices used in machine safeguarding.


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# Calculation of the minimum safety distance

The calculation of the minimum safety distance for a protective device is described in the U.S. Code of Federal Regulations, Volume 29 (29CFR), Part 1910, Subpart O entitled “Machine Safeguarding” and in ANSI B11.19-2003, Annex D.

**General formula**

$$D_s = H_s \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

**Minimum safety distance required**

$D_s$ The minimum distance in mm or inches from the hazardous area to the detection point, plan or zone

**Hand Speed Constant (approach speed)**

$H_s$ A parameter in mm/s or in/s, derived from data on approach speeds of the body or parts of the body. Often 1600 mm/s (63 in/s) is used for $H_s$

**Components of the overall stopping time of the machine**

$T_s$ Stopping/run-down 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 protective device and its interface

$T_{bm}$ Additional response time for the brake monitor

Note: Any additional time delays must be accounted for in this calculation

**Penetration factor**

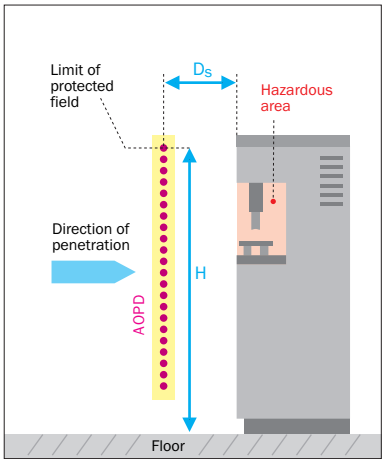
$D_{pf}$ An additional distance added to the overall safety distance required. This value is based on intrusion toward the hazardous area prior to actuation of the electrosensitive protective equipment (AOPD). Values range from 6 mm to 1220 mm (0.25 in to 48 in) or more, depending on the application. For example on vertical protection with an AOPD with an effective resolution of less than 64 mm (2.5 in), $D_{pf}$ can be determined approximately using the following formula:
$D_{pf}$ (in) = 3.4× (effective resolution – 0.276), but not less than 0

Users are also directed to refer to specific machine regulations and standards that may apply to their application. Several of these regulations and standards are presented in the appendix of the Safety Engineering section. Any protective device shall be installed in such a way that access to the hazardous area without the person being detected by the device is impossible.

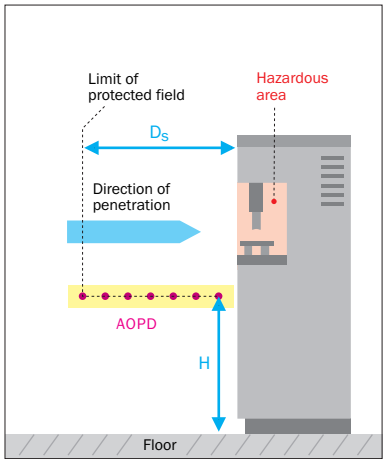
If the minimum safety distance calculated is acceptable from an operational, industrial and ergonomic point of view, it must nevertheless be determined whether the installation and the configuration of the protective device is such that people cannot enter the hazardous area and cannot be present in the hazardous area without being detected by the protective device.

If the minimum safety distance is too large and is unacceptable from an ergonomic point of view, it must be checked whether it is possible to reduce the overall response time of the machine or to increase the object detection capability (resolution) of the protective device.

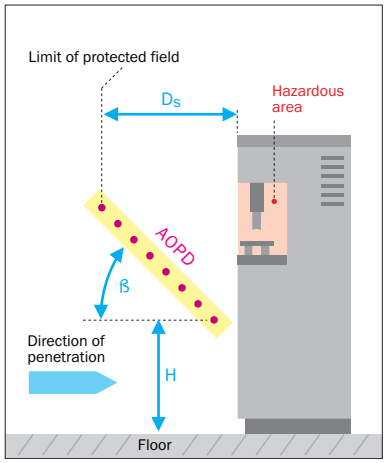
**In general, one differentiates between three different approach types**




Perpendicular approach / perpendicular entering of the protective field orientation




Parallel approach/parallel entry into the protective field orientation




Angular approach


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**The following table contains the formulae for the calculation of the safety distance $D_s$**
You will find examples on the next page.

| Approach | Detection capability (resolution) | Safety distance | Beam height (distance from floor) |
|---|---|---|---|
| **Perpendicular** ß = 90° (±5°) | d = < 64 mm (2.5 in) | **$D_s = H_s \times \sum T_{total} + D_{pf}$** where $D_{pf}$ is determined by: $D_{pf}$ = 3.4 × (resolution – 6.875 mm) $D_{pf}$ = 3.4 × (resolution – 0.275 in) | Height of the bottom beam ≤ 300 mm (12 in) Height of highest beam ≥ 1200 mm (48 in) [1] |
| | 64 (2.5 in) ≤ d ≤ 600 mm (24 in) | $D_{pf}$ = 900 mm (36 in) | Height of the bottom beam ≤ 300 mm (12 in) Height of highest beam ≥ 1200 mm (48 in) [1] |
| | 64 (2.5 in) ≤ d ≤ 600 mm (24 in) | $D_{pf}$ = 1200 mm (48 in) | Height of the bottom beam ≤ 300 mm (12 in) Height of highest beam ≥ 900 mm (36 in) [1] |
| **Parallel** ß = 0° (±5° ) | — | **$D_s = H_s \times \sum T_{total} + D_{pf}$** where $D_{pf}$ is determined by: $D_{pf}$ = 1200 mm (48 in) | Height of protective field ≤ 300 mm (12 in) |
| **Angular** 5° < ß < 85° | — | If ß ≥ 30°, use the perpendicular approach defined above. If ß < 30°, use the horizontal or parallel approach defined above. The safety distance $D_s$ is based on the beam closest to the hazardous point. | |

Per ANSI R15.06-1999 Appendix B

**$D_s$** = Safety distance
**H** = Height
**d** = Detection capability (resolution)
**ß** = Angle between detection plane and the direction of entry
**T** = Time

[1] **Important note:**
Under no circumstance shall it be possible to reach the closest hazardous point. For calculation of the height of detection zone ref. ISO 13852, table 1.

**In general, the following errors must be excluded when mounting protective devices:**


Reaching over


Reaching under


Reaching under from a crouched position


Standing behind


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# Application examples

## Point of operation versus area protection of an assembly line

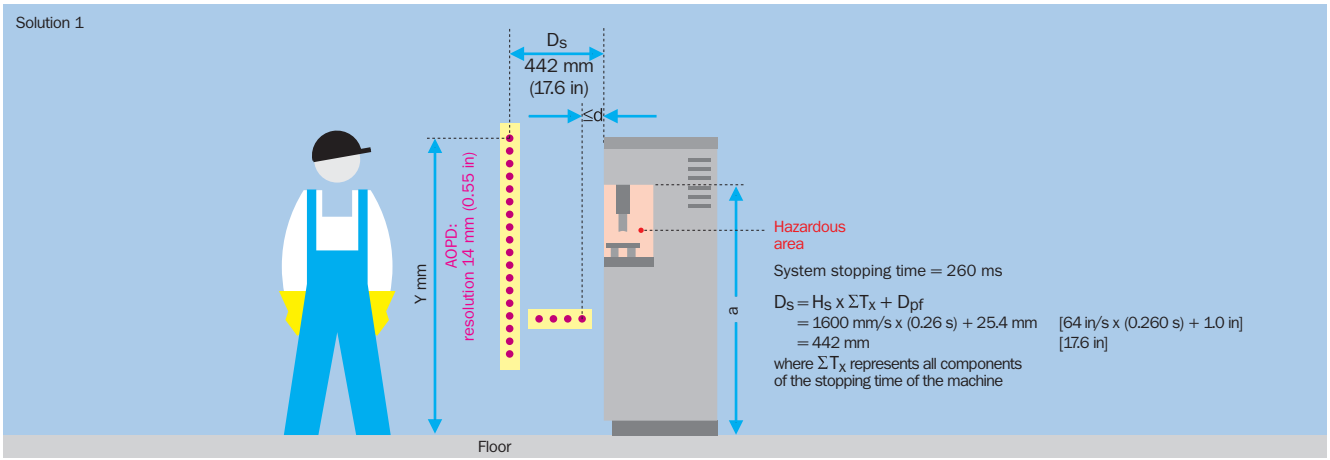
This example shows two possible ways of addressing safeguarding requirements for a machine with hazardous motion. The first method utilizes a vertical approach and the second uses a horizontal approach to safeguarding.

It is a condition that
- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

**Solution 1: Perpendicular approach, hazardous point protection with area guarding**

In the diagram below, an AOPD with 14 mm (0.55 in) resolution is mounted vertically to provide hazardous point protection. A second AOPD is mounted horizontally to prevent personnel from being present behind the vertical protection.

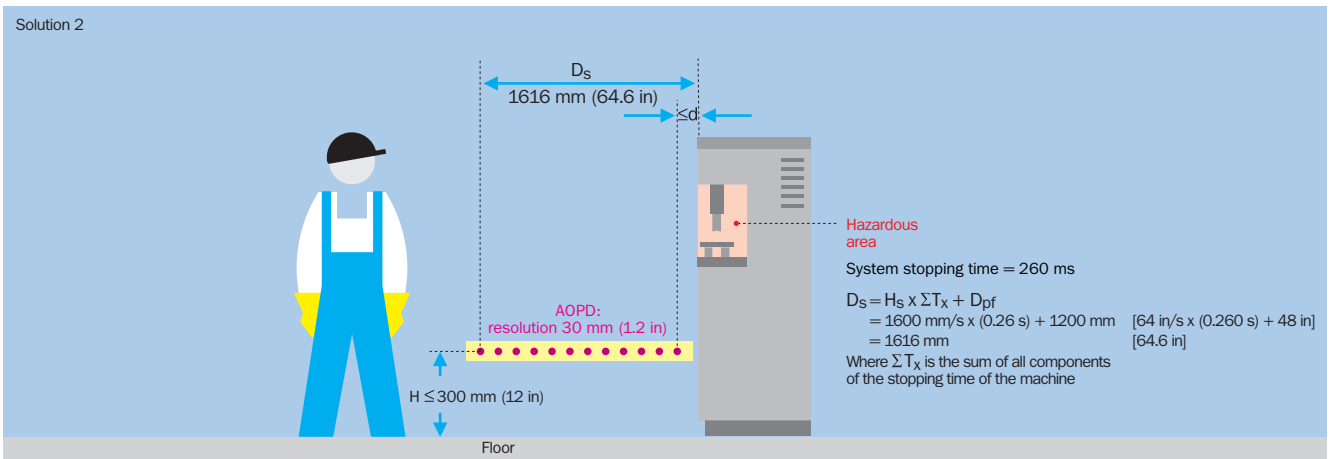
It is imperative that the vertical AOPD is mounted in such a way as to prevent personnel from reaching over, under or around the AOPD, thus reaching the hazardous point.




**Solution 2: Parallel approach, area protection**

In this approach a horizontal AOPD is used.
The diagram below shows the calculation of the safety distance $D_S$ and the positioning of the AOPD.

The maximum installation height of the AOPD of 300 mm (12 in) must not be exceeded. If these mounting considerations cannot be met, mechanical means have to prevent a person from entering the hazardous area undetected by passing under the AOPD.




Note:
The resolution of the AOPD depends on the height of the detection zone to assure the presence sensing in the hazardous area: $15 (d - 50 \text{ mm}) \leq H_S \leq 1000 \text{ mm}$


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**Result**

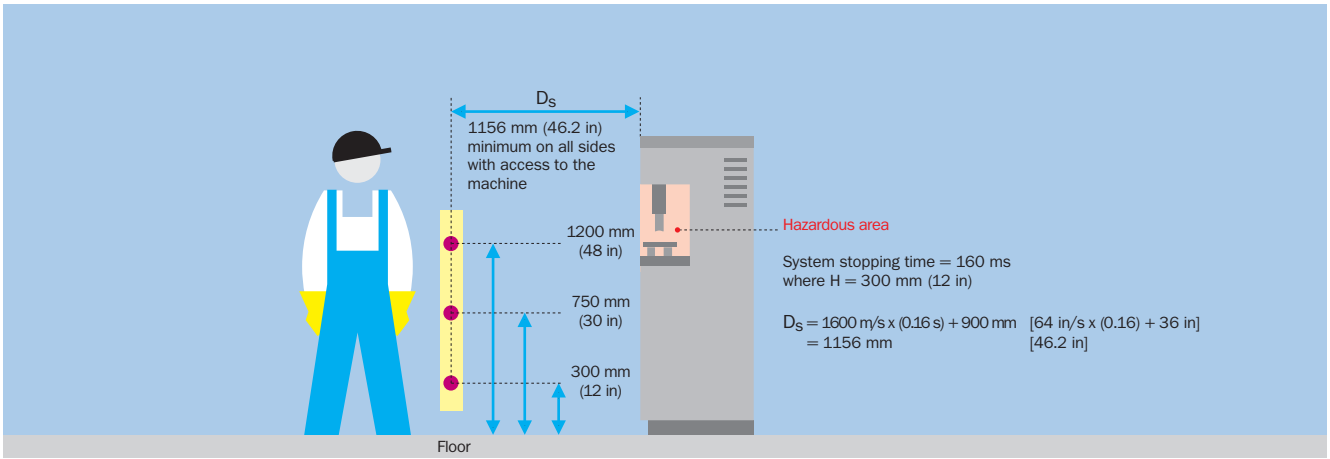
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Operative requirements determine which of the two solutions is chosen.

| | Advantages | Disadvantages |
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| **Solution 1**<br>**$D_s$ = 442 mm (17.6 in)** | ▪ Greater productivity, as the operator is closer<br>▪ The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances) | ▪ Higher price for the protective device |
| **Solution 2**<br>**$D_s$ = 1616 mm (64.6 in)** | ▪ Lower price for the protective device<br>▪ Enables access to be protected independently of the height of the hazardous area | ▪ The operator is much further away (long distances)<br>▪ It is difficult to store products on the floor, as the AOPD takes up a large amount of the space<br>▪ Lower productivity |

## Access safeguarding

Access protection with 3 beams (at heights of 300 mm, 750 mm and 1200 mm) enable perpendicular approach, as described in the chapter “Calculation of the safety distance” (➜ page A-30). This solution permits the operator to stand between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.



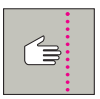

H = Installation height

$D_s$ = Safety distance

## Guarding the interior of a press

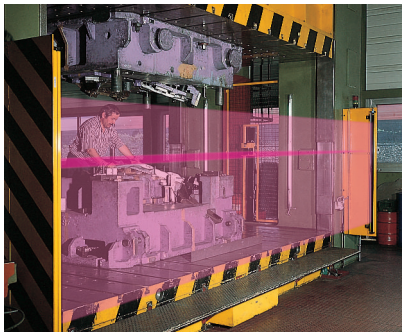
This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the interior. This is a secondary protective device that under no circumstances can take over the function of the primary protection, for which an appropriate device is used (AOPD or two-hand control).

In this special case: The safety distance for the primary protective device (AOPD) with the task of stopping the press must be calculated, while the secondary protective device detects the presence of a person in the press and so prevents the press starting up.



Spotting press

Hazardous point protection with safety light curtain (AOPD) and interior monitoring with safety laser scanner (AOPDR). Both sensors are activated on start-up. Then the SICK laser scanner PLS is muted during the downward stroke.




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## Additional information regarding 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 Standard B11.19-2003 (3.14) as:**

The capability of the machine control system, the protective device, 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 (E.6.1) further states:**

"Control Reliability"

- cannot prevent a repeat cycle in the event of a major mechanical failure or in the presence of multiple simultaneous component failures
- is not provided by simple redundancy. There must be monitoring to assure that redundancy is maintained.

**ANSI B11.20-2004 (Annex C) further clarifies the requirements of control reliability by stating the following:**

Control reliability is not provided by simple redundancy. There must be monitoring to assure that redundancy is maintained. Control reliability uses monitoring and checking to determine that a discernable component, module, device or system has failed and that the hazardous motion (or situation) is stopped, or prevented from starting or restarting. Control reliability ensures that a failure of the control system or device will not result in the loss of the safety-related function.

NOTE - Because some failures cannot be detected until the completion of a cycle or a portion of the cycle, loss of safety related functions may occur for a portion of the machine cycle.

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 protective device, its interface to the control system (or directly to the actuator control) and actuator control meet the above requirements.

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 should be hardware based and include monitoring at the system level. ANSI/RIA R15.06-1999 (4.5.4) provides a practical guide to implementing "control reliability" by requiring the following components:

a) The monitoring shall generate a stop signal if a failure is detected. A warning shall be provided if a hazard remains after cessation of motion
b) Following detection of a failure, a safe state shall be maintained until the fault is cleared
c) Failures with a common cause (e.g. overvoltage) must be taken into account if the probability is high that such a failure may occur
d) The single failure should be detected at time of failure. If not practical, the failure should be detected at the next demand upon the safety function.


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The key regulations and standards for machines used in Canada are presented in the following pages.

This brief summary cannot replace detailed consideration of national, regional or local regulations and standards that might apply to your application.

# Regulatory Requirements

The Canada Labour Code (CLC) governs, among other items, occupational safety and health in federal works, undertakings and businesses including employment on ships, trains and aircraft while in operation, and employment in the oil and gas industry in Canada Lands. More specifically, Part II of the CLC is intended to prevent accidents and injury to health arising out of, linked with or occurring in the course of employment.

Part II of the Canada Labour Code provides an employee with three fundamental rights:

- The right to know
- The right to participate
- The right to refuse

**Purpose of Part II of the Canada Labour Code:**

Under subsection 122.1, the purpose of the Canada Labour Code, Part II is to prevent accidents and injury to health arising out of, linked with or occurring in the course of employment to which this Part applies. Under subsection 122.2, preventive measures should consist first of the elimination of hazards, then the reduction of hazards and finally, the provision of personal protective equipment, clothing, devices or materials, all with the goal of ensuring the health and safety of employees.

The Occupational Health and Safety Act provides a means of power for each Province to make regulations, set general principles and duties for workplace parties. Worker safety regulations in Canada are enforced by the province in which the machine is located. In Ontario, regulations are enforced by the Ministry of Labour.

**Ontario regulations**

For example, four separate safety regulations (Regulation for Industrial Establishments; Construction Sites; Mines and Health Care Facilities) have been defined in the Province of Ontario. Canada expects that employers, supervisors, owners and constructors, among others, have an obligation to know and comply with the regulations that have been passed under the Act.

Section 7 of the Regulation for Industrial Establishments defines a process for Pre-Start Health and Safety Reviews. The intent of this section is to ensure that a timely professional review identifies and either removes or controls specific hazards, before a machine or process is started up.

The requirements for a Pre-Start Health and Safety Review are triggered when applicable sections of the Regulation for Industrial Establishments and Sections 24, 25, 26, 28, 31 or 32 also apply.

In this case, any of the following are used as protective elements in connection with a machine or apparatus:

1.Safeguarding devices that signal the machine to stop, including but not limited to, safety light curtains and screens, area scanning safeguarding systems, ... , two-hand control systems, ... , and single or multiple beam systems;

2.Barrier guards that use interlocking mechanical or electrical safeguarding devices.

Additional provisions outside the scope of this discussion may also trigger a Pre-Start Health and Safety Review.

In addition to the standards requirements, many workplaces that regularly employ 20 or more workers are required to establish Joint Health and Safety Committees. These committees meet regularly to discuss health and safety concerns, review progress and make recommendations. Joint Health and Safety Committees are an advisory group comprised of both worker and management representatives.



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# Canadian safety standards



The Ministry of Labour in Ontario has accepted the following standards as good engineering practice in complying with the Regulation for Industrial Establishments. If the machine is located outside of the Province of Ontario, please check to ensure that National, Provincial and Local regulations have been satisfied.

| | |
|---|---|
| CAN/CSA Z142 | Code for Punch Press and Brake Press Operation: Health, Safety and Guarding Requirements |
| CSA Z432 | Safeguarding of Machinery |
| CAN/CSA Z434 | Industrial Robot and Robot Systems – General Safety |
| CAN/CSA Z615 | Code for Hot Forging Producers, Health and Safety Requirements |
| CAN3-Z180.1 | Compressed Breathing Air and Systems |
| CSA B51-97 | Boiler, Presser Vessel, and Pressure Piping Code |
| CSA B52-99 | Mechanical Refrigeration Code |
| CSA W117.2 | Safety in Welding, Cutting and Allied Processes |
| ANSI B11.1 | Mechanical Power Presses (under review) |
| ANSI B11.2 | Hydraulic Power Presses |
| ANSI B11.3 | Power Press Brakes (OSHA-CPL 2-1.25) |
| ANSI B11.4 | Shears |
| ANSI B11.6 | Lathes |
| ANSI B11.8 | Drilling, Milling and Boring |
| ANSI B11.19 | Safeguarding Methods |
| ANSI B11.20 | Manufacturing Systems and Cells |
| ANSI B11.21 | Machines Using Lasers |
| ANSI B65.1 | Printing Press Systems |
| ANSI B65.2 | Binding and Finishing Systems |
| ANSI B65.5 | Stand Alone Platen Presses |
| ANSI/ALI ALCTV | Automotive Lifts – Safety Requirements for Construction, Testing and Validation |
| ANSI/ALI ALOIM | Automotive Lifts – Safety Requirements for Operation, Inspection and Maintenance |
| ANSI/RIA R15.06 | Industrial Robot and Robot Systems |
| ANSI/SPI B151.1 | Horizontal Injection Moulding machines |
| ANSI/Z245.1 | Mobile Wastes and Recyclable Materials Collection, Transportation and Compacting Equipment Safety Requirements (Additional Requirements by Ministry of Labour) |
| ISO 12100-1, -2 | Safety of Machinery: Basic Concepts, General Principles for Design |
| ISO 14121 | Safety of Machinery: Principles of Risk Assessment |
| ISO 13852 | Safety Distances to Prevent Danger Zones from being Reached by Upper Limbs |
| ISO 13854 | Minimum Gaps to Avoid Crushing of Parts of the Human Body |
| ISO 13853 | Safety Distances to Prevent Danger Zones from being Reached by Lower Limbs |
| ISO 13851 | Two Hand Control Devices |
| ISO 14120 | General Requirements for the Design and Construction of Guards |
| ISO 14119 | Interlocking Devices With and Without Guard Locking |
| ISO 13856-1...-4 | Pressure Sensitive Protective Devices |
| ISO 4413 | Safety Requirements for Fluid Power Systems and Components – Hydraulics |
| ISO 4414 | Safety Requirements for Fluid Power Systems and Components – Pneumatics |
| IEC/EN 61496-1, -2 | Electrosensitive protective equipment Sensing Safeguards; Safety Light Curtains |

In addition to these standards, other Acts beyond the Occupational Health and Safety Act may also apply and may vary base on which Canadian Province the machine is located. The following examples are based on both Federal Government and the Province of Ontario.

- The Building Code Act and Ontario Building Code (as amended)
- The Fire Marshals Act and Ontario Fire Code (as amended)
- The Electricity Act and Ontario Electrical Safety Code (as amended)
- Gasoline Handling Act
- Ontario Energy Act and Propane Storage, Handling and Utilization Code and Natural Gas Code
- National Building Code (NBC)
- National Fire Code (NFC)


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# Calculation of the minimum safety distance

The calculation of the minimum safety distance for a protective device is described in CAN/CSA Z142-02 Section 10.1 entitled "Formula to Calculate Minimum Safe Distance".

**General formula**

$$D_s = H_s \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

**Minimum safety distance required**

$D_s$ The minimum distance in mm or inches from the hazardous area to the detection point, plan or zone

**Hand Speed Constant (approach speed)**

$H_s$ A parameter in mm/s or in/s, derived from data on approach speeds of the body or parts of the body. Often 1600 mm/s (63 in/s) is used for $H_s$

**Components of the overall stopping time of the machine**

$T_s$ Stopping/run-down 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 protective device and its interface

$T_{bm}$ Additional response time for the brake monitor

Note: Any additional time delays must be accounted for in this calculation

**Penetration factor**

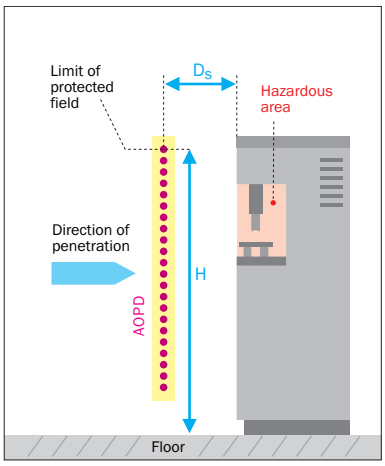
$D_{pf}$ An additional distance added to the overall safety distance required. This value is based on intrusion toward the hazardous area prior to actuation of the electrosensitive protective equipment (AOPD). Values range from 6 mm to 1220 mm (0.25 in to 48 in) or more, depending on the application. For example on vertical protection with an AOPD with an effective resolution of less than 64 mm (2.5 in), $D_{pf}$ can be determined approximately using the following formula:
$D_{pf}$ (in) = 3.4× (effective resolution – 0.276), but not less than 0

Users are also directed to refer to specific machine regulations and standards that may apply to their application. Several of these regulations and standards are presented in the appendix of the Safety Engineering section. Any protective device shall be installed in such a way that access to the hazardous area without the person being detected by the device is impossible.

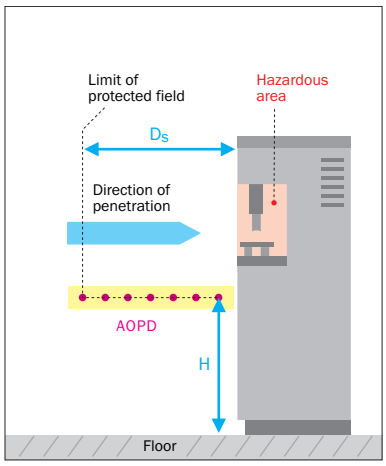
If the minimum safety distance calculated is acceptable from an operational, industrial and ergonomic point of view, it must nevertheless be determined whether the installation and the configuration of the protective device is such that people cannot enter the hazardous area and cannot be present in the hazardous area without being detected by the protective device.

If the minimum safety distance is too large and is unacceptable from an ergonomic point of view, it must be checked whether it is possible to reduce the overall response time of the machine or to increase the object detection capability (resolution) of the protective device.

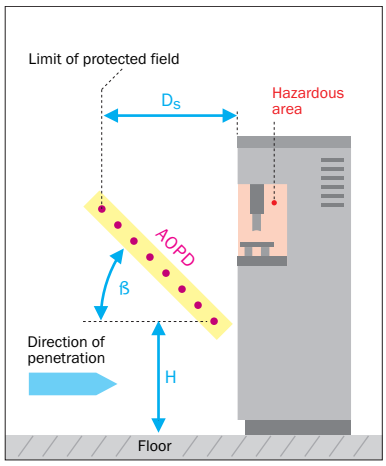
**In general, one differentiates between three different approach types**




Perpendicular approach / perpendicular entering of the protective field orientation




Parallel approach/parallel entry into the protective field orientation




Angular approach


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**The following table contains the formulae for the calculation of the safety distance $D_s$**
You will find examples on the next page.

| Approach | Detection capability (resolution) | Safety distance | Beam height (distance from floor) |
|---|---|---|---|
| **Perpendicular** ß = 90° (±5°) | d = < 64 mm (2.5 in) | $\mathbf{D_s = H_s \times \sum T_{total} + D_{pf}}$ where $D_{pf}$ is determined by: $D_{pf}$ = 3.4 × (resolution – 6.875 mm) $D_{pf}$ = 3.4 × (resolution – 0.275 in) | Height of the bottom beam ≤ 300 mm (12 in) Height of highest beam ≥ 1200 mm (48 in) [1)] |
| | 64 (2.5 in) ≤ d ≤ 600 mm (24 in) | $D_{pf}$ = 900 mm (36 in) | Height of the bottom beam ≤ 300 mm (12 in) Height of highest beam ≥ 1200 mm (48 in) [1)] |
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| **Parallel** ß = 0° (±5° ) | — | $\mathbf{D_s = H_s \times \sum T_{total} + D_{pf}}$ where $D_{pf}$ is determined by: $D_{pf}$ = 1200 mm (48 in) | Height of protective field ≤ 300 mm (12 in) |
| **Angular** 5° < ß < 85° | — | If ß ≥ 30°, use the perpendicular approach defined above. If ß < 30°, use the horizontal or parallel approach defined above. The safety distance $D_s$ is based on the beam closest to the hazardous point. | |

Per CAN/CSA Z434-03 Appendix B

**$D_s$** = Safety distance
**H** = Height
**d** = Detection capability (resolution)
**ß** = Angle between detection plane and the direction of entry
**T** = Time

[1)] **Important note:**
Under no circumstance shall it be possible to reach the closest hazardous point. For calculation of the height of detection zone ref. ISO 13852, table 1.

**In general, the following errors must be excluded when mounting protective devices:**


Reaching over


Reaching under


Reaching under from a crouched position


Standing behind


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# Application examples

## Point of operation versus area protection of an assembly line

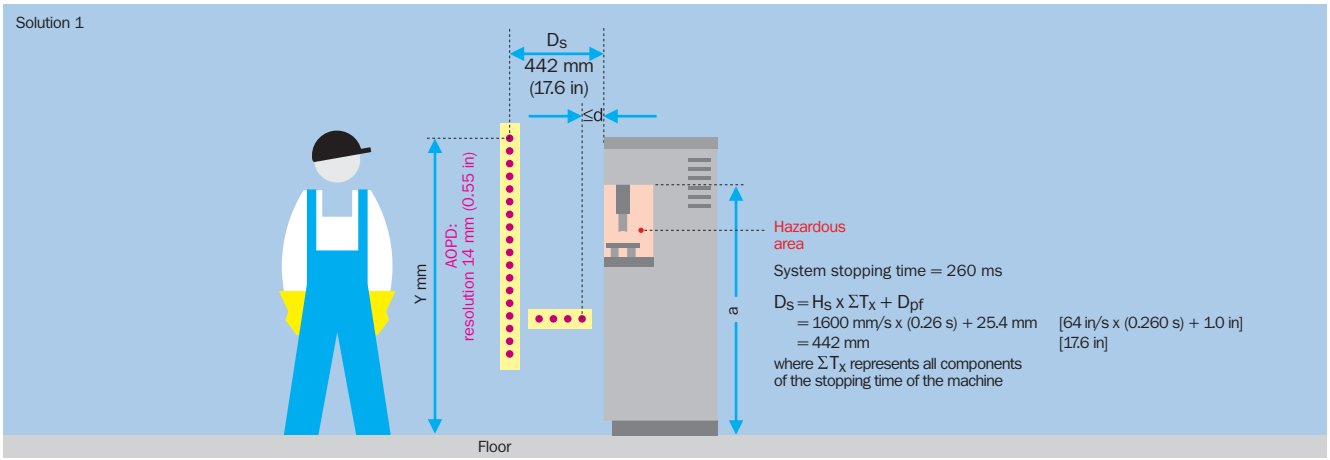
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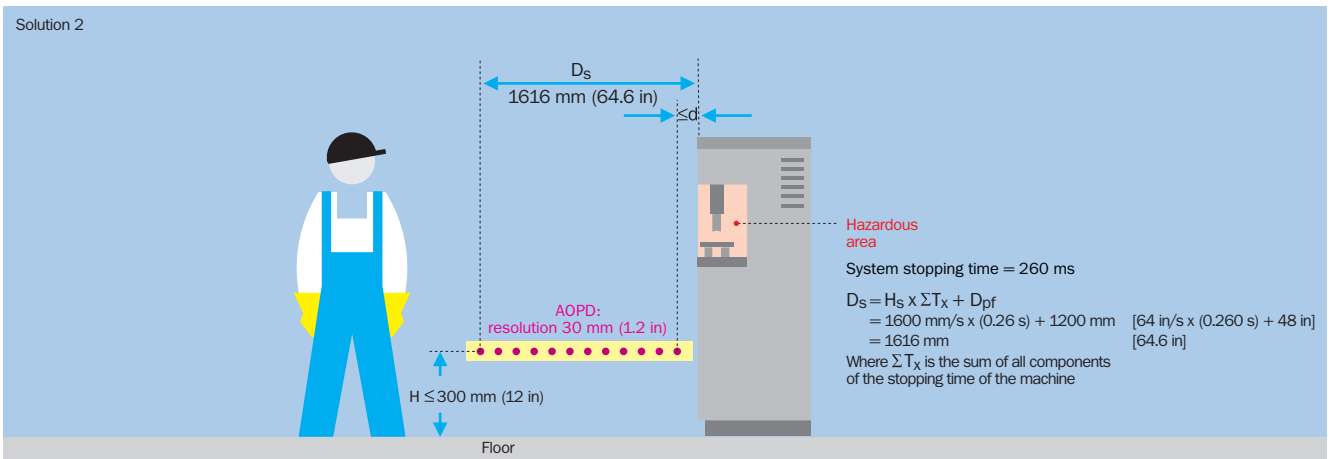
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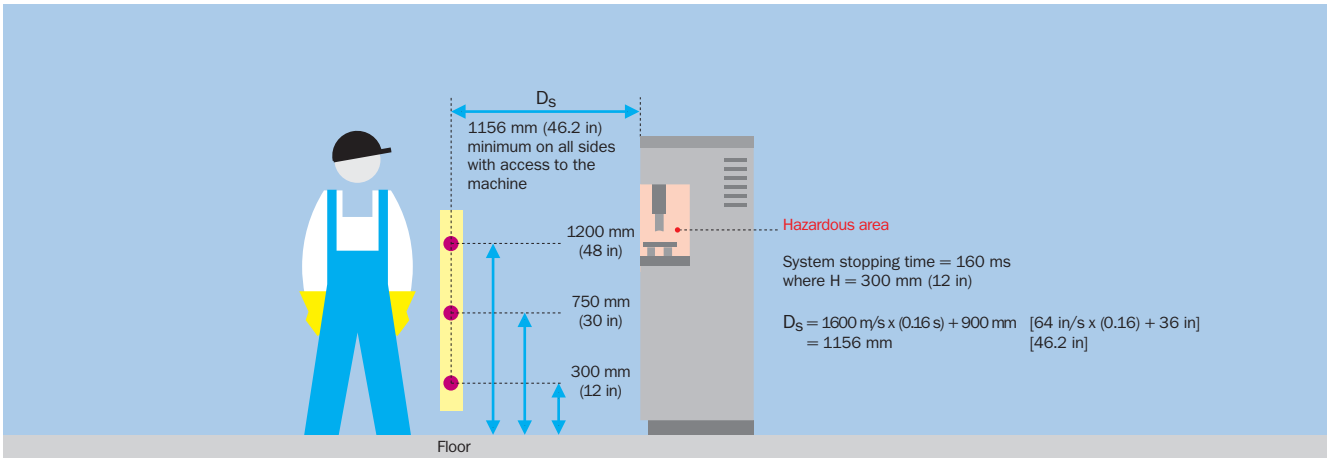
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Note: The control switch can have several functions.




H = Installation height

$D_s$ = Safety distance

## Guarding the interior of a press

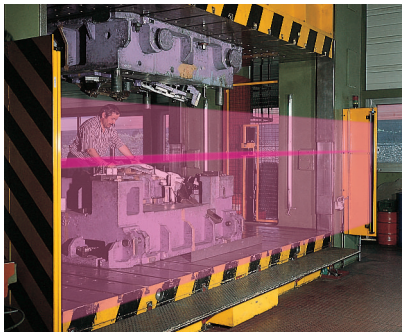
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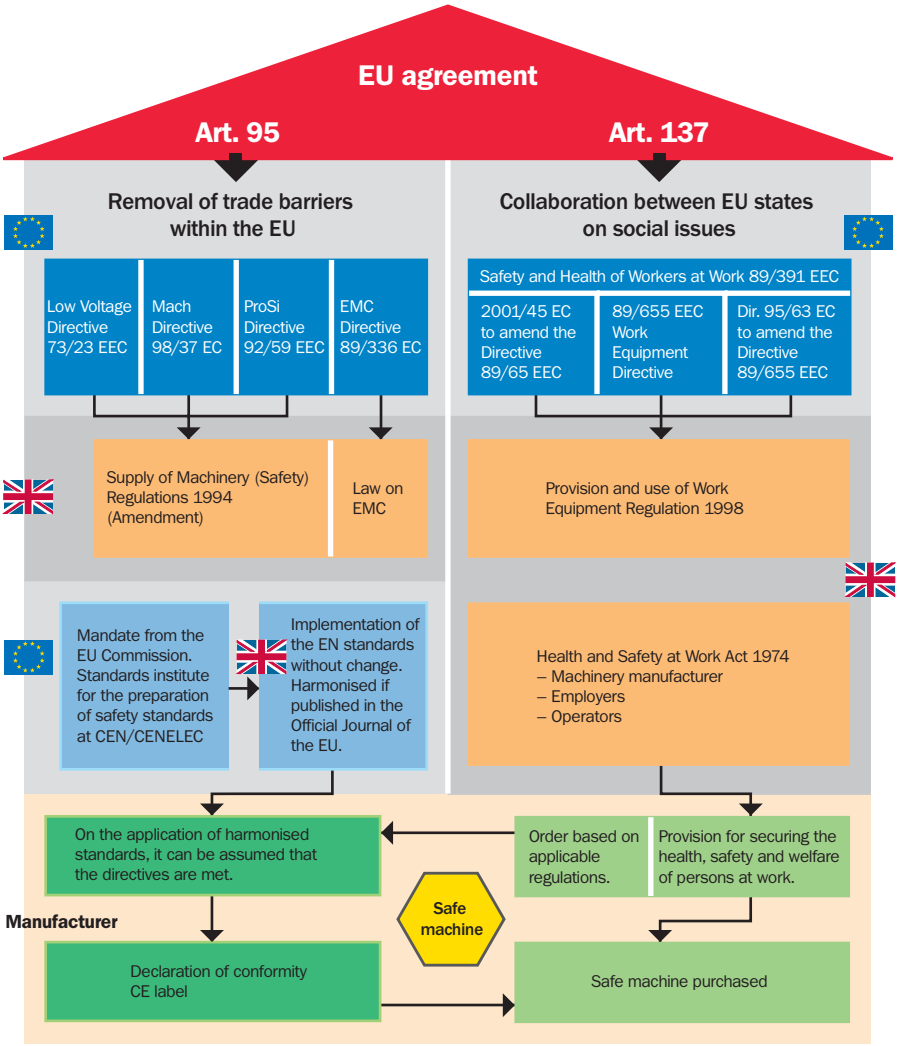

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The key regulations and standards for machines and systems used in the European community (EC) member countries are presented in the following pages.

This brief summary cannot replace detailed consideration of other national, regional or local regulations, directives or standards that may also apply to your specific application.

# Regulatory requirements – directives, objectives and procedures




The directives agreed by the EU Commission/Council must be implemented in national law by the member states in order to allow implementation of the concept of free trade.
Moreover, EU standards institutes have been authorised to prepare EU standards that define the legal requirements in more detail.
In the area of machine safety, harmonisation has progressed very rapidly to protect the operators on machines and systems.
Directives have been agreed and standards published.

**In this chapter we will briefly explain:**

- The Machinery Directive 98/37 EC — applicable to the production of machines as well as to safety components placed on the market individually, and also applicable to second-hand machinery and devices from other countries that are to be placed on the market in the EU for the first time (e.g. from the USA or Japan)
- The Work Equipment Directive 89/655 EEC — applicable to the use of machines and devices
- The most important standards and their current wording



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## The Machinery Directive 98/37/EC





Access protection with differentiation between man and material, realised using C4000 safety light curtain




The Machinery Directive 98/37 EC is intended for manufacturers of machines and devices, and organisations placing machines and devices on the market. It defines tasks for meeting the health and safety requirements for new machines, with the intention of removing trade barriers within Europe and guaranteeing operators a high level of protection.

The harmonised European standards define the possible ways and means of implementing these objectives. The Machinery Directive is integrated in national law and therefore binding.

The standards harmonised at European level are prepared by private institutions and must remain voluntary stipulations. On the other hand, it is assumed that a machine built in accordance with the harmonised standards published in the Official Journal of the EU will meet the essential requirements in the directive.

As required by European law, the directive and its amendments must be implemented in every member country. The directive came into force on 1 January 1995 for machines and on 1 January 1997 for safety components.

You will find the original text of the Machinery Directive on the Internet, in the portal on European Union law, among other sites. ➜ http://europa.eu.int/index_en.htm

**What must machine manufacturers do?**

The manufacturers must take into account the integration of safety during the design process. In practice this means that the designer must perform a hazard analysis and risk assessment during the development phase such that resulting measures can flow directly into the design.

To certify the conformity of the machine, the manufacturer must apply the CE label to every machine, and provide an EC Declaration of Conformity.

The Machinery Directive explains the complete process for conformity assessment. There are two categories of machines:

- Machines that are particularly hazardous are subject to special procedures. Annex IV of the Machinery Directive contains a list of the relevant machines. There is a similar list for electrosensitive devices for protecting people, such as photoelectric switches and scanners.
- All other machines that are not listed in Annex IV are subject to the standard process.

**The procedure for obtaining the EC Declaration of Conformity for machines and devices not listed in Annex IV**

If the machine/safety component is not listed in Annex IV, the manufacturer is responsible for applying the CE label without the involvement of a notified Body. The manufacturer must first document the measurements and test results and be able to provide them to the national authorities on request.


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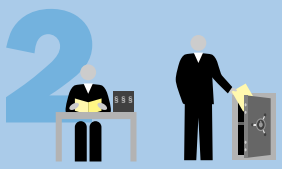
**The procedure for obtaining the EC Declaration of Conformity for machines and devices that are listed in Annex IV**

- If harmonised standards exist for the machine or safety components, and these standards cover the entire range of requirements, the EC Declaration of Conformity can be obtained in one of three ways (see points 1-3).
- If there are no harmonised standards for the machine, or if the machine or parts of the machine was/were not built according to C-type standards, the EC Declaration of Conformity can only be obtained with an EC-type examination (see point 3). The manufacturer must provide the machine and the corresponding technical documentation to the notified Body (➜ page A-45) so that such a test can be performed. This Body tests for compliance with the directives and prepares an EC-type examination certificate that contains the results of the tests.

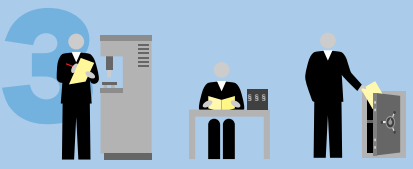
In all cases the manufacturer is responsible for preparing the Declaration of Conformity for the product in question and thus accepts responsibility for the machines and protective devices being designed and built in accordance with the standards and directives.



The manufacturer sends the technical documentation (cf. Annex VI of the directive) to a notified Body, which confirms receipt and simply archives the documentation.



The manufacturer commissions the notified Body to check the documentation for compliance with the harmonised standards. If this is the case, the authority provides the manufacturer with a certificate proving compliance with these standards.



The manufacturer makes the application for an EC-type examination by a notified Body.
➜ notified Body page A-45

## The Work Equipment Directive 89/655 EEC (supplemented with the Directive 95/63 EC)

The directive is intended to ensure that minimum regulations are observed during the use of work equipment to improve health and safety.
The employer's obligations are defined in articles 3 to 8 of the directive:

| | |
|---|---|
| **Art. 3** | General obligations |
| **Art. 4** | Rules concerning work equipment |
| **Art. 4a** | Inspection of work equipment |
| **Art. 5** | Work equipment involving specific risks |
| **Art. 5a** | Ergonomics and occupational health |
| **Art. 6** | Informing workers |
| **Art. 7** | Training of workers |
| **Art. 8** | Consultation of workers and workers' participation |

You will find the complete text of the 89/655 EEC Work Equipment Directive on the Internet, in the portal on European Union law, among other sites.
➜ http://europa.eu.int/eur-lex

Each member state is allowed to add its own national requirements: service/maintenance period, use of gloves, etc.
➜ see also graphic (right half) on page A-42


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## Bodies



**Bodies providing safety advice**

Companies that want to know whether their machines are compliant with the applicable European directives and standards can obtain advice on safety aspects from e.g. the HSE and DTI.

**Accredited Bodies**

Accreditation is undertaken and monitored by the appropriate national institution.

The types of machine that the Body is entitled to test are defined as part of the accreditation.

**Notified Bodies**

Each EC member state has the obligation to nominate notified Bodies as per the minimum requirements defined in the Machinery Directive, and to notify Brussels of these Bodies for listing.

Only these Bodies are authorised to issue EC-type examination certificates for the machines and safety components listed in Annex IV. It is explicitly stated that these Bodies are dedicated to specific areas of activity.

A list of the certification Bodies so far notified by EC member states may be obtained from the DTI London.

# European standards on the safety of machinery

**Harmonised European standards**

The European Union's Commission authorises the CEN (European Committee for Standardisation) or CENELEC (European Committee for Electrotechnical Standardisation) to prepare a standard.

The technical specifications for compliance with the essential safety requirements in the directive are then defined in the related forums. As soon as the standard has been ratified, it is published in the Official Journal of the European Union. It is then considered a harmonised standard.

This type of standard is used as a reference and replaces all national standards on the same subject. The conformity of a safety component or a machine with a harmonised standard forms a basis for assuming conformity with the underlying health and safety requirements defined in the Machinery Directive 98/37 EC.

**The status of the standard is indicated by various abbreviations**

- A standard with the prefix EN... is recognised in all EU states and can be applied
- A standard with the prefix prEN... is currently in preparation
- A document that also has TS in the prefix is a Technical Specification. These documents define technical requirements that are to be met by a product, a process or a service.
  A technical specification is an initial draft standard.



Car industry:
Area protection of an insertion station using a SICK laser scanner. The protective field is marked on the floor.





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## Standard types

There are three different types of standard:

**A-type standards**

(Basic safety standards) contain basic terminology, principles of design and general aspects that can be applied to all machinery.

**B-type standards**

(Group safety standards) address a safety aspect or safety equipment that can be used for a wide range of machinery.

- B1-type standards on special safety aspects (e.g. safety distances, surface temperature, noise), e.g. the electrical safety of machinery (EN 60204), the calculation of safety distances (EN 999).
- B2-type standards on safety equipment (e.g. two-hand controls, interlocking equipment, pressure-sensitive protective equipment, guards, electrosensitive protective equipment IEC 61496 parts 1 and 2 / EN 61496 part 1, EN/TS 61496-2 part 2 and EN/TS 61496 part 3).

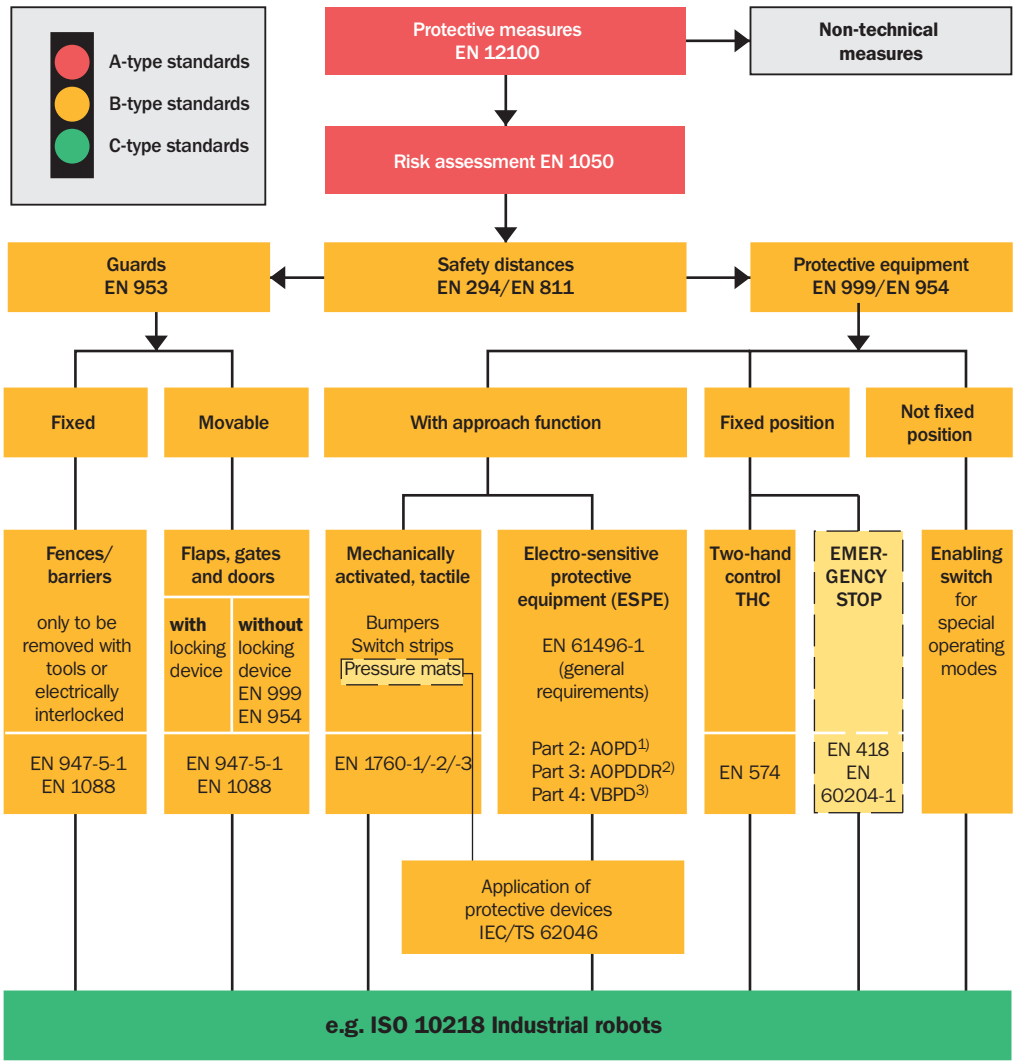
**C-type standards**

(Machinery safety standards) contain all safety requirements for a specific machine or a type of machine. If this standard exists, it has priority over the A-type or B-type standard.

Nevertheless, a C-type standard can refer to a B-type standard or an A-type standard.

If there is no C-type standard for a machine, conformity can be achieved based on the A-type or B-type standard. In all circumstances the requirements of the Machinery Directive must be met.

**Possible selections for protective devices on an industrial robot and related standards**




1) AOPDActive Optoelectronic Protective Device
2) AOPDDRActive Optoelectronic Protective Device responsive to Diffuse Reflection
3) VBPDVision Based Protective Device


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## Categories of the safety-related parts of the control system EN 954-1 (ISO 13849-1)



**Cf. page A-23**

| Categories | Concise list of requirements | System behaviour | Principles for achieving safety |
|---|---|---|---|
| B | The safety-related parts of controls and/or their protective devices, as well as their components, must be designed, built, assembled and combined in compliance with the applicable standards such that they can withstand the effects expected. | The occurrence of a fault can result in the loss of the safety function. | Predominantly characterised by the selection of components |
| 1 | The requirements of B must be met. Proven components and proven safety principles must be used. | The occurrence of a fault can result in the loss of the safety function, but the probability of occurrence is less than in B. | |
| 2 | The requirements of B must be met and proven safety principles used. The machine control must check the safety function at suitable intervals. | The occurrence of a fault can result in the loss of the safety function between checks/tests. The loss of the safety function is detected by the check. | Predominantly characterised by the structure |
| 3 | The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that:<br>▪ a single fault in each of these parts does not result in the loss of the safety function, and<br>▪ whenever feasible within reasonable limits, the single fault is detected | The safety function is retained when the single fault occurs.<br>Some, but not all faults are detected.<br>Accumulation of undetected faults may lead to loss of the safety function. | |
| 4 | The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that:<br>▪ a single fault in each of these parts does not result in the loss of the safety function, and<br>▪ the single fault is detected before or when the safety function is required or, if such detection is not possible, an accumulation of faults must not lead to loss of the safety function. | The safety function is always retained when faults occur.<br>The faults are detected in good time to prevent loss of the safety function. | |



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## Summary of typical standards referenced in machine safeguarding

| Type of standard | European standards EN | International standards ISO / IEC | Title |
|---|---|---|---|
| A | EN 12100-1*<br>EN 12100-2*<br>* previously EN 292 | ISO 12100-1<br>ISO 12100-2 | Safety of machinery — basic concepts, general principles for design |
| | EN 1050 | ISO 14121 | Risk assessment |
| B | EN 61496-1<br>EN/TS 61496-2<br><br>EN/TS 61496-3 | IEC 61496-1<br>IEC 61496-2<br><br>IEC 61496-3 | Safety of machines — electrosensitive protective equipment (ESPE)<br>▪ Part 1: General requirements and tests<br>▪ Part 2: Particular requirements for equipment using active optoelectronic protective devices<br>▪ Part 3: Particular requirements for Active Optoelectronic Protective Devices responsive to Diffuse Reflection (AOPDDR) |
| | EN 999 | ISO 13855 | The positioning of protective equipment in respect of approach speeds of parts of the human body |
| | EN 294 | ISO 13852 | Safety distances to prevent danger zones being reached by the upper limbs |
| | EN 349 | ISO 13854 | Safety of machinery — minimum gaps to avoid crushing of parts of the human body |
| | EN 811 | ISO 13853 | Safety of machinery — safety distances to prevent danger zones being reached by the lower limbs |
| | EN 954-1<br>EN 13849-2 | ISO 13849-1<br>ISO 13849-2 | Safety-related parts of control systems<br>▪ Part 1: General principles for design<br>▪ Part 2: Validation |
| | EN 62061 | IEC 62061 | Functional safety of safety-related electrical, electronic and programmable electronic control systems |
| | EN 61508 | IEC 61508 | Functional safety of electrical, electronic and programmable electronic safety-related systems |
| | EN 60204-1 | IEC 60204-1 | Electrical equipment of machines<br>▪ Part 1: General requirements |
| | EN 1088 | ISO 14119 | Safety of machinery. Interlocking devices associated with guards. Principles for design and selection |
| | EN 574 | ISO 13851 | Safety of machinery. 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 | Safety of machinery. Prevention of unexpected start-up |
| | EN/TS 62046 | IEC/TS 62046 | Safety of machinery — Use of protective equipment to detect the presence of persons |
| C | EN 692 | | Mechanical presses |
| | EN 693 | | Hydraulic presses |
| | EN 13736 | | Pneumatic presses |
| | EN 12622 | | Safety of machine tools. Hydraulic press brakes |
| | EN 775 | ISO 10218 | Industrial robots |
| | EN 1010 | ISO 1010 | Printing and paper processing machines |
| | EN 11111 | ISO 11111 | Textile machines |
| | EN 81-1 | | Safety rules for the construction and installation of lifts<br>▪ Part 1: Electric lifts |
| | EN 280 | | Mobile elevating work platforms — Design calculations — Stability criteria — Construction — Safety — Examinations and tests |
| | EN 1570 | | Safety requirements for lifting tables |
| | EN 1493 | | Vehicle lifts |
| | EN 1808 | | Safety requirements on suspended access equipment — Design, calculations, stability criteria, construction. Tests |


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| Type of standard | European standards EN | International standards ISO / IEC | Title |
|---|---|---|---|
| C | EN 691 | | Woodworking machines — safety and health — common requirements |
| | EN 1870-1 | | Safety of woodworking machines — circular sawing machines<br>▪ Part 1: Circular saw benches (with and without sliding table) and dimension saws |
| | EN 1870-4 | | Safety of woodworking machines — circular sawing machines<br>▪ Part 4: Multiblade rip-sawing machines with manual loading and/or unloading |
| | EN 848-1 | | Safety of woodworking machines — one side moulding machines with rotating tool<br>▪ Part 1: Single spindle vertical moulding machines |
| | EN 940 | | Safety of woodworking machines — combined woodworking machines |
| | EN 1218-1 | | Safety of woodworking machines — tenoning machines<br>▪ Part 1: Single end tenoning machines with sliding table |
| | EN 289 | | Rubber and plastics machinery. Compression and transfer moulding presses. Safety requirements for the design |
| | EN 422 | | Rubber and plastics machinery. Safety — blow moulding machines intended for the production of hollow articles — requirements for design and construction |
| | EN 1114-1 | | Rubber and plastics machines — extruders and extrusion lines<br>▪ Part 1: Safety requirements for extruders |
| | EN 1612-1 | | Rubber and plastics machines — reaction moulding machines<br>▪ Part 1: Safety requirements for metering and mixing units |
| | EN 528 | | Storing and retrieval equipment — safety |
| | EN 281 | | Self-propelled industrial trucks with driver's seat; Rules for the design and layout of pedals |
| | EN 1459 | | Safety of industrial trucks — self-propelled variable-reach trucks |
| | EN 1525 | | Safety of industrial trucks. Driverless trucks and their systems |
| | EN 1526 | | Safety of industrial trucks — additional requirements for automated functions on trucks |
| | prEN 1672-1 | | Food processing machinery — safety and hygiene requirements — basic concepts |
| | 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 415-4 | | Palletisers and depalletisers |

→ Further information on this topic can be found on the VDMA's site, www.vdma.org, or the "Safety of Machinery in Europe", available from Beuth Verlag GmbH


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## Calculation of the minimum safety distance

| General formula for calculation from EN 999 | |
|---|---|
| $S = (K \times T) + C$ | |
| **S** | Minimum distance in millimetres, measured from the hazardous area to the detection point, to the detection line, to the detection plane or to the protective field |
| **K** | A parameter in millimetres per second, derived from data on approach speeds of the body or parts of the body |
| **T** | Stopping/run-down time of the entire system in seconds |
| **C** | Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered |

The calculation of the safety distance for an ESPE is described in the EN 999 standard. If the machine is subject to a specific standard (e.g. metal presses) or a special technical specification, then reference must be made to this document.

Every ESPE must be installed such that access to the hazardous area is reliably detected by the protective device. For finger and hand protection, or the protection of a hazardous area, it must not be possible for a person to be present in the hazardous area without being detected.

If the minimum distance calculated satisfies the industrial and ergonomic requirements, it must also be checked whether the installation and the configuration of the protective device is so designed that undetected presence of people in the hazardous area is impossible.

If, however, people can be present in the hazardous area without detection, the installation must be equipped with additional protective measures/protective devices. If the minimum distance is too large and is unacceptable on ergonomic grounds, it must be defined whether it is possible to reduce the overall stopping time of the machine. Otherwise, an ESPE with a better resolution is to be selected.

The measurement of the stopping/run-down time, a service provided by SICK, is important here and requires specific expertise.
➜ See “SICK services” page A-2.

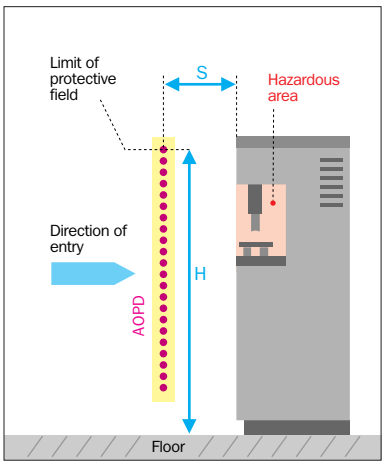
Example:
On perpendicular approach and with a total stopping time of 100 ms, a safety distance of 368 mm is to be maintained for an AOPD with a resolution of 35 mm. With a resolution of 14 mm, on the other hand, the safety distance is only 200 mm.

The following table is to be applied for presses in accordance with the EN 692 and EN 693 standards.

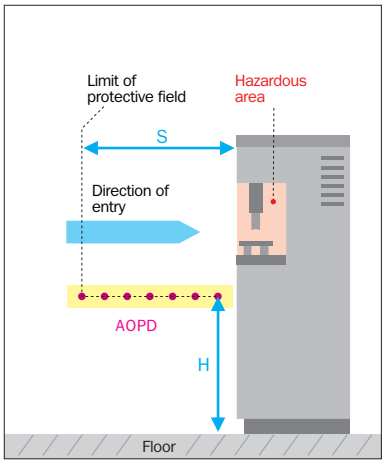
Taking into account the resolution of the AOPD, when calculating the minimum distance S, supplement C at least must be added (cf. EN 692).

| Resolution of the ESPE d (mm) | Supplement C (mm) | Stroke triggering by AOPD/PSDI mode |
|---|---|---|
| d ≤ 14<br>14 < d ≤ 20<br>20 < d ≤ 30 | 0<br>80<br>130 | permitted |
| 30 < d ≤ 40<br>d > 40 | 240<br>850 | not permitted |

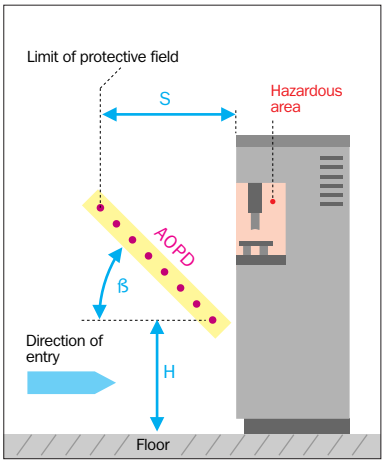
**In general, one differentiates between three different approach types**




Perpendicular approach/perpendicular entry into the protective field level




Parallel approach/parallel entry into the protective field level




Angular approach


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**The following table contains the formulae for calculating the safety distance S**
You will find examples on the next page.

| Approach | Detection capability (resolution) | Minimum safety distance (mm) | Comments/notes |
|---|---|---|---|
| **Perpendicular**<br>ß = 90° (±5°) | d = ≤ 40 mm | S = 2000T + 8(d – 14)<br>S must not be < 100 mm | To prevent bypassing the ESPE, reference standard EN 294.<br>In practice this standard cannot always be applied because it considers the hand can be manipulated. In this case it is necessary to seek advice from the relevant authorities. |
| | | If S is > 500 mm using the above formula, use<br>S = 1600T + 8(d – 14)<br>In this case S cannot be < 500 mm | |
| | 40 < d ≤ 70 mm | S = 1600T + 850 | Height of the bottom beam ≤ 300 mm<br>Height of the highest beam ≥ 900 mm |
| | d > 70 mm<br>multi-beam | S = 1600T + 850 | Number of beamsRecommended heights<br>4 300, 600, 900, 1200 mm<br>3 300, 700, 1100 mm<br>2 400, 900 mm<br>1 750 mm |
| | single-beam | S = 1600T + 1200 | |
| **Parallel**<br>ß = 0° (±5° ) | — | S = 1600T + (1200 – 0.4× H)<br>where 1200 – 0.4× H > 850 mm | 15× (d – 50) ≤ H ≤ 1000 mm<br>if H ≥ 300 mm, there is a risk of undetected access under the beam to be taken into account, where d ≤ H/15 + 50 |
| **Angular**<br>5° < ß < 85° | — | where ß > 30°, cf. vertical approach<br>where ß < 30°, cf. parallel approach<br>S then applies to the furthest beam whose height ≤ 1000 mm. | d ≤ H/15 + 50 is in respect to the lowest beam |

**S** = Minimum distance
**H** = Height
**d** = Resolution
**ß** = Angle between detection plane and the direction of entry
**T** = Time

**In general, the following errors must be excluded when mounting protective devices:**


Reaching over


Reaching under


Reaching under from a crouched position


Standing behind


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# Application examples

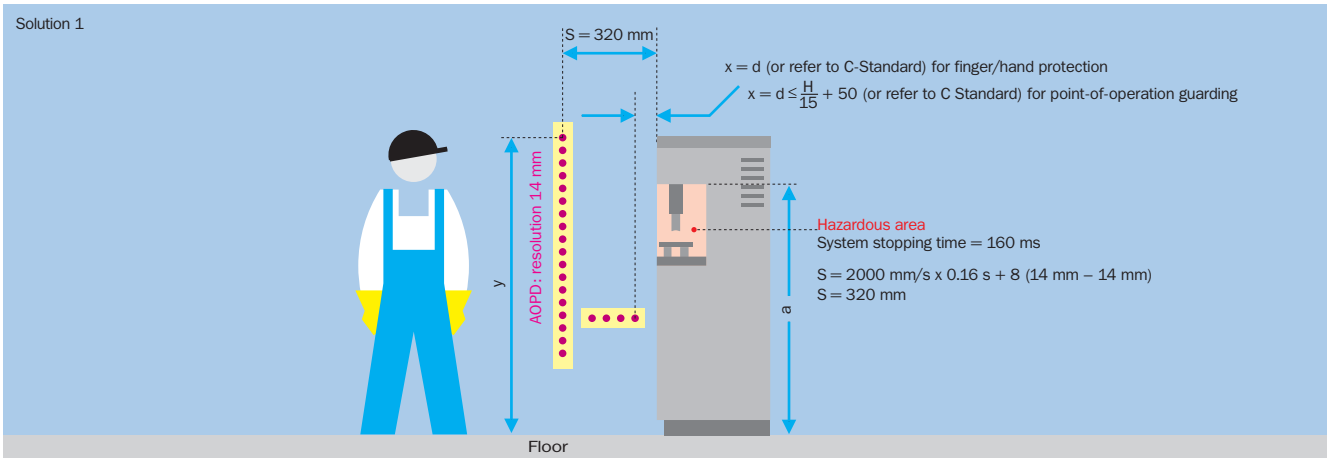
## Point of operation versus area protection of an assembly line

This example shows two possible ways of addressing safeguarding requirements for a machine with hazardous motion. The first method utilizes a vertical approach and the second uses a horizontal approach to safeguarding.

It is a condition that
- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

**Solution 1: Perpendicular approach**
**Hazardous point protection with point-of-operation guarding**

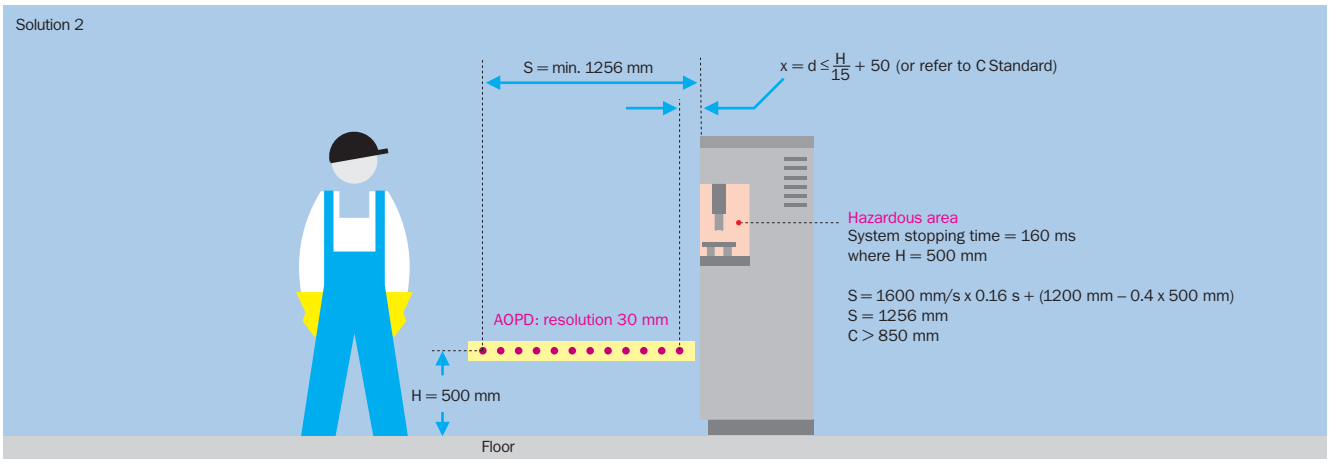
The calculation, as shown in the diagram, yields a safety distance of S = 320 mm. By using an AOPD with a better resolution, a smaller safety distance may be realized. However, the safety distance must not be less than 100 mm. To ensure that the person is detected anywhere in the hazardous area, two AOPDs are used: a vertical AOPD, positioned at the calculated safety distance (perpendicular approach), and a horizontal AOPD, to eliminate the hazard of standing behind the vertical AOPD.




a = Height of the hazardous area
d = Detection capability (resolution) of the AOPD
S = Safety distance
x = From end of the protective field to the mechanical point-of-operation guarding
y = 1800 mm, if the height of the hazardous area a = 1000 mm (as per EN 294, table 1)

**Solution 2: Parallel approach**
**Hazardous area protection**

A horizontal AOPD is used.
The diagram below shows the calculation of the safety distance S and the positioning of the AOPD. If the installation height of the AOPD is increased to 500 mm, the safety distance is reduced. However, it must still not be possible to access the hazardous area beneath the AOPD. In such cases it is necessary to install an additional protective device based on the risk assessment.




C = Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered
d = Detection capability (resolution) of the AOPD
H = Installation height
S = Safety distance
x = From end of the protective field to the mechanical point-of-operation guarding


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**Result**

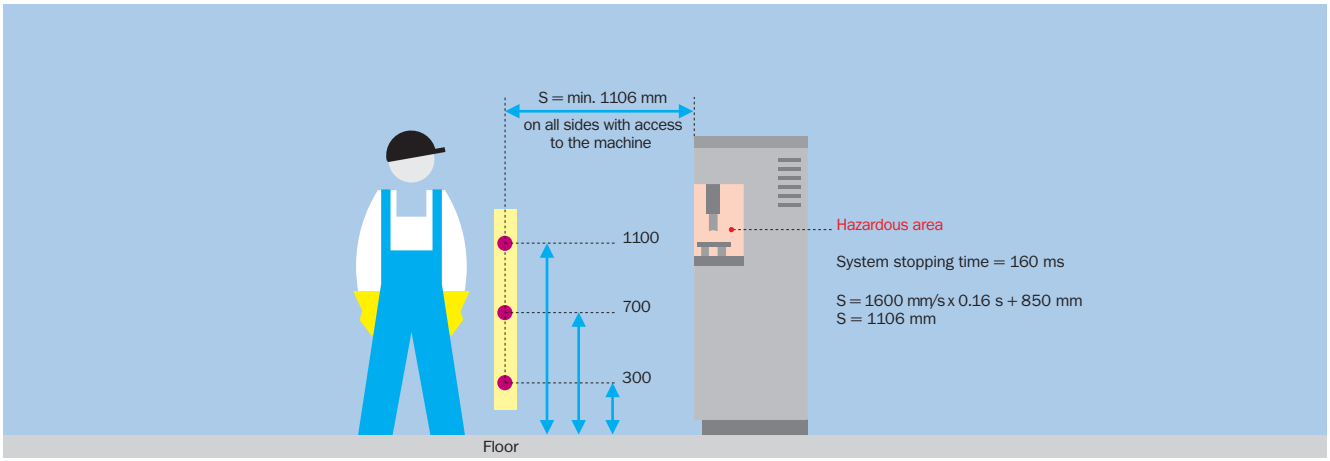
The table below shows the results of these two solutions.
Operative requirements determine which of the two solutions is chosen.

| | Advantages | Disadvantages |
|---|---|---|
| **Solution 1**<br>**S = 320 mm** | ▪ Greater productivity, as the operator is closer<br>▪ The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances) | ▪ Higher price for the protective device |
| **Solution 2**<br>**S = 1256 mm** | ▪ Lower price for the protective device<br>▪ Enables access to be protected independently of the height of the hazardous area | ▪ The operator is much further away (long distances)<br>▪ It is difficult to store products on the floor, as the AOPD takes up a large amount of the space<br>▪ Lower productivity |

## Access safeguarding

Access protection with 3 beams (at heights of 300 mm, 700 mm and 1100 mm) allows perpendicular approach, as described in the chapter “Calculation of the safety distance” (➜ page A-50). This solution permits the operator to stand between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.

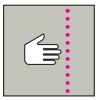



H = Installation height

S = Safety distance

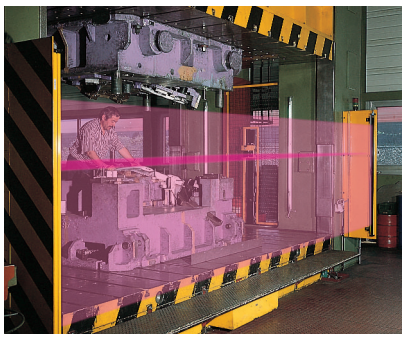
## Guarding the Interior of a press

This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the interior. This is a secondary protective device that under no circumstances can take over the function of the primary protection, for which an appropriate device is used (AOPD or two-hand control).



Spotting press
Hazardous point protection with safety light curtain (AOPD) and interior monitoring with safety laser scanner (AOPDR). Both sensors are activated on start-up. Then the SICK laser scanner is muted during the downward stroke.

In this special case: The safety distance for the primary protective device with the task of stopping the press must be calculated while the secondary protective device detects the presence of a person in the press, and thus prevents initiation of motion by the press control.




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The key regulations and standards for machines used in Japan are presented in the following pages.

This brief summary cannot replace detailed consideration of national, regional or local regulations and standards that might apply to your application.

# Regulatory Requirements

Chapter V. of the Industrial Health and Safety Law defines the requirements associated with industrial safety and health as it relates to machines and harmful substances.

These requirements have been adopted as:
- Law No. 57 dated June 8, 1972
- Law No. 91 dated May 31, 2000 (latest amendments).

This chapter includes a number of Articles including those outlined in the table below and several others:

| Article Designation | Topics covered |
|---|---|
| Article 3 | Responsibility for safety and health |
| Article 37 | Permission for manufacturing |
| Article 38 | Inspection at the time of manufacture |
| Article 39 | Issue of inspection certificate |
| Article 40 | Restriction of use |
| Article 41 | Valid term of certificate |
| Article 42 | Restrictions on transfer / Limitation of Installation |
| Article 43 | Restrictions on transfer (additional) |
| Article 44 | Examination of equipment |
| Article 45 | Periodic inspection of equipment |

These articles represent comprehensive safety and health law for industry as a whole. Generally, the contents of these regulations are administrative in nature.

**Article 42** defines the requirements associated with manufacturers of machines that have dangerous or harmful operations as defined by Cabinet Order 318 entitled Machines Having to Be Made in Compliance with a Construction Code or Provided with Safety Devices as Specified by the Minister of Health, Labour and Welfare. These machines cannot be transferred, leased or installed in Japan unless they conform to the construction code defined by the Minister of Health, Labour and Welfare or are equipped with safety apparatus also defined by the Minister of Health, Labour and Welfare.

**Article 44** states that a person or entity that has manufactured or imported a machine(s) described in Article 42 must undergo an individual type examination conducted by either
- the Labour Minister of Health, Labour and Welfare,
- the Director General of the Prefectural Labour Bureau, or
- an agency designated by the Labour Minister of Health, Labour and Welfare.

A person or entity that has satisfied the requirements associated with the individual type examination shall, as provided for by Ministry of Health, Labour and Welfare Ordinance, affix a label indicating the fact of having satisfied the requirements associated with individual examination.
Additional information is available from the Japanese International Center for Occupational and Health web site at:
➜ www.jicosh.gr.jp/english

The Guidelines for Comprehensive Safety Standards provides guideline information to improve machinery safety and establish standards for comprehensive safety measures. These guidelines are applicable to all machinery with respect to the design, manufacture, etc., of machinery and the use of machinery by workers of employers. The Guidelines were established with the purpose of preventing occupational accidents caused by machinery by encouraging the manufacture of safe machinery and the safe use of machinery by employers.

Manufacturers are required to perform a risk assessment and risk reduction strategy when designing, manufacturing, or modifying a machine, or when delivering or leasing an imported machine. When residual risks are higher than tolerable levels of risk based on the risk assessment in manufacturing, additional safety measures shall be implemented to reduce the risk to a tolerable level. The risk assessment and corresponding risk reduction strategy must be documented.



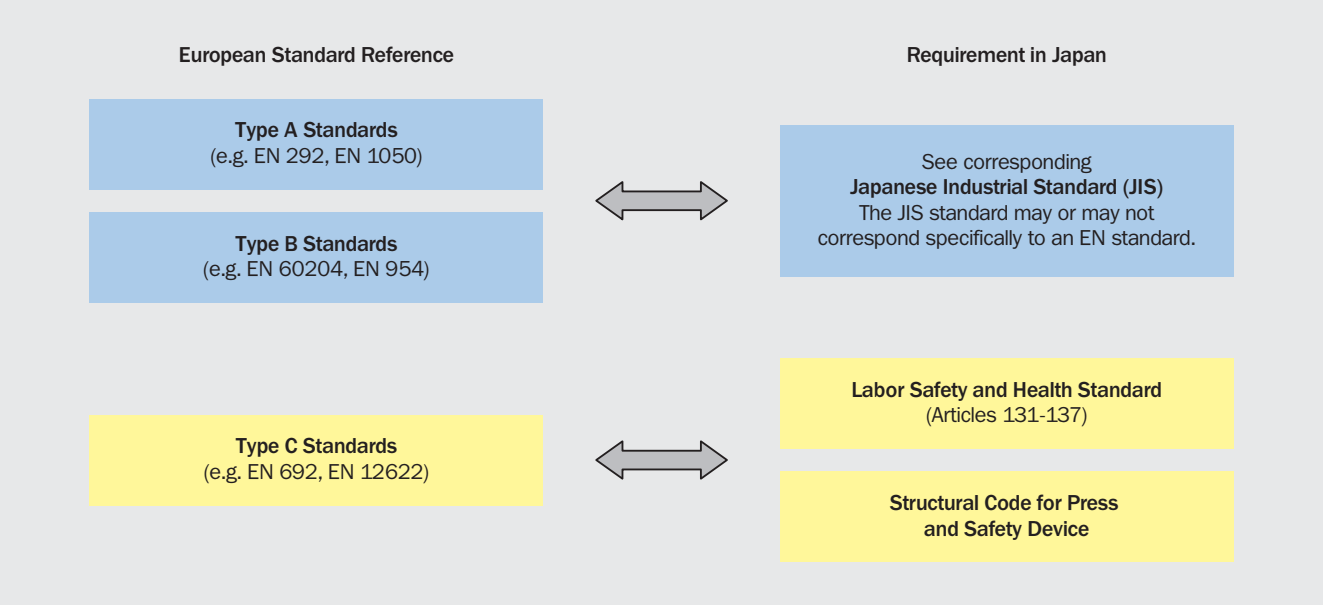
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The Labor and Safety Health Standards are implemented based on Ministerial Ordinance. These standards also apply to industry as a whole, but can provide more concrete and detailed requirements for each industry branch. For example, Chapter 4 discusses the requirements related to press machines. A few of the requirements related to Chapter 4 Press Machine are presented below for example:

| Article Reference | Requirements |
|---|---|
| Article 131 | Prevention of dangers caused by the press. Employers must take measures for the employee's safety e.g. Guard, Safety device, etc. |
| Article 133 | Appointment of the operation chief of the press machine operations. The operation chief is responsible from press operations e.g. Die change, keeping to the changeover switch, etc. |
| Article 134-3 | Periodic compulsory inspection. The employer is responsible to execute compulsory inspection once per year. |

**All safety devices utilize for press machine operation safeguarding must have type approval.**

The following figure provides a general overview comparing European standards requirements to Japanese standards requirements. Specific Japanese standards requirements are subject to change.





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# Consensus Standards

The Japanese Standards Association (JSA) has adopted the following standards. Additional information can be obtained from the Japanese Standards Association's web site at:
➜ www.jsa.or.jp/default_english.asp

| Japanese Industrial Standard (JIS) | ISO/IEC Equivalent Reference Standard | Safety of MachineryTopic Discussion |
|---|---|---|
| JIS B 0906 | ISO 10816 | Mechanical vibration -- Evaluation of machine vibration |
| JIS B 9700-1, -2 | ISO 12100-1, -2 | Basic concepts, general principles for design |
| JIS B 9701 | ISO 14119 Amend. 1 | Interlocking Devices Associated With Guards |
| JIS B 9702 | ISO 14121-1, -2 | Principles of risk assessment |
| JIS B 9703 | ISO 13850 | Emergency stop |
| JIS B 9704-1, -2, -3 | IEC 61496-1, -2, -3 | Electrosensitive protective equipment |
| JIS B 9705-1, -2 | ISO 13849-1, -2 | Safety-related parts of control systems |
| JIS B 9706-1, -2, -3 | IEC 61310-1, -2, -3 | Indication, marking and actuation |
| JIS B 9707 | ISO 13852 | Safety distances to prevent danger zones being reached by the upper limbs |
| JIS B 9708 | ISO 13853 | Safety distances to prevent danger zones being reached by the lower limbs |
| JIS B 9709 | ISO 14123 | Reduction of risks to health from hazardous substances |
| JIS B 9710 | ISO 14119 | Interlocking devices associated with guards |
| JIS B 9711 | ISO 13854 | Minimum gaps to avoid crushing of parts of the human body |
| JIS B 9712 | ISO 13851 | Two-hand control devices |
| JIS B 9713-1...-4 | ISO 14122-1...-4 | Permanent means of access to machinery |
| JIS B 9714 | ISO 14118 | Prevention of unexpected start-up |
| JIS B 9715 | ISO 13855 | Positioning of protective equipment with respect to the approach speeds of parts of the human body |
| JIS B 9716 | ISO 14120 | Guards -- General requirements for fixed and movable guards |
| JIS B 9960-1, -11, -31, -32 | IEC 60204-1, -11, -31, -32 | Electrical equipment requirements of machines |
| JIS C 60079 | IEC 61508 | Functional safety of electrical/electronic/programmable electronic safety-related systems |
| JIS C 60079 | IEC 60079 | Electrical apparatus for explosive gas atmospheres |
| JIS C 61000 | IEC 61000 | Electromagnetic compatibility (EMC) |
| JIS C 8201 | IEC 60947 | Low-voltage switchgear and controlgear |
| JIS Z 8503 | ISO 10075 | Ergonomic principles of design |
| JIS Z 8734 | ISO 3741 | Acoustics -- sound power levels of noise sources |
| TS B 62046 | IEC/TS 62046 | Application of protective equipment to detect presence of persons |

The list of standards provided in the table above is not exhaustive. Other Japanese standards requirements do exist. Consult the local, regional and national regulations in Japan for specific requirements that may apply for your application.


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# Calculation of the minimum safety distance



| General formula for calculation from JIS B 9715 | |
|---|---|
| **S = (K × T) + C** | |
| **S** | Minimum distance in millimetres, measured from the hazardous area to the detection point, to the detection line, to the detection plane or to the protective field |
| **K** | A parameter in millimetres per second, derived from data on approach speeds of the body or parts of the body |
| **T** | Stopping/run-down time of the entire system in seconds |
| **C** | Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered |

The calculation of the minimum safety distance for an ESPE is described in the JIS B 9715 standard. When a machine is subject to a specific regulation (e.g power driven press machine) or special technical specification in Japan, then the minimum safety distance calculation and associated application requirements must be made in reference to that regulation or specification. For additional information or assistance, please contact the SICK subsidiary in Japan at ➜ www.sick.jp.

Every ESPE must be installed such that access to the hazardous area is reliably detected by the protective device. For finger and hand protection, or the protection of a hazardous area, it must not be possible for a person to be present in the hazardous area without being detected.

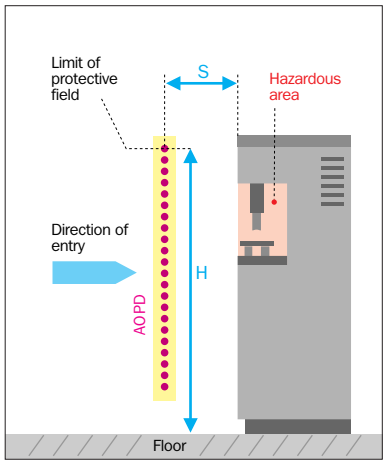
If the minimum distance calculated satisfies the industrial and ergonomic requirements, it must also be checked whether the installation and the configuration of the protective device is so designed that undetected presence of people in the hazardous area is impossible.

If, however, people can be present in the hazardous area without detection, the installation must be equipped with additional protective measures/protective devices. If the minimum distance is too large and is unacceptable on ergonomic grounds, it must be defined whether it is possible to reduce the overall stopping time of the machine. Otherwise, an ESPE with a better resolution is to be selected.

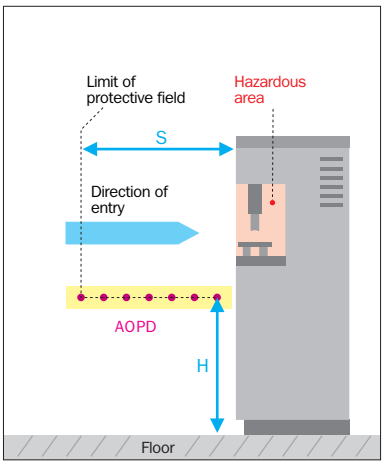
The measurement of the stopping/run-down time, a service provided by SICK, is important here and requires specific expertise.
➜ See “SICK services” page A-2.

| Resolution of the ESPE d (mm) | Supplement C (mm) | Stroke triggering by AOPD/PSDI mode |
|---|---|---|
| d ≤ 14<br>14 < d ≤ 20<br>20 < d ≤ 30 | 0<br>80<br>130 | permitted |
| 30 < d ≤ 40<br>d > 40 | 240<br>850 | not permitted |

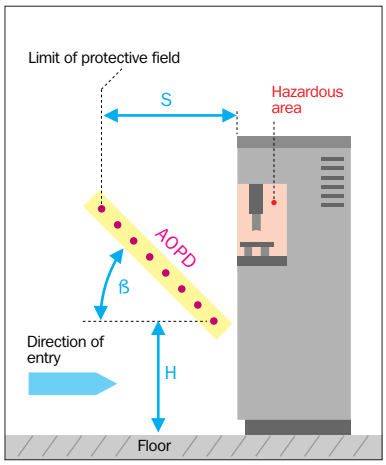
**In general, one differentiates between three different approach types**




Perpendicular approach/perpendicular entry into the protective field level




Parallel approach/parallel entry into the protective field level




Angular approach


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**The following table contains the formulae for calculating the safety distance S**
You will find examples on the next page.

| Approach | Detection capability (resolution) | Minimum safety distance (mm) | Comments/notes |
|---|---|---|---|
| **Perpendicular**<br>ß = 90° (±5°) | d = ≤ 40 mm | S = 2000T + 8(d – 14)<br>S must not be < 100 mm | To prevent bypassing the ESPE, reference standard JIS B 9707.<br>In practice this standard cannot always be applied because it considers the hand can be manipulated. In this case it is necessary to seek advice from the relevant authorities. |
| | | If S is > 500 mm using the above formula, use<br>S = 1600T + 8(d – 14)<br>In this case S cannot be < 500 mm | |
| | 40 < d ≤ 70 mm | S = 1600T + 850 | Height of the bottom beam ≤ 300 mm<br>Height of the highest beam ≥ 900 mm |
| | d > 70 mm<br>multi-beam | S = 1600T + 850 | Number of beams Recommended heights<br>4 300, 600, 900, 1200 mm<br>3 300, 700, 1100 mm<br>2 400, 900 mm<br>1 750 mm |
| | single-beam | S = 1600T + 1200 | |
| **Parallel**<br>ß = 0° (±5° ) | — | S = 1600T + (1200 – 0.4× H)<br>where 1200 – 0.4× H > 850 mm | 15× (d – 50) ≤ H ≤ 1000 mm<br>if H ≥ 300 mm, there is a risk of undetected access under the beam to be taken into account, where d ≤ H/15 + 50 |
| **Angular**<br>5° < ß < 85° | — | where ß > 30°, cf. vertical approach<br>where ß < 30°, cf. parallel approach<br>S then applies to the furthest beam whose height ≤ 1000 mm. | d ≤ H/15 + 50 is in respect to the lowest beam |

**S** = Minimum distance
**H** = Height
**d** = Resolution
**ß** = Angle between detection plane and the direction of entry
**T** = Time

**In general, the following errors must be excluded when mounting protective devices:**


Reaching over


Reaching under


Reaching under from a crouched position


Standing behind


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# Application examples

## Point of operation versus area protection of an assembly line

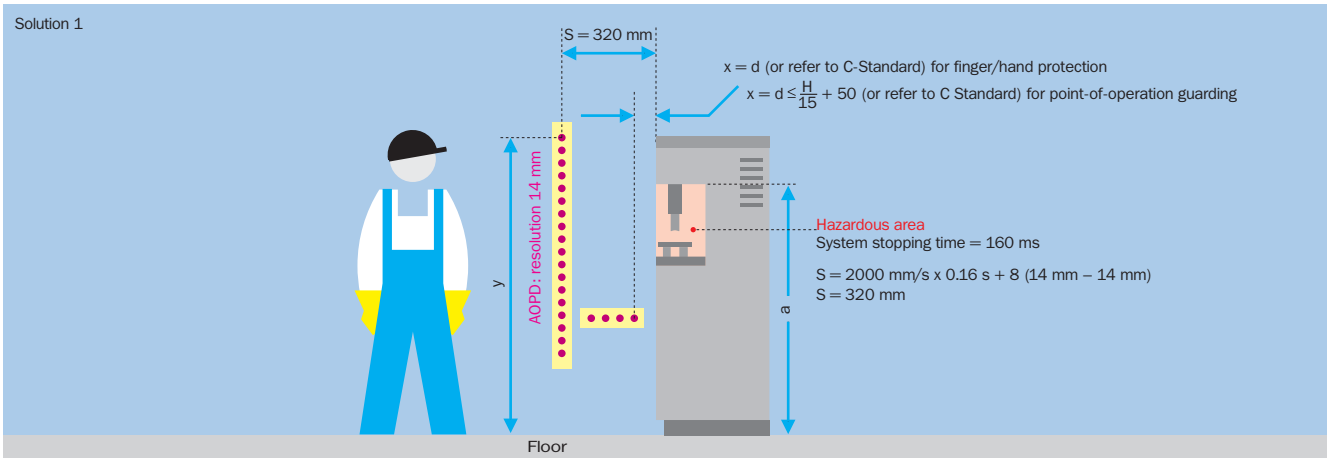
This example shows two possible ways of addressing safeguarding requirements for a machine with hazardous motion. The first method utilizes a vertical approach and the second uses a horizontal approach to safeguarding.

**Solution 1: Perpendicular approach**
**Hazardous point protection with point-of-operation guarding**

The calculation, as shown in the diagram, yields a safety distance of S = 320 mm. By using an AOPD with a better resolution, a smaller safety distance may be realized. However, the safety distance must not be less than 100 mm. To ensure that

It is a condition that
- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

the person is detected anywhere in the hazardous area, two AOPDs are used: a vertical AOPD, positioned at the calculated safety distance (perpendicular approach), and a horizontal AOPD, to eliminate the hazard of standing behind the vertical AOPD.

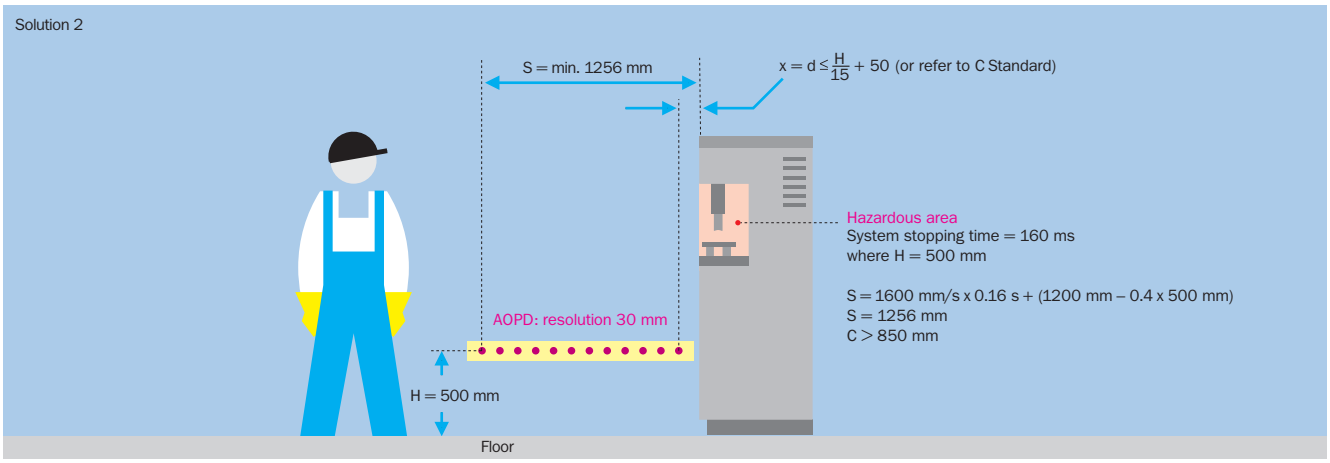



a = Height of the hazardous area
d = Detection capability (resolution) of the AOPD
S = Safety distance
x = From end of the protective field to the mechanical point-of-operation guarding
y = 1800 mm, if the height of the hazardous area a = 1000 mm (as per JIS B 9707)

**Solution 2: Parallel approach**
**Hazardous area protection**

A horizontal AOPD is used.
The diagram below shows the calculation of the safety distance S and the positioning of the AOPD. If the installation height of

the AOPD is increased to 500 mm, the safety distance is reduced. However, it must still not be possible to access the hazardous area beneath the AOPD. In such cases it is necessary to install an additional protective device based on the risk assessment.




C = Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered
d = Detection capability (resolution) of the AOPD
H = Installation height
S = Safety distance
x = From end of the protective field to the mechanical point-of-operation guarding


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**Result**

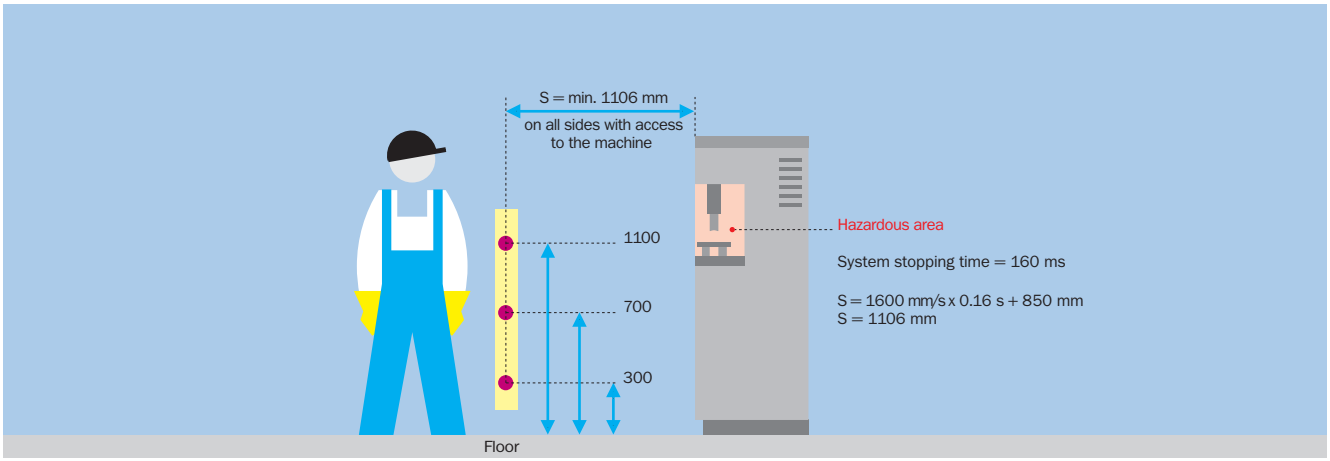
The table below shows the results of these two solutions.
Operative requirements determine which of the two solutions is chosen.

| | Advantages | Disadvantages |
|---|---|---|
| **Solution 1**<br>**S = 320 mm** | ▪ Greater productivity, as the operator is closer<br>▪ The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances) | ▪ Higher price for the protective device |
| **Solution 2**<br>**S = 1256 mm** | ▪ Lower price for the protective device<br>▪ Enables access to be protected independently of the height of the hazardous area | ▪ The operator is much further away (long distances)<br>▪ It is difficult to store products on the floor, as the AOPD takes up a large amount of the space<br>▪ Lower productivity |

## Access safeguarding

Access protection with 3 beams (at heights of 300 mm, 700 mm and 1100 mm) allows perpendicular approach, as described in the chapter “Calculation of the safety distance” (➜ page A-57). This solution permits the operator to stand between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.



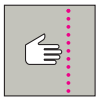

H = Installation height

S = Safety distance

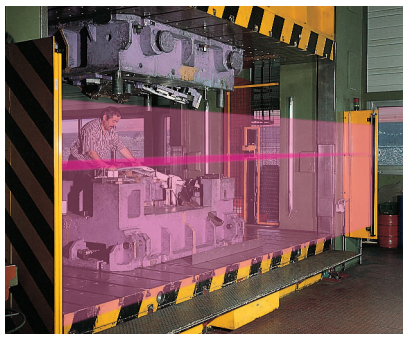
## Guarding the Interior of a press

This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the interior. This is a secondary protective device that under no circumstances can take over the function of the primary protection, for which an appropriate device is used (AOPD or two-hand control).

In this special case: The safety distance for the primary protective device with the task of stopping the press must be calculated while the secondary protective device detects the presence of a person in the press, and thus prevents initiation of motion by the press control.



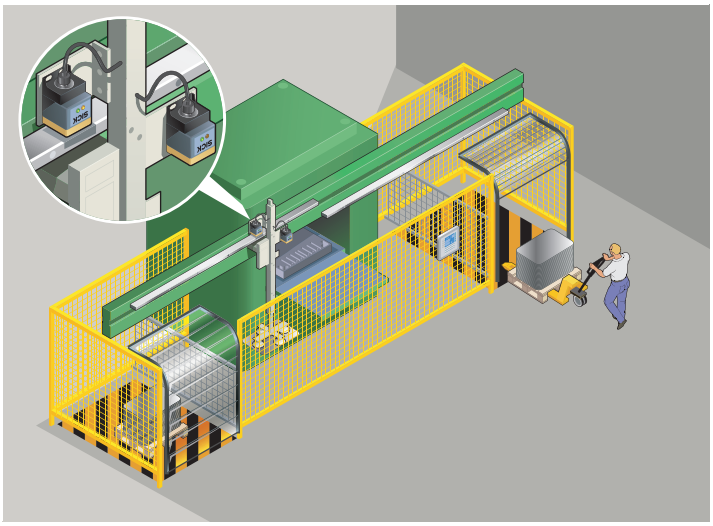
Spotting press
Hazardous point protection with safety light curtain (AOPD) and interior monitoring with safety laser scanner (AOPDR). Both sensors are activated on start-up. Then the SICK laser scanner is muted during the downward stroke.




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# Products and complete solutions for effective operator protection and accident prevention



## Solutions from SICK: an eye on the big picture!

Today, using industrial safety technology is a must. However it is only when this technology optimizes the production processes and provides safety that our goal has been achieved.

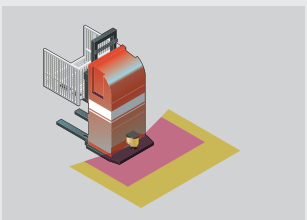
Whether individual solutions or integrated safety concepts, SICK provides efficient solutions that provide you with the best safety!

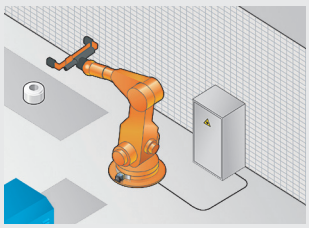
## Think about tomorrow, today!

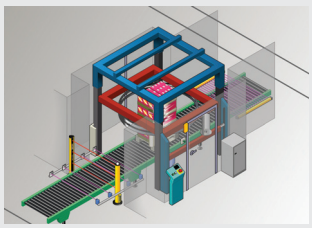
The name SICK stands for expertise derived from practice. Our knowledge of machines and systems forms the basis for customized and individual solutions that will also satisfy your future requirements.

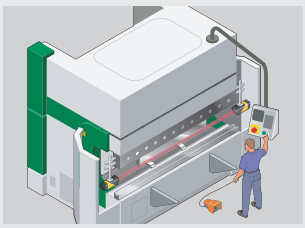
The applications described on the following pages illustrate possible solutions. The selection of devices, their arrangement and mounting must be adapted to the task, the specific situation and the requirements of the site where the devices are used, especially in the safety technology sector.

Let SICK solve your safety applications.











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# Applications at a glance



| Task | Description | Industrial sector | Product | Page |
|---|---|---|---|---|
| Hazard protection | Hazard protection on a cylinder head handling station | Automotive and other vehicles | C4000 | B-2 |
| | Protection of a handling machine in cheese manufacture | Food & beverage | C2000, IP 67 Housing | B-3 |
| | Protection of a press brake | Machine tools and production systems | V4000, M2000, C2000 | B-4 |
| Hazardous point protection with area protection | Hazardous point and area protection on an industrial robot | Assembly, handling, robotics, automation | C4000 | B-5 |
| | Hazardous point and area protection on a rotary table | Automotive and other vehicles | C4000, S3000, UE4100, UE4400 | B-6 |
| Hazardous area protection | Protection of a skid in automobile production | Automotive and other vehicles | S3000 | B-8 |
| | Area protection on a pipe-bending machine | Metal and steel production, processing | S3000 | B-9 |
| | Protection of crossing paths for automated transport systems | Automotive and other vehicles | S3000, VS/VE18-2, LE20 | B-10 |
| | Hazardous area protection on a wrap-around tray packaging machine | Food & beverage | C2000, L4000, RE300, UE410 Flexi | B-11 |
| | Protection of the route for an automated guided vehicle | Storage and conveyor technology | S3000, S300 | B-12 |
| Access protection | Access protection and positioning in a gas bottle facility | Storage and conveyor technology, pharmaceutical/medical | IN4000, M2000, UE4200 | B-13 |
| | Safety interlocks on robot cells in a harsh operating environment | Automotive and other vehicles | i1001 Lock | B-14 |
| | Three-sided protection of a punching machine | Machine tools and production systems | M4000 | B-15 |
| | Protection of a stone transport crane | Construction, stone, glass, ceramics, etc. | M2000 | B-16 |
| | Hazardous point and access protection on a press brake machine | Machine tools and production systems | C4000, C2000, M2000, UE470 | B-17 |
| Access protection with area protection | Access and area protection on a palletizer robot | Food & beverage, packaging | S300, i14 Lock, E100, UE410 Flexi | B-18 |
| | Hazardous area and access protection on a robot cell | Assembly, handling, robotics, automation | S3000, UE440 | B-19 |
| Safe position monitoring | Safe monitoring of a gantry robot's working area | Automotive and other vehicles | IN4000 | B-20 |
| | Safe monitoring of a robot's working area | Assembly, handling, robotics, automation | IN4000 | B-21 |
| Access protection with differentiation between man and material (muting) | Access protection for AGV gates on a robot cell | Automotive and other vehicles | M4000, T4000 Compact | B-22 |
| | Hazardous area and access protection on a coil store | Storage and conveyor technology | M4000 with UE403, T4000 Compact, UE4200 | B-23 |
| | Access protection on a pallet stretch wrapper | Food & beverage, packaging | M4000, i16, C4000 Palletizer, UE410 Flexi | B-24 |
| Access protection with differentiation between man and material (muting alternative) | Access protection with differentiation between man and material on a palletising system | Storage and conveyor technology, Packaging | C4000 Palletizer | B-25 |
| | Access protection to a robot cell with differentiation between man and material | Automotive and other vehicles | C4000 Entry/Exit | B-26 |
| | Access protection on an assembly cell | Automotive and other vehicles | S3000, UE440 | B-27 |
| Overview for access protection with differentiation between man and material | | | | B-28 |

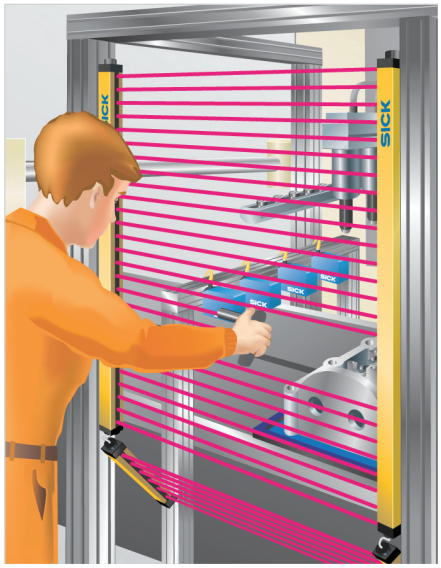


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Application Finder

- SICK is continually publishing examples of application solutions on the Inter-net (➜ www.sickusa.com/applications).
- The "Application Finder" will guide you to additional solutions involving products from SICK's Industrial Sensor, Industrial Safety Systems and Automatic Identification Divisions.




# Application overview

**Hazardous point protection on a cylinder head handling station**

| | |
|---|---|
| **Task** | Hazardous point-of-operation protection |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Handling robots |
| **Product family** | C4000 |

# Application in detail

**Task**

Along with manual assembly stations, a cylinder head assembly line also includes fully automatic assembly stations with handling robots. Their working area is to be protected against access by the workers to prevent injuries to fingers and hands. The protective device is to be designed in such a way that when the robot is at a standstill, work processes, e.g. the insertion of parts, rectification of malfunctions and setup, are not hindered.

**Implementation**

Using the C4000 safety light curtain, it was possible to implement hazardous point protection and point-of-operation guarding. To protect the assembly or handling stations, the cells are equipped with light curtains on the sides open to the workers. If a worker reaches into the cell while the robot is working, the light curtain is interrupted and the assembly or handling process stopped. As it would be possible to step behind the vertically arranged light curtain (as shown in the figure), an additional light curtain is fitted at an angle beneath the vertical safety light curtain. The safety light curtains are connected together serially. The vertical light curtain acts as a guest and the light curtain fitted beneath it is the host. As a result, the two light curtains can be connected to the robot control system via a single input.

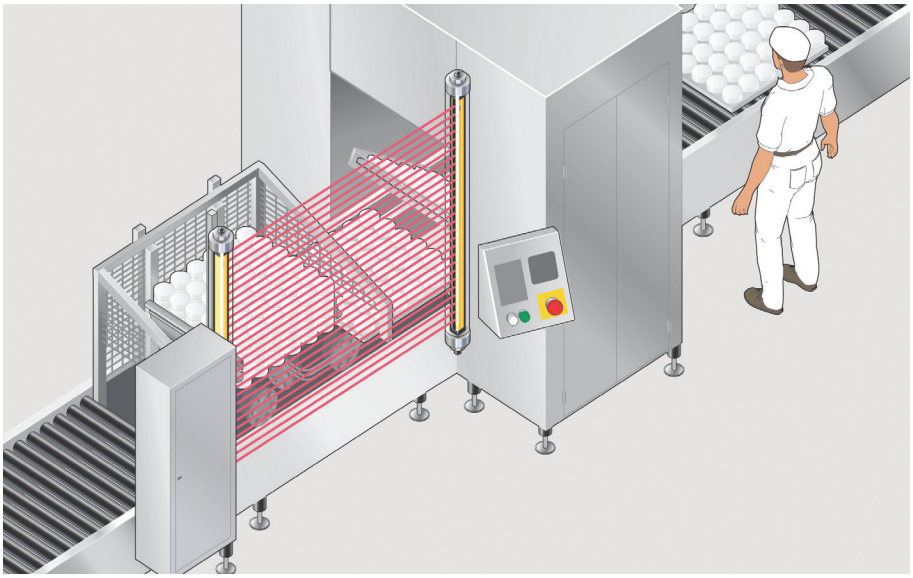
**Customer benefits**

The proven safety technology makes it possible to reliably implement hazardous point protection and point-of-operation guarding.The serial configuration (cascading), simplifies wiring and reduces the number of inputs required, cutting the amount of space required in the control cabinet.This provides for lower installation costs.


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| ➜ C4000 | E-3 |
| ➜ Services | A-2 |




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## Application overview

**Protection of a handling machine in cheese manufacture**

| | |
|---|---|
| **Task** | Hazardous point-of-operation protection |
| **Industrial sector** | Food & beverage |
| **Application location** | Stacker |
| **Product family** | C2000, IP 67 Housing |

## Application in detail

**Task**

In the factory of a French Camembert manufacturer, a reliable solution was sought for protection against crushing hands and fingers on a stack collector.The solution must also not interfere with the production process. The environment for the safety system has an atmospheric humidity of up to 85 % – at an ambient temperature of 25 °C. Also the equipment must be washed off once or twice a day using alkaline or acidic cleaning agents. Finally, cold water (5 to 10 °C) at a pressure of 40 bar is used for rinsing and cleaning.

**Implementation**

The C2000 in IP 67 housing is an ideal solution.

The protective housing is a PMMA acrylic tube with V4A stainless steel end caps. It is of compact design without trap points for dirt or contamination. A pressure equalisation membrane integrated into one of the end caps prevents the penetration of moisture and ensures that the window does not mist up. The cable entry is provided using proven PG cable glands.

The resistance of the materials used for the IP 67 Housing series as well as the cable was positively assessed in material compatibility tests performed by Ecolab (Henkel) for the cleaning products P3 (P3-topax 56, P3-topax 66, P3-topax 91, P3-topactive 200, P3-topactive DES). The low pressure foam method (COP cleaning and disinfection) for the food processing industry is recommended.

The C2000 is an electrosensitive protective equipment of type 2 in accordance with IEC 61496. The parallel light beams generate a flat protective field in front of the dangerous area. Unauthorised or inadvertent reaching into the running machine results in the interruption of one or more light beams. The evaluation electronics for the C2000 detect this situation within a few milliseconds and immediately generate a shutdown signal for the stack collector.

**Customer benefits**

Using the C2000 in an IP 67 housing ensures reliable protection despite harsh ambient conditions. The machine protection not only meets the requirements in relation to hygiene, resistance to cleaning, availability and safety, but also meets ergonomics requirements and productivity, as the stack collector is always accessible when shutdown.

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| ➜ C2000 | E-106 |
| ➜ IP 67 Housing | E-119 |
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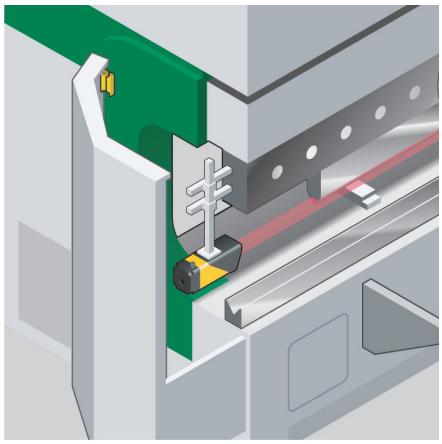


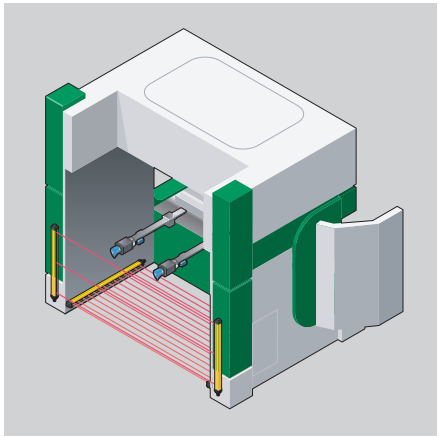

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## Application overview

**Protection of a press brake**

| | |
|---|---|
| **Task** | Hazardous point protection |
| **Industrial sector** | Machine tools and production systems |
| **Application location** | Machine tools |
| **Product family** | V4000, M2000, C2000 |

## Application in detail

**Task**

Both the front and back of a hydraulic press brake are to be protected.The dangerous tool closing movement needs to be safely stopped if someone reaches in and workers need to be able to safely access the rear of the machine without the hindrance of moving guards (e.g. doors).

**Implementation**

The hazardous point between punch and die is protected using the V4000 safety camera system. The system's sender and receiver are mounted to the ram. During the downward movement it safeguards a two-dimensional safety field. The height of the field is reduced as the punch approaches the die. As soon as an object that is not allowed (e.g. hand or finger) enters the safety field, a stop signal is given.

The access protection on the rear of the press brake is provided using a host/guest system composed of vertically mounted M2000 multi-beam photoelectric safety switch and a horizontally arranged C2000 safety light curtain for point-of-operation guarding. If someone enters the hazardous area, the dangerous movement of the press is stopped.

**Customer benefits**

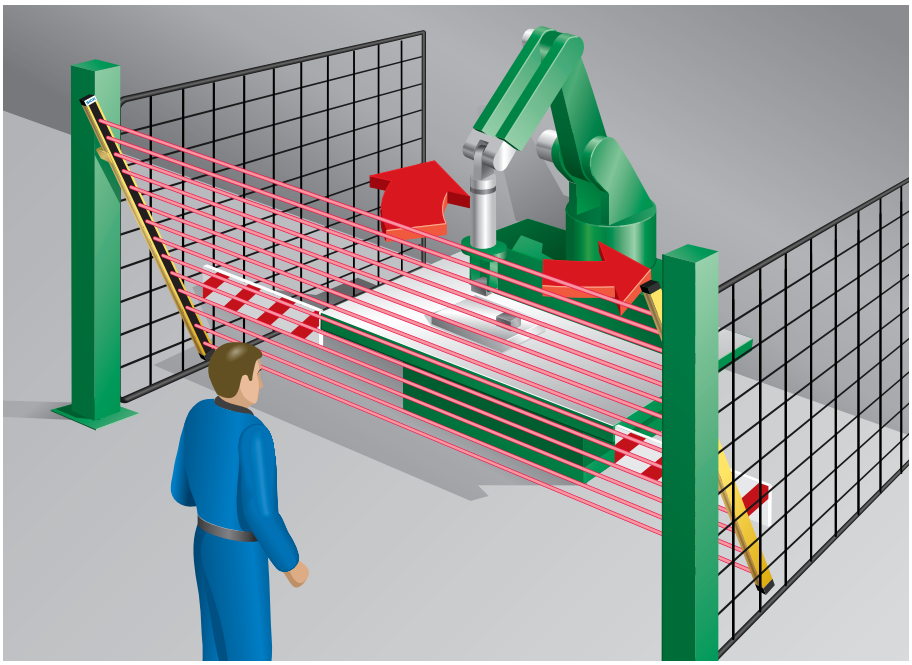
Along with ensuring maximum safety, the image information for the safety camera system is also used for optimizing the bending process and the cycle time. The reduction in the cycle time increases the capacity of the machine and, as a result, the cost-effectiveness.

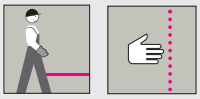
The combination of the M2000 and C2000 on the back of the machine provides a high level of safety and increased productivity.


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| ➜ C2000 | E-106 |
| ➜ M2000 | F-38 |
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## Application overview

**Hazardous point and area protection on an industrial robot**

| | |
|---|---|
| **Task** | Hazardous point-of-operation protection with area protection |
| **Industrial sector** | Assembly, handling, robotics, automation |
| **Application location** | Robot station |
| **Product family** | C4000 |

## Application in detail

**Task**

The insertion station of an industrial robot needs to be protected by electrosensitive protective equipment. The user often needs to enter the hazardous area. A door or a grid would make it more difficult to insert and remove parts.

**Implementation**

There are two possible ways of providing protection using C4000 safety light curtains (Type 4):

First option:

Hazardous point and area protection using two light curtains in a host-guest configuration. A light curtain, arranged vertically in front of the cell, stops the robot if the worker reaches into the protective field or the robot leaves its defined path due to an error and enters the worker's workplace. A second light curtain, arranged horizontally above the floor, is used so it is not possible to stand behind the vertical light curtain.

The host-guest connection is electrical, so the two devices act like a "single" stand-alone light curtain. This configuration saves I/O interfaces on safe controls or relay evaluation modules. This also saves additional wiring for the guest.

Second option:

The light curtain is positioned at an angle (see figure). So it is not possible to stand behind the light curtain. The front edge of the protective field is defined by the safety distance. As this is the more cost-effective solution for the problem, it was implemented.

**Customer benefits**

Quicker and less awkward insertion and removal of parts than with hazardous area protection using a door or grid. As a result, the productivity is increased. The work process is also easier to observe.

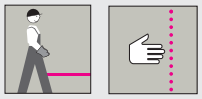


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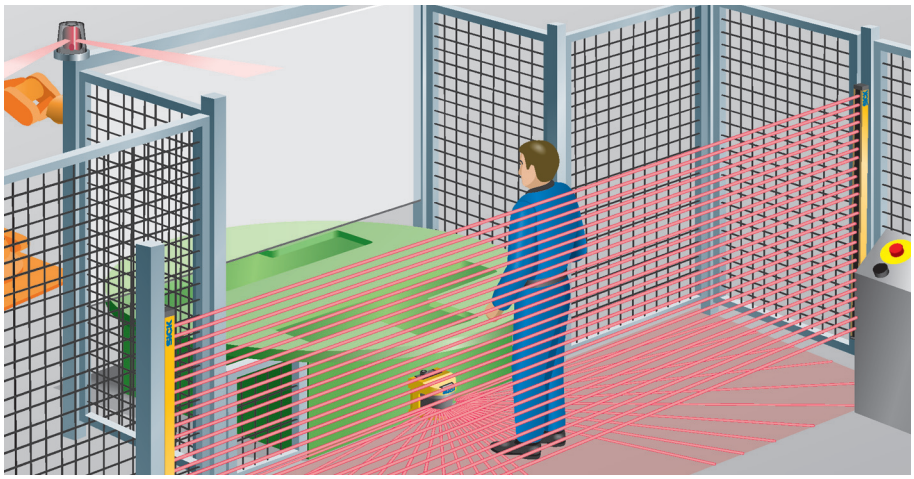
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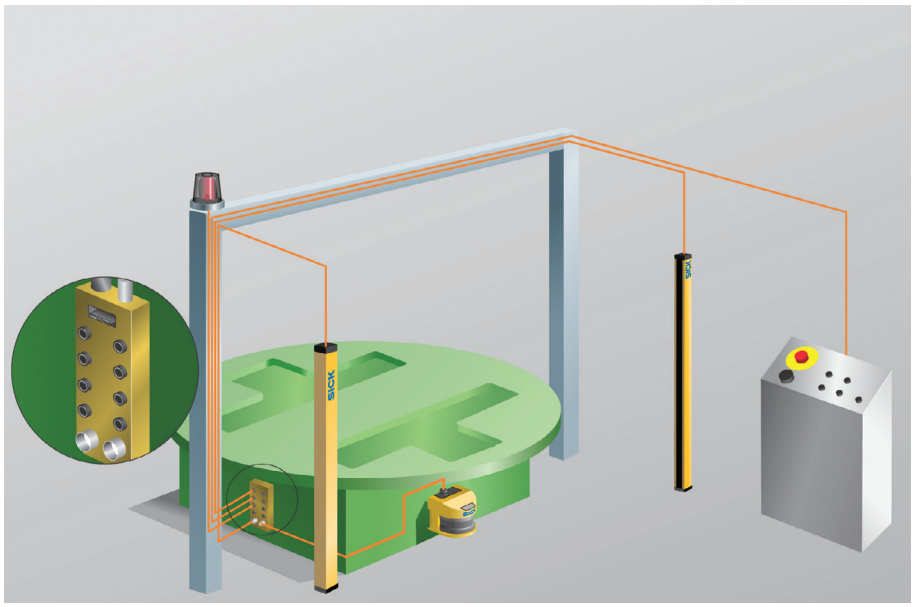


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## Application overview

**Hazardous point and area protection on a rotary table**

| | |
|---|---|
| **Task** | Hazardous point-of-operation protection with area protection |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Revolving machine |
| **Product family** | C4000, S3000, UE4100/UE4400 |


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| ➜ S3000 | C-17 |
| ➜ C4000 | E-3 |
| ➜ UE4100 | 0-30 |
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# Application in detail

**Task**

Small parts, such as bolts and straps, are welded to sheet metal body parts on a rotary table by a robot. The sheet metal parts are inserted in the rotary table by the robot, clamped and the table rotated by 180°. A worker then fits the small parts to the body part. The rotary table is then rotated by 180° again into the robot cell where the parts are welded automatically. To protect against the hazardous rotation of the table and welding process, the robot cell must be equipped with appropriate safety systems. All safety devices are to be analysed from a control room via PROFIBUS and relevant information displayed.

**Implementation**

Protection was achieved using the C4000 safety light curtain and the S3000 safety laser scanner. If the worker enters the hazardous area, the light curtain is interrupted and the rotary motion of the table or the welding process is stopped. To protect the area between the rotary table and the light curtain, a safety laser scanner is also fitted. This device ensures that it is not possible to stand behind the C4000. Because it is possible to program the scanner's monitored area, the non-rectangular area between the rotary table and the light curtain can be monitored in its entirety. The two safety sensors, as well as emergency stop switches and other sensors, are installed on the UE4100 bus node.

The safety application is solved using one bus node. The bus loading is reduced to a minimum.

**Customer benefits**

The combination of light curtain and laser scanner enables, full protection of the robot rotary table. The protection area can be adapted based on the space that needs to be monitored.

The C4000 and S3000 safety devices have an expanded communication interface via which they can be connected to the UE4100/UE4400 bus node. As a result, the devices can be completely analysed from a control room using the SICK Configuration & Diagnostic Software (CDS) without the need for any initial in-situ diagnostics.

With this expanded communication interface, electrosensitive protective devices remain independent of the evaluation unit selected. I.e. safety laser scanners and safety light curtains are suitable both for a conventional solution with safety relays and for a solution with a safe network solution. Investments in new hardware due to changes are therefore not necessary.



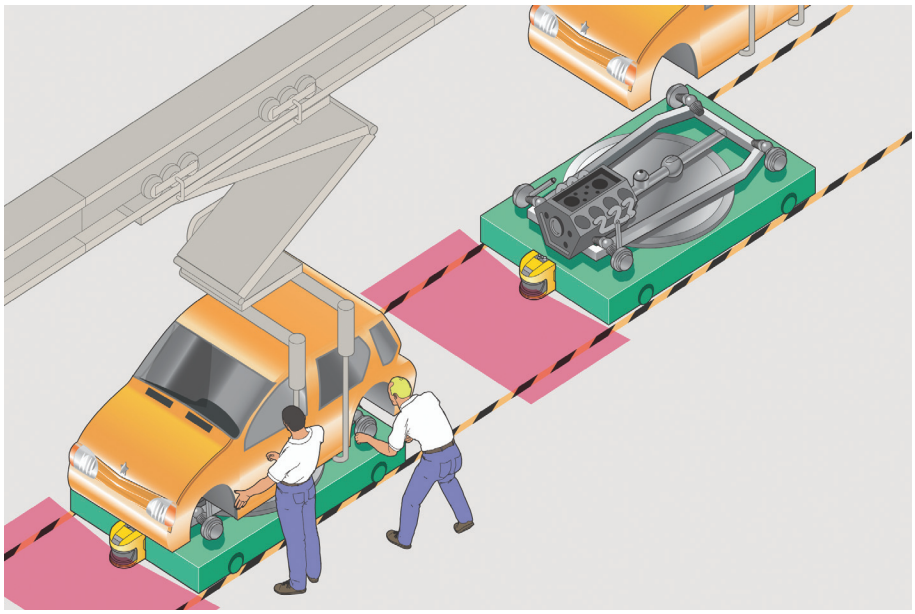

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## Application overview

**Protection of a skid in automobile production**

| | |
|---|---|
| **Task** | Hazardous area protection |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Assembly line |
| **Product family** | S3000 |

## Application in detail

**Task**

During final assembly in an automotive manufacturing plant, the engine and body are transported to the "marriage" on automatically guided vehicles (AGVs). As personnel or other vehicles could cross the vehicle's path, the AGV must be protected, i.e. even at high velocities the AGV must stop reliably before a collision can occur. This aspect is particularly important during assembly, after fitting the body, when workers must perform manual work. In the past, this protection was provided by tactile bumpers. However these bumpers only provide protection at low velocities.

**Implementation**

An S3000 Professional laser scanner was fitted to the front of the AGV to scan the programmed protective and warning fields. With its velocity-dependent safety zone / warning zone the device slows down the vehicle or stops it completely as soon as a person or object is detected. Incremental encoders are used for the velocity-dependent control of the protective field (high velocity results in a long braking distance that, in turn, must be monitored by a long protective field). As soon as the scanner detects an object, the device reduces vehicle velocity or stops the AGV. Due to the use of digital switching inputs, it is also possible to change the protective field appropriately on left- or right-hand bends. Up to 8 protective fields and 8 monitoring fields can be programmed.

**Customer benefits**

Velocity-dependent protective field switching allows routes to be driven considerably faster, as the velocity is reduced and the protective field shortened before sharp bends (this feature allows tighter bends to be used). The vehicle can be accelerated on straight sections and the protective field adjusted to suit.

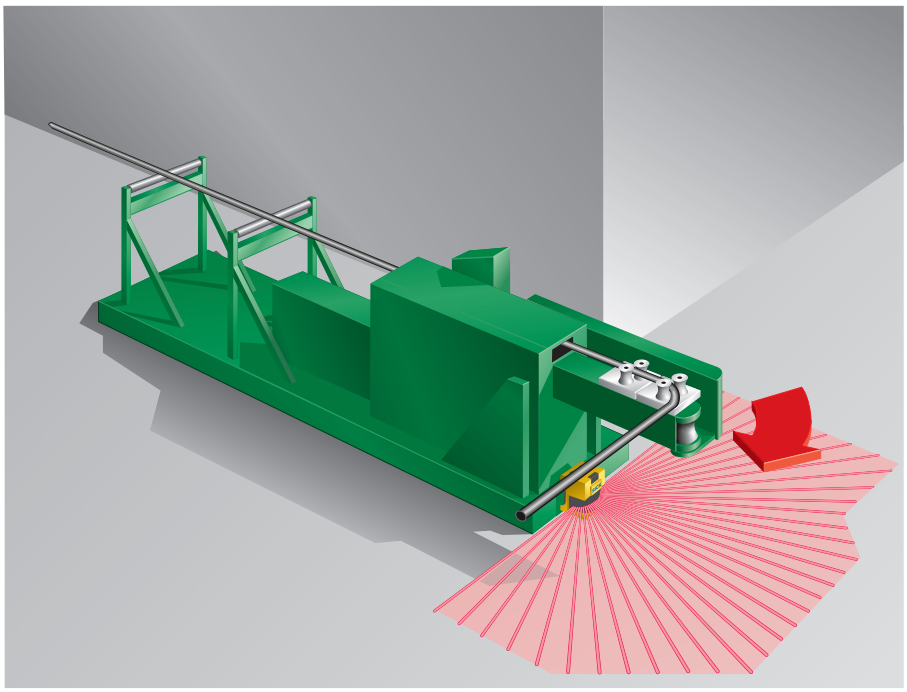
Fixed protective fields must always be set in such a way that there is no spurious switching due to the surroundings, so high velocities are generally not possible in such cases.

Use of the S3000 Professional laser scanner has significantly improved both cost-effectiveness and the protection of people and property.


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## Application overview

**Area protection on a pipe-bending machine**

| | |
|---|---|
| **Task** | Hazardous area protection |
| **Industrial sector** | Metal and steel production, processing |
| **Application location** | Pipe bending machine |
| **Product family** | S3000 |

## Application in detail

**Task**

Steel pipes of varying length, shape and diameter are processed on a pipe bending machine for manufacturing furniture. There are hazards for the machine operator such as the bending movement of the working head (risk of crushing) as well as the pivoting movement of the free end of the piece of pipe. A risk assessment resulted in a categorization of Category 3 for the safety-related parts of the machine controller.

Past protection measures, such as mats, light curtains and physical barriers cause a significant hindrance for the machine operators when loading and removing material. These items are also subject to heavy mechanical wear.

**Implementation**

By using a S3000 safety laser scanner, the system can be conveniently protected without hindering operation. The scanner sits underneath the bending head and covers a scanning range of 190°. The freely programmable protective field responsible for safe shutdown of the dangerous movement covers the entire hazardous area horizontally such that reaching over can also be prevented. A warning field of variable dimensions is used as a warning zone. If the operator enters this zone while the dangerous movement is taking place, a warning signal is output before the work step needs to be interrupted.

**Customer benefits**

The freely programmable protective field allows optimal adaptation to hazardous areas. Wear-free scanner technology guarantees simple integration, high availability, improved ergonomics and an increase in machine utilisation.



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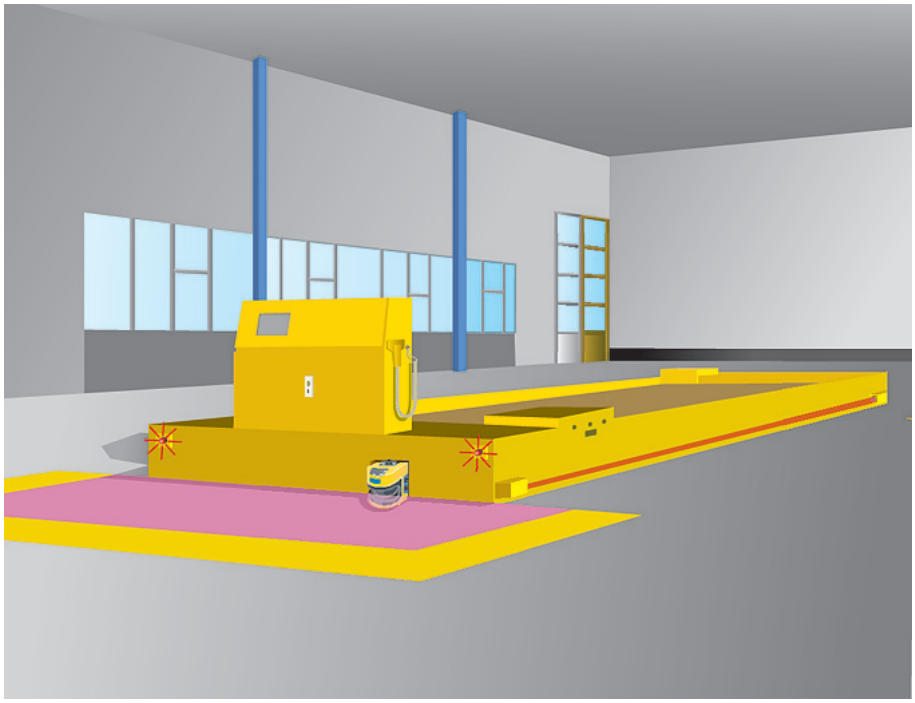
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## Application overview

**Protection of crossing paths for automated transport systems**

| | |
|---|---|
| **Task** | Hazardous area protection |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Automated guided systems |
| **Product family** | S3000, VS/VE18-2, LE20 |

## Application in detail

### Task

A large automated guided system (AGS), 13 m long, transports the rear sections of aircraft. In its primary direction of movement and when it travels in reverse, the AGS is monitored by S3000 safety laser scanners that send signals to the vehicle control system if there are people or obstacles in the way. The velocity of the vehicle is then reduced or the vehicle is stopped. For fine positioning, the AGS moves sideways at a velocity of 0.16 m/s. The long sides of the vehicle are to be equipped with electro-sensitive protective equipment, instead of mechanical switch strips.

### Implementation

When the vehicle drives sideways, people are protected by two VS/VE18 cylindrical single-beam photoelectric safety switches – one system per side. Both of these systems are connected to one LE20 evaluation unit, which tests the systems at 3 s intervals. If the light beam between sender and receiver is interrupted, the LE20 stops the vehicle.

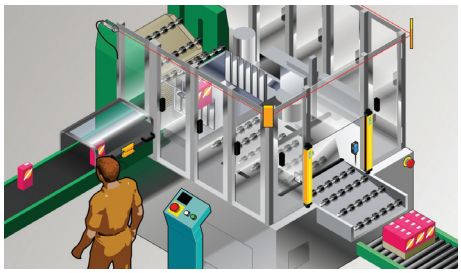
### Customer benefits

The electrosensitive solution is considerably more economical and less sensitive to malfunctions than the solution using mechanical switch strips. Less material is used and mounting is significantly easier. Compared to contact only alternatives, the monitoring of the sides using VS/VE18 is also the more cost-effective solution even on much shorter AGVs.


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| ➜ S3000 | C-3 |
| ➜ VS/VE18-2 | G-27 |
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# Application overview

**Hazardous area protection on a wrap-around tray packaging machine**

| | |
|---|---|
| **Task** | Hazardous area protection |
| **Industrial sector** | Food & beverage |
| **Application location** | Packing machines |
| **Product family** | C2000, L4000, RE300/RE4000, UE410 Flexi |

# Application in detail

### Task

A wrap-around tray packaging machine picks up 6 or 12 drink cartons and places them on a tray insert. The machine aligns the tray insert and bonds it to a carrier (tray) that securely restrains the items during transport.

The packaged items move through a tunnel into the machine. As long as the tunnel is closed it prevents direct access to the hazardous zone. If the packaged items become jammed, the tunnel must be cleared. It then no longer provides its safety function.

The exit on the packaging machine also representsan additional way to possibly access the dangerous movements of the machines. This access is to be prevented by an electrosensitive protective equipment.

Nine doors can be opened for making adjustments, for maintenance work or for troubleshooting. These doors need to be protected against access in a cost-saving manner. The use of safety switches is too expensive for this application and requires considerable installation and wiring effort. For this reason, a lower cost, time saving solution is required.

Emergency stop buttons should be used to stop the entire machine in case of danger.

### Implementation

The tunnel is protected with an RE300 non-contact safety switch. When the tunnel cover is opened, this switch shuts down the conveyor belt and the machine. The dangerous movements are stopped.

A C2000 safety light curtain is fitted to the exit on the packer. This light curtain is muted by a signal from the PLC (programmable logic controller) and a WL27 photoelectric reflex switch with no release delay when the packaged items leave the packer on their carrier. If a person reaches in there, the C2000 shuts down the conveyor.

The nine doors on the machine are secured all-round using one L4000 photoelectric safety switch and two deflector mirrors. Nine separate safety switches are replaced. If any of these doors are opened, the light beam is interrupted. The L4000 then issues a stop signal that is evaluated in the UE410 Flexi safety controller. This controller generates a shutdown signal that is sent to the controller for the packaging machine. When the doors are all shut again the packaging machine is re-started using a reset button. The reset button must be positioned such that all the doors can be seen when the button is actuated. The actuation of an emergency stop button interrupts the supply of power to the machine.

All safety sensors, the muting photoelectric switch, emergency stop buttons and reset button are connected to a UE410 Flexi modular safety controller. The UE410 Flexi therefore covers all the safe control aspects. The necessary logic can be selected in the controller using rotary switches. No software is required.

### Customer benefits

A series of safety relays and a muting module are replaced by the UE410 Flexi modular safety controller comprising one main module and two expansion modules. The L4000 photoelectric safety switch replaces nine safety switches with one light beam. Both measures significantly reduce the wiring effort and hardware costs.



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| ➜ L4000 | G-2 |
| ➜ RE300 | L-2 |
| ➜ UE410 Flexi | O-2 |
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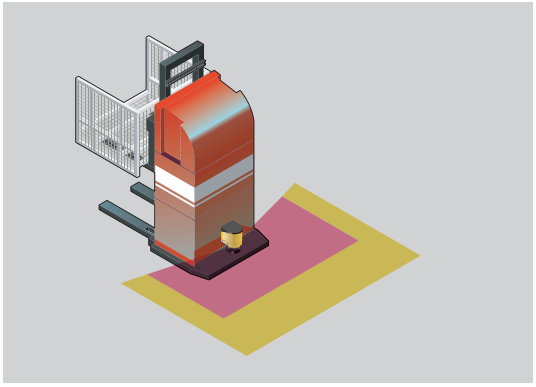

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## Application overview

**Protection of the route for an automated guided vehicle**

| | |
|---|---|
| **Task** | Hazardous area protection |
| **Industrial sector** | Storage and conveyor technology |
| **Application location** | Automated guided systems |
| **Product family** | S3000, S300 |

## Application in detail

**Task**

Automated guided vehicles (AGV) are used to transport heavy mesh crates or pallets between machining stations and storage locations. Once the AGV has picked up a pallet or mesh crate, it moves automatically to the next programmed destination. Persons must be protected along this route (Type 3). Collisions with other vehicles and material on the floor also need to be prevented. Bumpers that only permit low vehicle speeds should be replaced.

**Implementation**

The automated guided vehicle (AGV) is protected in both directions of travel. An S3000 Professional safety laser scanner is used for moving forward and an S300 is used when moving in reverse. Using DKS40 incremental encoders, the S3000 Professional acquires the velocity of the vehicle via its dynamic control inputs. Protective and warning fields for different velocities are configured in the S3000 and S300 safety laser scanners. These fields are switched dynamically, depending on the speed and direction of movement.

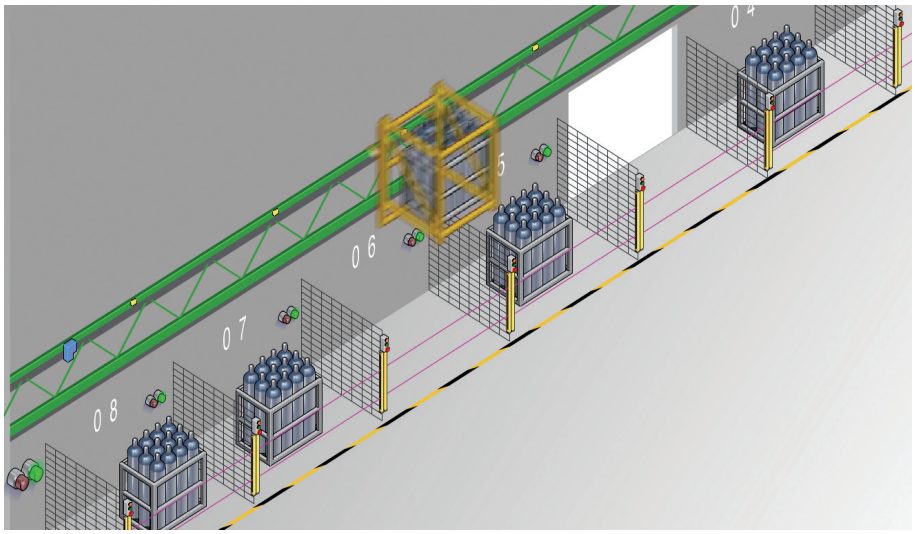
**Customer benefits**

By using the S3000 and S300 safety laser scanners, a higher vehicle velocity is possible than with mechanical bumpers, as a result the utilization of the vehicles is greater and costs are saved.

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## Application overview

**Access protection and positioning in a gas bottle store**

| | |
|---|---|
| **Task** | Access protection |
| **Industrial sector** | Storage and conveyor technology, pharmaceutical/medical |
| **Application location** | Material store |
| **Product family** | IN4000, M2000, UE4200 |

## Application in detail

**Task**

Filled gas bottles are set down in racks in defined storage locations by a conveyor system and subsequently picked up again from these locations. The position information is provided to the conveyor system by a central computer. The individual storage locations must be approached in a safe and precise manner. To protect people while the gas bottle racks are set down or picked up, the individual storage locations need to be protected against access.

**Implementation**

IN4000 non-contact safety switches are used for the exact positioning of the conveyor system. They send the signal for safe set down or pick up of the bottle rack to the conveyor system.

To protect against hazards, each storage location is protected separately using M2000 multi-beam photoelectric safety switches. As a result, a bottle rack can be set down or picked up while bottle racks are placed in a neighbouring cell, e.g. using a pallet truck, at the same time. During this process the light beams on the M2000 are interrupted and a signal sent to the system controller to ensure the conveyor system cannot move to this cell.

UE4200 series AS-Interface Safety at Work modules are used for the integration of the position switches and multiple light beam safety devices. Safe evaluation is performed using the AS-Interface safety monitor.

**Customer benefits**

Exact positioning of the conveyor system and simultaneous protection of the operators is achieved. AS-Interface simplifies the wiring of the safety functions distributed in the system; the parameters for these functions can be easily set in the AS-Interface safety monitor.



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## Application overview

**Safety interlocks on robot cells in a harsh operating environment**

| | |
|---|---|
| **Task** | Access protection |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Manufacturing cell |
| **Product family** | i1001 Lock |

## Application in detail

**Task**

To protect a handling robot during engine assembly, the hazardous area is fenced. Access to the robot cell is only allowed via a door when the dangerous robot movements have come to a stop.

**Implementation**

Access protection of the robot cell is achieved using the i1001 Lock safety locking device. The safety locking device is fitted to the door frame, the actuator to the door.

After the door is closed, the handle actuator is inserted in the locking device and the two items joined together. The i1001 Lock is mechanically locked. Only then can the robot start its assembly task.

Access to the robot cell is prevented using the locking mechanism on the safety locking device until the robot has completed its handling action and has returned to its parking position. Only then is the lock released using a signal to the locking solenoid on the i1001 Lock. Then it is possible to re-open the door by turning the handle actuator.

A release button that is connected to the solenoid release must be located inside of the safeguarded area next to the i1001 Lock safety locking device. This allows personnel that may be inside of the safeguarded space to exit immediately, if necessary.

**Customer benefits**

If it is necessary to complete a handling action before access is provided to a hazardous area, a safety locking device can be used.

The i1001 Lock, specially designed for harsh operating conditions, provides reliable access protection and long service life.

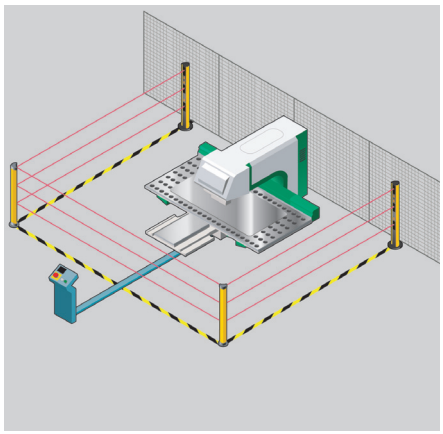
Two LEDs indicate the current status of the door: whether it is open/closed and locked/unlocked.

The design of the i1001 Lock enables it to be used without problems on heavy doors or in the case of imprecise door mounting.


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## Application overview

**Three-sided protection of a punching machine**

| | |
|---|---|
| **Task** | Access protection |
| **Industrial sector** | Machine tools |
| **Application location** | Punching machine |
| **Product family** | M4000 |

## Application in detail

**Task**

A punching machine must be protected from three sides. Pieces of sheet metal of various sizes are processed on the machine; the batch sizes also vary significantly. To operate the machine unhindered, access is required for loading and for tool and program changes. A mechanical fence would severely hinder productivity and was not considered.

**Implementation**

A M4000 multiple light beam safety device with two deflector mirror columns was chosen for access protection. The devices are permanently installed at the necessary safety distance from the hazardous point (tool) as per EN 999. On interruption of at least one light beam, the system sends a stop signal to the machine control. As people in the hazardous area cannot be detected, it is necessary to incorporate a restart interlock on the punching machine. It must not be possible to reach the related reset button from the hazardous area.

**Customer benefits**

Use of a cost-effective system composed of safety photoelectric switches and deflector mirror columns means only two sides need to be actively wired; easy-to-adjust deflector mirrors in robust columns. When the machine is shut down, it is freely accessible, thus increasing productivity.



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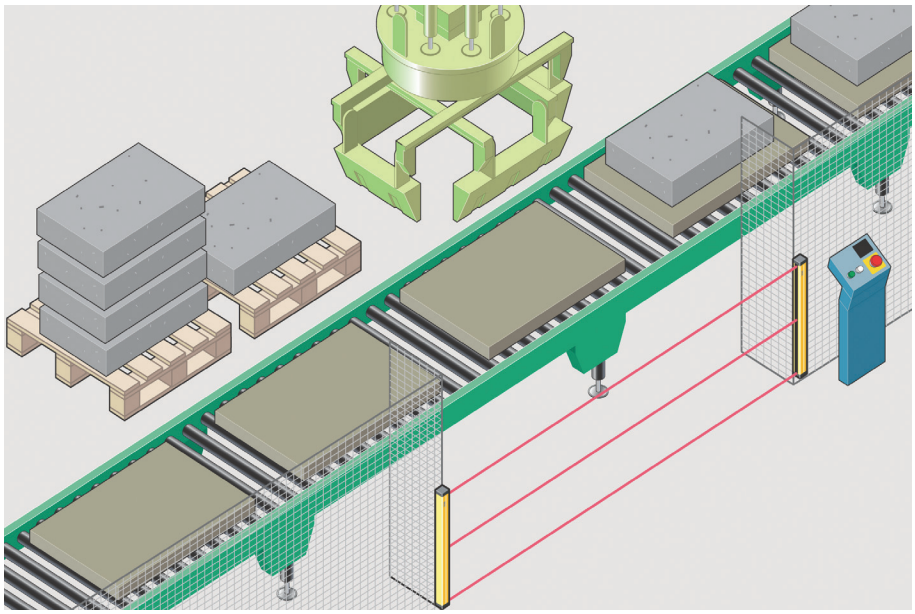
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## Application overview

**Protection of a stone transport crane**

| | |
|---|---|
| **Task** | Access protection |
| **Industrial sector** | Construction, stone, glass, ceramics, etc. |
| **Application location** | Paving machine |
| **Product family** | M2000 |

## Application in detail

### Task

In the past, a block positioning crane has been protected with fences and numerous safety switches. When it was necessary to perform servicing, change moulds or troubleshoot problems on the machine, the fences had to be opened and partially or completely dismantled. When the fences had been closed and re-assembled again, it was often necessary to re-fit and adjust more than a dozen safety switches.

An additional problem was the vibration in the area around the crane caused by shaking the blocks in the mould; these vibrations caused "false alarms" at the limit switches and brought the crane to a standstill.

### Implementation

A solution was required that took less time, generated fewer error messages, as well as improved access to the system. The machine tool and structural steelwork manufacturer found the solution in the M2000 multi-beam photoelectric safety switch. In conjunction with a safe PLC, this testable access protection system represents an easy-to-use, time-saving solution.

Classified in accordance with Type 2 IEC 61496, the M2000 provides scanning ranges of up to 70 m along with integrated external device monitoring and restart interlock functions.

As in this case, it is possible to stand behind the photoelectric safety switch, a restart interlock function must be incorporated in the system. Prior to moving the crane and after every interruption of the M2000 during a dangerous crane movement, a reset button (restart interlock function) must be activated.

### Customer benefits

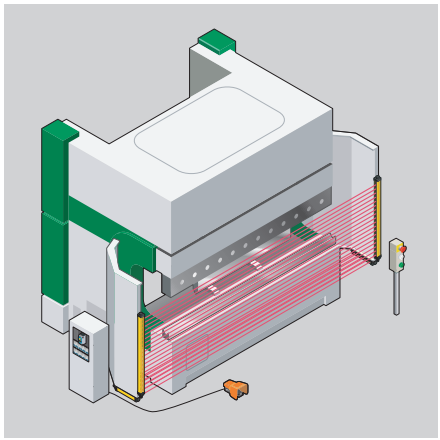
The time-consuming assembly and dismantling of fences/safety doors and safety switches, as well as false alarms from the limit switches no longer occur.

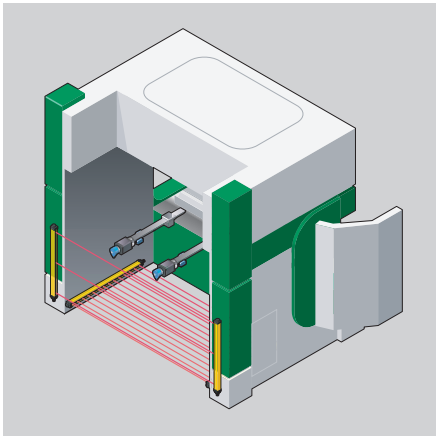
With the use of the electrosensitive multi-beam photoelectric safety switch, a robust, cost-effective solution was found. Costs for hardware, control cabinet and cable laying have been saved.

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## Application overview

**Hazardous point and access protection on a press brake**

| | |
|---|---|
| **Task** | Access protection |
| **Industrial sector** | Machine tools and production systems |
| **Application location** | Machine tools |
| **Product family** | C4000, C2000, M2000, UE470 |

## Application in detail

**Task**

Both the front and back of a hydraulic press brake are to be protected. The dangerous tool closing movement needs to be safely stopped if someone reaches in and needs to be able to safely access the rear of the machine without the hindrance of moving guards (e.g. doors).

**Implementation**

The hazardous point on the press is protected using a UE470 safety controller with a C4000 safety light curtain. As soon as an object that is not allowed (e.g. hand or finger) enters the light curtain's protective field, a stop signal is given.

The access protection on the back of the press brake machine is provided using a host/guest system composed of a vertically mounted M2000 multi-beam photoelectric safety switch and a horizontally arranged C2000 safety light curtain for point-of-operation guarding. Entrance into the hazardous area stops the dangerous movement of the press.

All press-related signals such as top dead center (TDC), bottom dead center (BDC) and stop control contact (SCC) are evaluated. The press is shut down, depending on the connected safety sensors.

For this safety application, the indication of “PSDI“ as well as the “Reset required," “Reset," “EDM“ and “Emergency stop“ are configured in the safety controller UE470.

**Customer benefits**

The proven safety technology makes it possible to reliably implement hazardous point protection and access protection. The combination of M2000 and C2000 on the rear of the machine replaces moving guards. It provides a high level of safety and, with the machine switched off, quick clear access, which increases productivity.

The use of the UE470 safety controller replaces the complex relay wiring. Up to 5 operating modes can be selected. All press-related signals, including run-on monitoring (SCC) are evaluated. Uniform controller and safety sensor configuration and diagnostics are possible using just one tool for setting parameters (CDS). On-line monitoring increases the ease of servicing.



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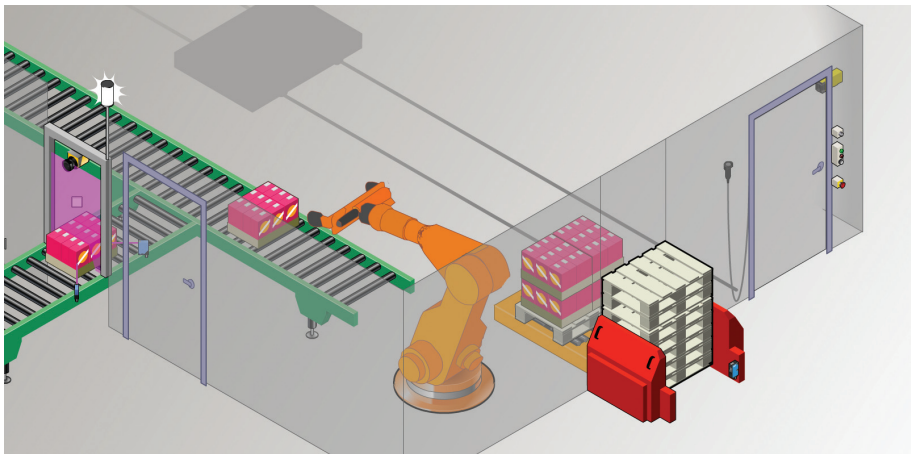
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# Application overview

**Access and area protection on a palletiser robot**

| | |
|---|---|
| **Task** | Access protection with area protection |
| **Industrial sector** | Food & beverage, packaging |
| **Application location** | Robot station |
| **Product family** | S300, i14 Lock, E100, UE410 Flexi |

# Application in detail

**Task**

In an automatic palletizer system, a robot picks up packaged items and places them on pallets. The dangerous movements of the robot need to be stopped if an unauthorized person enters the cell through the entrance for the packaged items or a door. It needs to be possible to setup the machine using an enabling button that mutes the function of the safety device on the door for the duration of the setup work.

**Implementation**

For vertical access control on the packaged item entrance, a system composed of an S300 safety laser scanner and two WL12 photoelectric reflex switches is used. The system differentiates between man and material. Packaged items are allowed through unhindered but if a person attempts to enter, the machine is stopped immediately. The sensors are connected via a UE410 Flexi modular safety controller to use the muting logic.

The service door is protected using an i14 Lock safety switch. To open the door, it is necessary to press a button on the control panel. This action triggers a stop command for the machine. The locking is maintained until all dangerous movements have safely stopped. Only then is it possible to open the door.

To setup the machine or perform maintenance, the robot must be moved to a safe position using the safety operating device. To setup the robot, a key switch on the control panel is changed from automatic to setup mode and then a Start button is pressed. As the actual protective function of the lock on the door is disabled for the duration of setup, the E100 enabling switch is used as a safety device. If the switch is held in the middle position, the machine operates at reduced velocity (setup mode). If the E100 is pressed all the way down, or released, all dangerous movements on the machine are stopped. The muting of the safety function on the i14 Lock safety locking device is realized using a second UE410 Flexi.

**Customer benefits**

The entire muting application is accomplished using one UE410 Flexi module that is only 22.5 mm wide. The necessary functions can be easily adjusted using rotary switches.

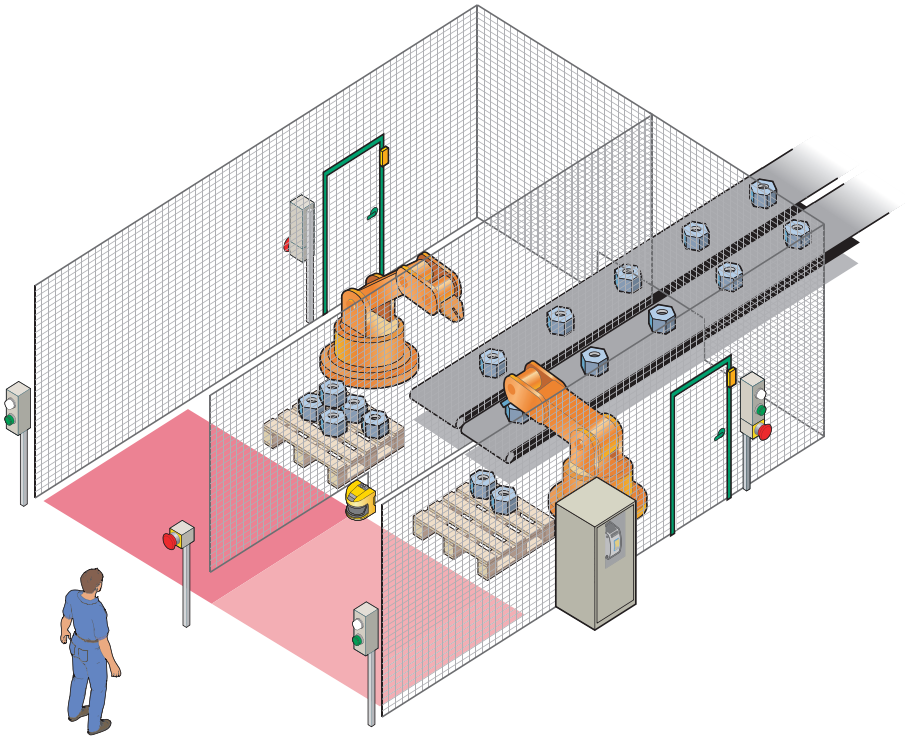
The E100 safety operating device enables the machine to be setup safely. In this case, one UE410 Flexi module is sufficient to mute the i14 Lock safety locking device instead of two relays.

Additional safety sensors, e.g. emergency stop buttons or additional safety switches can be easily connected using expansion modules. The UE410 Flexi system can be expanded from 8 to 104 inputs/outputs.


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## Application overview

**Hazardous area and access protection on a robot cell**

| | |
|---|---|
| **Task** | Access protection with area protection |
| **Industrial sector** | Assembly, handling, robotics, automation |
| **Application location** | Robot station |
| **Product family** | S3000, UE440 |

## Application in detail

**Task**

Two robot cells are continually loaded with pallets of workpieces to be machined. Mechanical protection would significantly hinder loading and cause delays. For this reason the working areas on both robots and the access to the cells need to be protected separately using an electrosensitive protective device.

**Implementation**

The hazardous areas of both robot cells are secured using the UE440 compact safety controller in conjunction with an S3000 safety laser scanner.

The S3000 safety laser scanner monitors the two hazardous areas using two simultaneous protective fields so that the safety controller shuts down the related robot if a protective field is entered.

The side access doors to the robot cells are monitored by safety switches. The emergency stop and the reset function are also realized using the safety controller.

**Customer benefits**

Just one S3000 safety laser scanner replaces moving guards (heavy doors) on two workstations and permits safe, unhindered access to the two robots. The size of the protective field can be adjusted to the velocity of the dangerous robot movements using simple operating mode switching.

The UE440 compact safety controller evaluates the simultaneous protective fields on the scanner and switches the related OSSD. Uniform controller and safety sensor configuration and diagnostics are possible using just one tool for setting parameters (CDS). On-line monitoring increases the ease of servicing.



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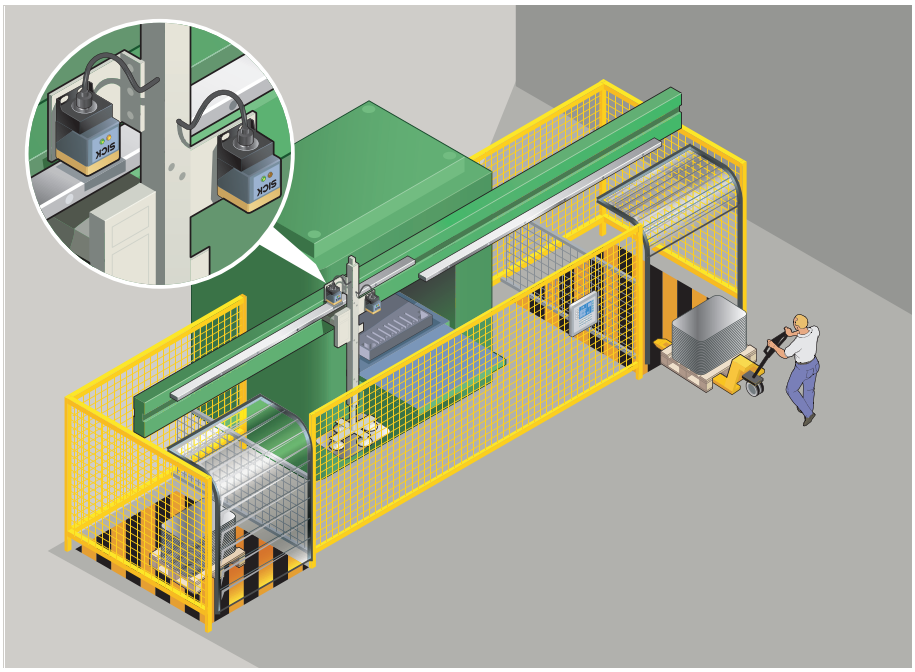


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## Application overview

**Safe monitoring of a gantry robot's working area**

| | |
|---|---|
| **Task** | Safe position monitoring |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Gantry robot |
| **Product family** | IN4000 |

## Application in detail

**Task**

A gantry robot picks up sheets of metal from the right or left supply station and places them in the feeder for the press in the middle of the system. When the material in one station is used up, new pallets with sheets of metal are placed in the station manually. For this reason, the roller door on the empty station (right or left) must be opened. When the door is opened, the robot is only allowed to pick up material from the station with the closed roller door.

**Implementation**

Two IN4000 non-contact safety switches are fastened to the robot's horizontal carriage. These inductive sensors detect the presence of metal. The two monitoring areas are defined by the length of two metal rails. If the robot moves from one of these defined areas, a stop signal is sent to the safety controller PLC that stops the drive. The state (open/closed) of the roller doors is signaled to the PLC by additional sensors. People present in one of the open supply stations are securely protected against the dangerous movements of the robot.

**Customer benefits**

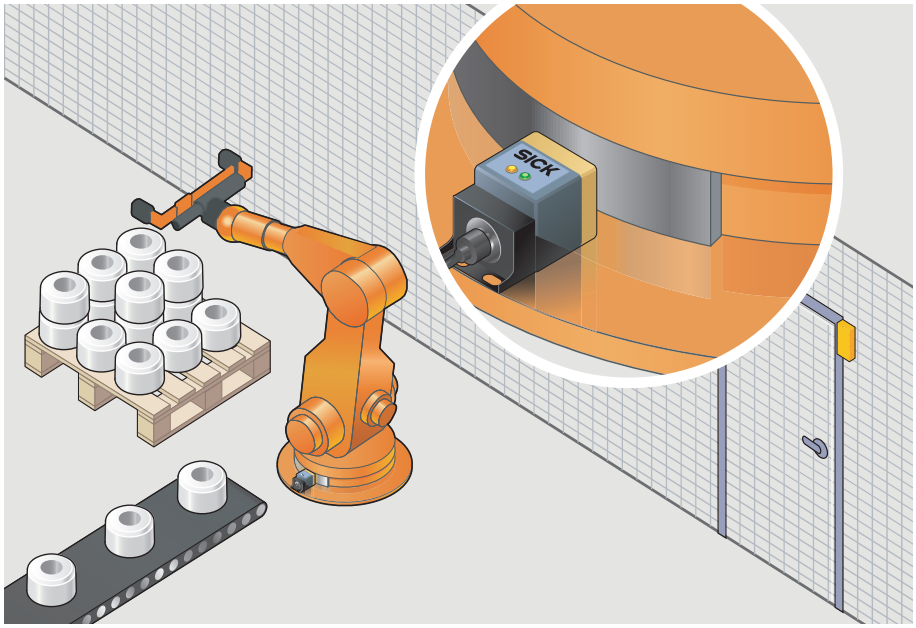
The mechanical barriers (doors) are very expensive and they do not meet related safety requirements. The IN4000 is the ideal product for this application. Contact only roller switches are not suitable for the force produced by the velocity of the continuous horizontal movements of the elements. Thanks to the non-contact technology in the IN4000, there is no wear on this product. Additional advantages are easy installation and adjustment, as well as resistance to shock and vibration.


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## Application overview

**Safe monitoring of a robot's working area**

| | |
|---|---|
| **Task** | Safe position monitoring |
| **Industrial sector** | Assembly, handling, robotics, automation |
| **Application location** | Robot station |
| **Product family** | IN4000 |

## Application in detail

**Task**

In a robot cell, the robot's gripper removes workpieces and places them on a conveyor belt. The operating area of the robot must be safely limited so that, should the normal controller fail, the robot cannot collide with parts of the cell, such as the fence. In the past, this activity was performed by mechanical safety switches. However, due to the high rate of operation (approx. 28,000 cycles per second) these switches have not proved reliable enough as their rollers wear excessively and production is stopped.

**Implementation**

The requirements are met in this application with an IN4000 non-contact inductive safety system. The sensor is fitted to the mounting plate and operated using an evaluation unit or safe controller. Due to the non-contact polling, mechanically related malfunctions no longer occur. The IN4000 reliably stops the robot if its control system is faulty. The device also features increased immunity to the shocks and vibration it is subjected to daily in the harsh industrial environment.

**Customer benefits**

The working area of the robot is reliably monitored, as a result production downtime is reduced. The costs for expensive hardened metal tracks, roller switches and cabling are also reduced.

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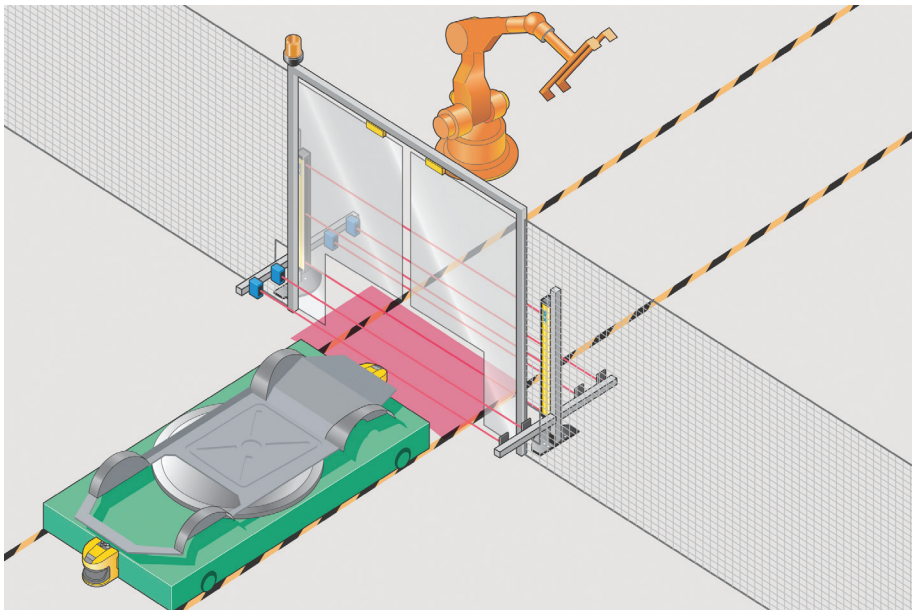
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## Application overview

**Access protection for AGV gates on a robot cell**

| | |
|---|---|
| **Task** | Access protection with differentiation between man and material (muting) |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Robot station |
| **Product family** | M4000, T4000 Compact |

## Application in detail

### Task

Robot cells for the assembly of vehicle floors are linked using automated guided systems (AGSs). The guards for the assembly cells are equipped with gates for the entry and exit of the AGSs. These gates must be protected against the access of persons when the AGSs are passing through the gate.

### Implementation

Access protection can be achieved using the T4000 C safety lock, the M4000 multiple light beam safety device and WL24 photoelectric reflex switches. Access across the path of the AGS is protected by the M4000 multiple light beam safety device. To ensure that the AGS does not trigger a safety stop up on driving through the path of the photoelectric safety switch, two photoelectric reflex switches are arranged in front of and behind the photoelectric safety switch. When the AGS drives up to the gate, two WL24 photoelectric reflex switches mounted in front of the photoelectric safety switch are interrupted and provide the signal to deactivate the photoelectric safety switch. To check the access protection for tampering or faults, the signals at the photoelectric reflex switches is checked with time sampling.

To ensure that there is no risk of crushing between the AGS and fencing, there is 500 mm clearance beside the loaded AGS. To prevent people from being able to pass through this space at the same time as the AGS, and enter the robot cell undetected, the gate is equipped with hinged doors that are monitored using T4000 C safety sensors. To enter the robot cell beside the AGS, a person would have to open the hinged door, an action that would result in a safety stop.

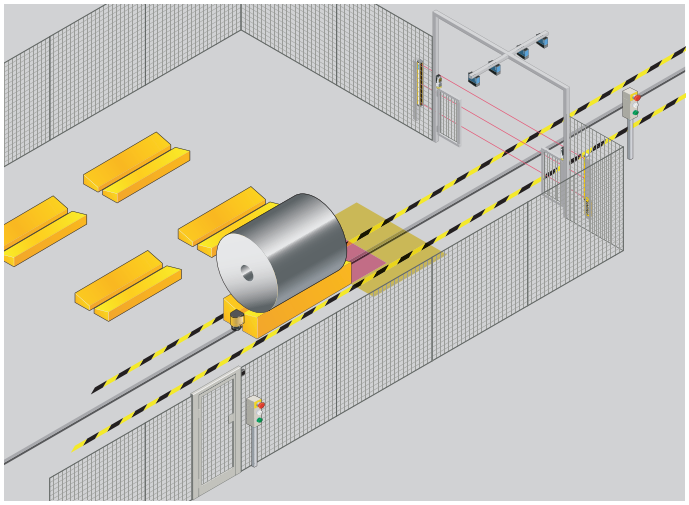
### Customer benefits

The sensors provided complete access protection. The individual components feature wear-free operation and easy installation.


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## Application overview

**Hazardous area and access protection on a coil store**

| | |
|---|---|
| **Task** | Access protection with differentiation between man and material (muting) |
| **Industrial sector** | Storage and conveyor technology |
| **Application location** | Coil store |
| **Product family** | M4000 Advanced with UE403, T4000 Compact, S300, UE4200 |

## Application in detail

**Task**

The working area in an automated coil store is protected against unauthorized access by fences. Carriages used to bring the coils into this area or to remove them need to be able to pass in and out through a gate unhindered. However, if people pass through the gate, dangerous movements must be stopped. The doors in the fence also need to be protected.

**Implementation**

A muting system monitors the gate to the coil store. This system comprises an M4000 Advanced multiple light beam safety device with integrated muting module with four DS40 distance sensors with background suppression. The carriage with the coil is reliably detected and the M4000 muted by the special arrangement of the DS40 distance sensors. The carriage can move into or out of the cell without the electrosensitive protective equipment (ESPE) stopping the system. However, if a person enters the system, his/her presence is detected by the ESPE and the system is stopped. The two hinged doors are secured using T4000 compact safety switches. These sensors are used to ensure a person cannot enter the system at the same time as the carriage while the ESPE is muted. The slow moving carriage is protected in both directions of travel by S300 safety laser scanners. Safety switches with a locking device are used for access protection on the doors.

Due to the distributed arrangement of the individual safety functions in and around the working area, a safety solution with AS-Interface Safety at Work is appropriate.

The safety switches and muting solution are integrated using the related UE4200 safety modules. The safe signals are processed and the safe shutdown triggered using the AS-Interface Safety at Work monitor.

The slow moving carriage is protected in both directions of travel by S300 safety laser scanners.

**Customer benefits**

This solution offers reliable access protection with differentiation between people and material as well as hazardous area protection on the vehicle. Using non-contact safety switches, ensures a robust, cost-effective solution. AS-Interface simplifies the wiring of the safety functions distributed in the system; the parameters for these functions can be easily and flexibly set in the AS-Interface Safety at Work monitor.



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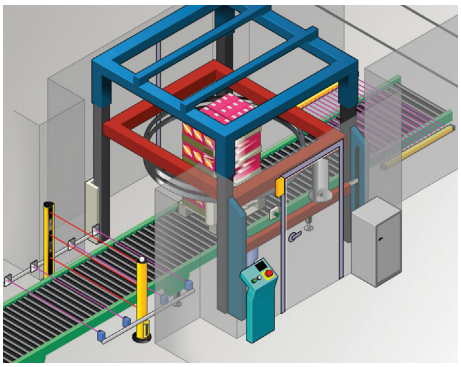
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- SICK is continually publishing examples of application solutions on the Inter-net (➜ www.sickusa.com/applications).
- The "Application Finder" will guide you to additional solutions involving products from SICK's Industrial Sensor, Industrial Safety Systems and Automatic Identification Divisions.



## Application overview

**Access protection on a pallet stretch wrapper**

| | |
|---|---|
| **Task** | Access protection with differentiation between man and material (muting) |
| **Industrial sector** | Food & beverage, packaging |
| **Application location** | Packing machines |
| **Product family** | M4000, i16S, C4000 Palletizer, UE410 Flexi |

## Application in detail

### Task

A pallet stretch wrapper accepts partially or completely full pallets from one side, generally from a palletizer. It wraps the related items (identified by a bar code reader) in stretch film and then passes them to a conveyor system.

The wrapping is performed using two motors: one moves the rotating arm around the pallet and the other moves the arm up and down. As some stretch wrapper machines wrap up to 150 pallets per hour, these movements are fairly dangerous. Normally the film is re-loaded from one side by an operator every couple of hours. All possible accesses to the machine must be protected.

### Implementation

The entrance to the machine is secured by a muting system comprising an M4000 multiple light beam safety device and four WL18 photoelectric reflex switches as muting sensors. This system differentiates between man and material. Due to the arrangement of the muting sensors, pallets with packed items are detected and the M4000 muted: the machine continues to operate. If a person tries to enter the machine, the M4000 is not muted: the machine's dangerous movements are stopped.

The machine's exit is protected against access by a C4000 Palletizer safety light curtain. This device learns the shape of the pallet bases and is therefore able to differentiate between operators and pallets. No additional muting sensors are required.

The access to the machine is protected by an i16 safety switch. Opening the door stops only the film loading mechanism so that maintenance can be performed efficiently without shutting down the entire machine.

A Reset button must be pressed to re-start the machine after a stop caused by the safety sensors. On the actuation of an emergency stop button or unauthorized access through a service door, the C4000 Palletizer safety light curtain or the M4000 multiple light beam safety device interrupts the supply of power to the machine.

All safety sensors, emergency stop buttons and the Reset button are connected to a UE410 Flexi modular safety controller. The necessary logic can be selected in the controller using rotary switches. No software is required.

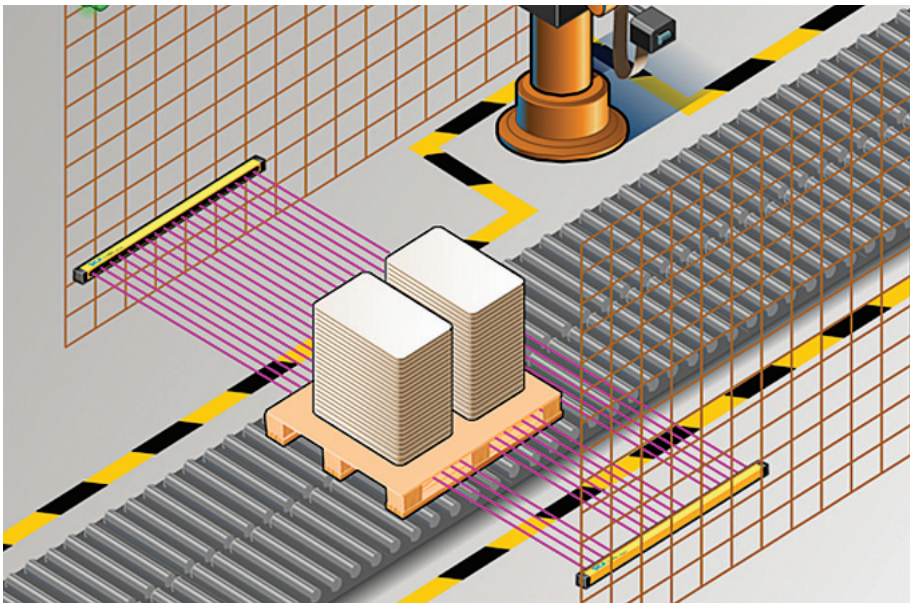
### Customer benefits

The UE410 Flexi modular safety controller can be expanded as required. It comprises a main unit and expansion units (input and output expansion modules, relay output expansions, a diagnostics module for the field bus interface to PROFIBUS-DP, DeviceNet or CANopen) that can be simply plugged together at the sides. The modules communicate with each other using a "backplane bus." The individual functions can be selected on the front using a screwdriver. UE410 Flexi saves space in the control cabinet. The wiring effort is considerably reduced compared to conventional safety switches. In this example, two UE410 Flexi controllers replace six conventional safety relays and the related wiring.


| Further information | Page |
|---|---|
| ➜ C4000 Palletizer | E-99 |
| ➜ M4000 | F-2 |
| ➜ i16S | H-17 |
| ➜ UE410 Flexi | O-2 |
| ➜ Services | A-2 |




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## Application overview

**Access protection with differentiation between man and material on a palletiser system**

| | |
|---|---|
| **Task** | Access protection with differentiation between man and material (muting alternative) |
| **Industrial sector** | Storage and conveyor technology, packaging |
| **Application location** | Palletiser |
| **Product family** | C4000 Palletizer |

## Application in detail

**Task**

A palletizer system is divided into various sections, e.g., pallet entry and exit, horizontal binder for securing the load, label stamp, etc. Pallet entry and exit are used for supplying material and pallets. At the same time, workers must be protected against dangerous movement in case of accidental access. Material needs to be able to enter and leave unhindered. If a person enters the hazardous area a stop signal must be sent to the system controller.

**Implementation**

For access protection, a C4000 Palletizer safety light curtain is installed horizontally at pallet height in front of the entry and exit to the palletizer system. Only one pair of sensors is required with this solution; muting sensors are not required simplifying integration in the system controller.

The continuously active sensor is no longer muted, but instead automatically learns unlimited "shadow patterns" for pallets that it then allows to pass as long as the patterns do not change. The C4000 Palletizer Standard variant is manually "taught" the object to be accepted. As a result, both versions are difficult to tamper with and provide safety up to Category 4.

Selectable direction detection or an additional inputs for, e.g., a bar code scanner provide further possible ways of optimally designing the safety distance.

**Customer benefits**

The C4000 Palletizer provides an innovative, economical solution as numerous individual components can be eliminated. The pair of C4000 Palletizer sensors durably increases availability due to the reduced-fault sources (additional sensors). Maintenance work can be undertaken more quickly due to the increased freedom. Apart from fence elements and wiring in the control cabinet, valuable space is also saved as the pallets can be parked in the protective field.





Application Finder

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| Further information | Page |
|---|---|
| ➜ C4000 Palletizer | E-99 |
| ➜ Services | A-2 |



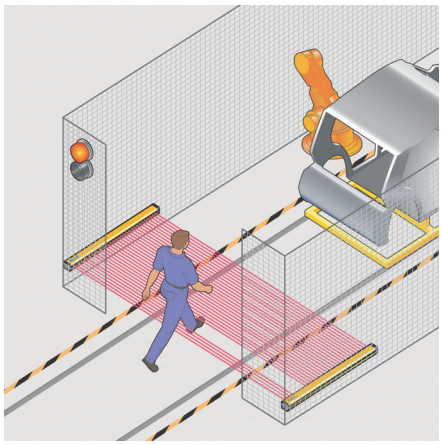
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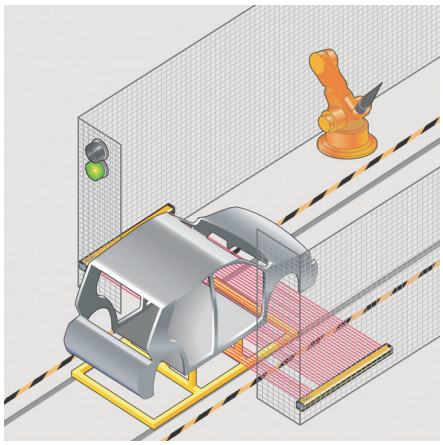


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## Application overview

**Access protection to a robot cell with differentiation between man and material**

| | |
|---|---|
| **Task** | Access protection with differentiation between man and material (muting alternative) |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Robot station |
| **Product family** | C4000 Entry/Exit |

## Application in detail

**Task**

During the body manufacture at an automotive manufacturing plant, shells are automatically transported into the hazardous area of a robot cell. If a person enters this area, the robot must be stopped immediately.

In the past, the area was protected with a light curtain and several muting sensors; however these sensors can be tampered with and are difficult to mount.

**Implementation**

The C 4000 Entry/Exit safety light curtain with its dynamic, self-teaching blanking was used. The continually active sensor is difficult to tamper with and therefore provides maximum safety up to Category 4. It reliably detects objects, learns their distances and monitors them. Invalid objects or asynchronous movements result in immediate shut down. The robot is stopped immediately as soon as a person enters the hazardous area. The protective field length of 900 mm ensures that it is not possible to inadvertently step over the protective device. The light curtain is also immune to weld sparks.

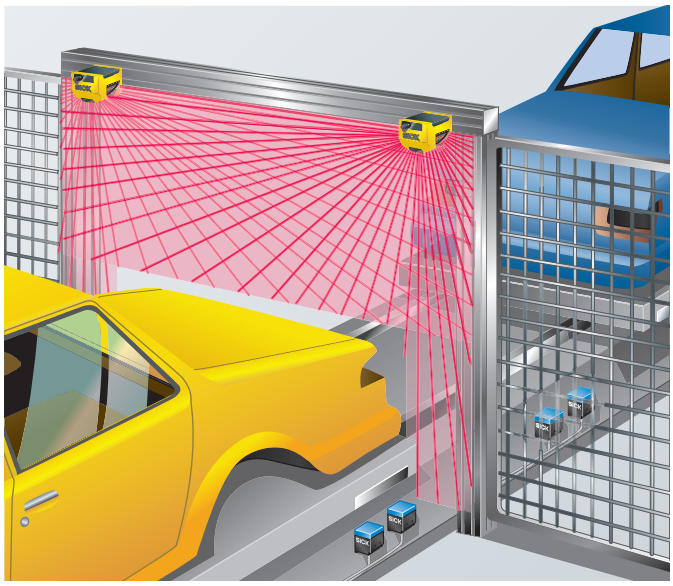
**Customer benefits**

No additional sensors or further protection measures, e.g. muting sensors, muting lamps or hinged doors, are needed. The compact sensor pair is easy to mount and saves time, e.g. particularly during maintenance.

| Further information | Page |
|---|---|
| ➜ C4000 Entry/Exit | E-92 |
| ➜ Services | A-2 |



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## Application overview

**Access protection on an assembly cell**

| | |
|---|---|
| **Task** | Access protection with differentiation between man and material (muting) |
| **Industrial sector** | Automotive and other vehicles |
| **Application location** | Assembly line |
| **Product family** | S3000, UE440 |

## Application in detail

**Problem**

The entrance to an assembly cell during final assembly in an automotive manufacturing plant needs to be protected. In this case, the solution not only needs to comply with Category 3, but also to permit the transport of the bodyshells to the robots. Here, a contour check needs to be made so that people are reliably detected.

**Implementation**

Two S3000 safety laser scanners are fitted vertically over the conveyor so that their protective fields monitor the entire entrance area: there are no monitoring gaps beside the bodyshell and the conveyor. The protective fields are adjusted to the profile of the bodyshell in steps using IQ40 inductive proximity switches arranged on the conveyor. The skid with the bodyshell can pass without triggering a signal. If a person interrupts the protective fields, conveyor and robot movement are stopped. The correct function of the IQ40 proximity switches for the activation of protective field switching as well as the necessary concurrency are monitored by the UE440 compact safety controller with protection against tampering.

**Customer benefits**

The sensors used provide complete access protection without gaps. As the protective fields of the two S3000 safety laser scanners are always active, hinged doors beside the conveyor are not necessary.



B

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| Further information | Page |
|---|---|
| ➜ S3000 | C-10 |
| ➜ UE440 | O-22 |
| ➜ Services | A-2 |



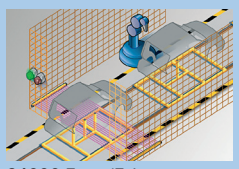
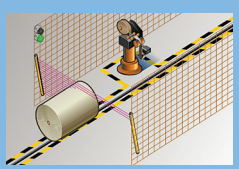
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# Overview for access protection with differentiation between man and material

**Selecting the most suitable solution**

In the following, you will find the most important products for ensuring access protection with differentiation between man and material. Let SICK help you determine the best solution for your application!

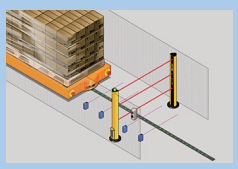
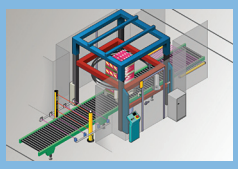
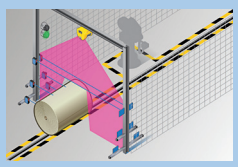
B

| Principle | Type acc. to IEC 61496 | Typical application/sensor | Function and criteria | Advantages, safety and notes | Page |
|---|---|---|---|---|---|
| Pattern recognition | Type 4 | Transporting items on transport aids, e.g. skids<br>  <br>C4000 Entry/Exit | ■ Function<br>Object patterns that are produced, e.g., by the struts on a skid on passing through the protective field of the horizontally mounted safety light curtain are automatically photographed and handed over during the passage.<br>■ Criteria<br>▪ Max. 1 to 5 objects in protective field at same time (system dependent)<br>▪ Max. width of each object 150 mm<br>▪ Size and distance between the objects constant on passing through the protective field | ■ High potential savings, as no additional hinged flaps are required, wiring effort and downtimes are minimized<br>■ High availability, as no interruption in production due to faulty muting lamps, incorrectly adjusted muting sensors or override cycles<br>■ Fewer components, easy mounting, no additional muting sensors, only one sensor pair (ESPE)<br>■ The protective field can be used as a parking position for skids<br>■ No muting, always active, as a result a high level of safety<br>■ ATEX II 3G 3D certified (explosion protected for food industry such as flour, fodder, etc.) | E-92 |
| Pattern recognition | Type 4 | Transporting items on transport aids, e.g. a pallet load secured with shrink film<br>  <br>C4000 Palletizer Standard | ■ Function<br>Objects with a closed optical contour pass through the protective field of the horizontally mounted safety light curtain. The sensor monitors whether the geometry is closed.<br>■ Criteria<br>▪ One object with closed optical contour<br>▪ Minimum width 500 mm<br>▪ Changing batches are taught in manually | ■ High availability as no interruption of production due to faulty muting lamps, incorrectly adjusted muting sensors or override cycles<br>■ Fewer components, easy mounting, no additional muting sensors, only one sensor pair (ESPE)<br>■ The protective field can be used as a parking position for skids<br>■ No muting, always active, as a result a high level of safety<br>■ ATEX II 3G 3D certified (explosion protected for food industry such as flour, fodder, etc.) | E-99 |
| Pattern recognition | Type 4 | Transporting items on/in transport aids, e.g. pallets or mesh crates<br>  <br>C4000 Palletizer Advanced | ■ Function<br>Object patterns e.g. the feet of a pallet are automatically photographed and handed over during the passage.<br>■ Criteria<br>▪ Max. 2 to 5 objects in protective field at same time (system dependent)<br>▪ Max. width of each object 240 mm<br>▪ Size and distance between the objects constant on passing through the protective field | ■ High availability as no interruption of production due to faulty muting lamps, incorrectly adjusted muting sensors or override cycles<br>■ Fewer components, easy mounting, no additional muting sensors, only one sensor pair (ESPE)<br>■ The protective field can be used as a parking position for skids<br>■ No muting, always active, as a result a high level of safety<br>■ ATEX II 3G 3D certified (explosion protected for foodstuff industry such as flour, fodder, etc.) | E-99 |
| Pattern recognition | Type 4 | Transporting items, e.g., paper or coils of steel<br>  <br>C4000 Advanced, diagonally arranged | ■ Function<br>Objects with closed optical contours are transported through the protective field of the safety light curtain. During this process the sensor monitors whether the optical geometry is closed and whether there is only one item.<br>■ Criteria<br>▪ One object with closed optical contour<br>▪ Max. height 1500 mm | ■ Space saving due to almost vertical mounting<br>■ Straightforward mounting, no additional muting sensors, only one sensor pair (ESPE)<br>■ No muting, always active, as a result a high level of safety<br>■ No gaps allowed in the object<br>■ Lateral shadow areas must also be protected | E-3 |

■ Cost-effectiveness ■ Safety ■ Notes


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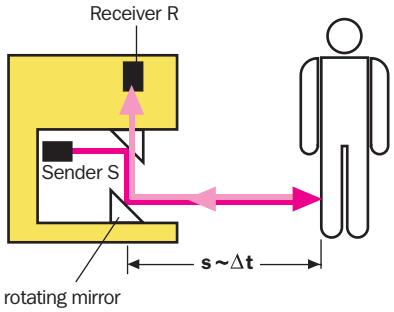
| Principle | Type acc. to IEC 61496 | Typical application/sensor | Function and criteria | Advantages, safety and notes | Page |
|---|---|---|---|---|---|
| **Decentral muting IP 65** | **Type 4** | Transporting items on transport aids or directly on conveyor equipment such as conveyor belts, chain or roller conveyors<br>  <br>M4000 Advanced<br>M4000 Advanced A/P<br>M4000 Advanced Curtain with UE403 | ■ Function<br>The item transported is detected using additional muting sensors for as long as it is transported through the protective field of the photoelectric safety switch. A differentiation is made between man and material due to the arrangement and detection principle of the muting sensors.<br>■ Criteria<br>▪ Continuous detection of the item transported as long as it is transported through the protective field of the photoelectric safety switch | ■ Highly flexible solution in relation to the shape of the item transported and the settings for the muting configurations<br>■ Minimization of wiring effort due to decentralized IP 65 muting solution. Muting signals connected locally<br>■ High resolution of the M4000 Advanced Curtain variants reduces safety distance<br>■ Increased safety, e.g., due to defined beams that remain permanently active (partial blanking instead of muting)<br>■ Precise adjustment and correct selection of the detection principle for the muting sensors required<br>■ Additional mechanical protection, such as hinged doors, may be necessary | F-2<br>E-18 |
| **Central muting IP 20** | **Type 2**<br>**Type 3**<br>**Type 4** | Transporting items on transport aids or directly on conveyor equipment such as conveyor belts, chain or roller conveyors<br>  <br>AOPD with UE410 Flexi | ■ Function<br>The item transported is detected using additional muting sensors for as long as it is transported through the protective field of the safety sensor. A differentiation is made between man and material due to the arrangement and detection principle of the muting sensors.<br>■ Criteria<br>▪ Continuous detection of the item transported for as long as it is transported through the protective field of the safety sensor | ■ Complete safety control logic, e.g. for end of line packaging applications, in an IP 20 control cabinet module (UE410 Flexi)<br>■ Space-saving 22 mm width of the UE410 Flexi controller<br>■ Use of any AOPD (Type 2 and 4) and AOPDDR (type 3)<br>■ All cables must be laid to a central control cabinet | 0-2 |
| **Protective fields with gateway** | | Transporting items on transport aids or directly on conveyor equipment such as conveyor belts, chain or roller conveyors<br>  <br>S3000 | ■ Function<br>An appropriate "gateway" in the protective field of the safety laser scanner is activated by the item transported using a safe controller or standard sensors before the vertical protective field is reached. Defined areas or parts of the machine around the protective field are continuously monitored as a reference. In this way, tampering or incorrect adjustment is detected.<br>■ Criteria<br>▪ Switching of the "gateways" by safe controller or using standard sensors<br>▪ Maximum 7 different "gateways" | ■ Very flexible solution in relation to the shape of the item transported/protective field<br>■ No additional sensors necessary with safe controller<br>■ Easy mounting, as hinged doors are not necessary, less mechanics and wiring effort<br>■ No muting, always active, as a result a high level of safety. If there is no transported item, the protective field is completely closed<br>■ Automatic checking for correct controller signals<br>■ Response time greater than for photoelectric safety switches or multiple light beam safety devices | C-3 |

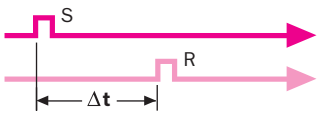
■ Cost-effectiveness ■ Safety ■ Notes


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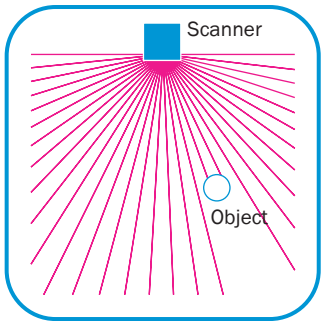
# Principle of operation of laser scanners

Laser scanners are compact systems that scan their surroundings with a beam (“optical radar”). If the emitted light pulses hit an object, the light is reflected and detected in the laser scanner’s receiver. The time between the emission of a light pulse and the reception of the reflection represents the distance between the laser scanner and object (light time-of-flight measurement). An internal rotating mirror “moves” the light pulses in a circle to produce 2-dimensional scanning.
So-called monitored areas can be defined within the field of view (scanning angle) and the device-specific scanning range of a laser scanner. If an object is detected in a monitored area, this situation is indicated by the laser scanner using 2 switching outputs (safe “stop” signal to the machine).




Laser scanner principle of operation




Fan-shaped scanning of the surroundings

# Use of laser scanners

Laser scanners are used for area monitoring (hazardous area protection), hazardous point protection and access protection.

A differentiation is made between:

- Stationary applications
  - Horizontal applications: e.g. pipe bending machines, machining centres, robot cells, press return area, etc.
  - Vertical applications: Entry/Exit, hand protection
- Mobile applications
  - Monitoring the movement of AGVs (automated guided vehicles), narrow aisle stackers, etc.

# Advantages of the SICK safety laser scanners

**Additional functions for plant and machine control**

- Switchable monitored areas in accordance with the current process phase
- Monitoring external switching elements/contactors (EDM) saves costs and effort in the machine control
- High-current outputs for directly operated switching elements (contactors), making conversion of the switching signals using relay interfaces, etc. unnecessary
- Measured data on the surroundings as well as reflector detection to support vehicle steering (AGV). Only one sensor for safety and control
- Integrated restart interlock (RES) minimises the effort in the machine control

**Product range**

- A very wide range of application requirements can be addressed with a compatible product family, thus minimising stock-keeping and investment costs.

**Experience**

- Proven in use
- The highest quality standards guarantee stable serial production
- Consultation and service expertise

# Safety services

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

➜ For information about the services please refer to chapter A



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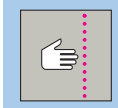
# Safety laser scanners









| Safety application | Scanning range (m) | Scanning angle (°) | Switchable field sets [1] | Incremental encoder connections | Static control inputs | Functions: External device monitoring (EDM) | Functions: Host/guest operation | Functions: Safe interface to bus systems | Functions: Reflector mark detection and expanded measured data input | Functions: Measured data output via RS-422 interface | Product | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|    | 4 / 5.5 / 7 | 190 | 8 | 2 | 4 | ✔ | ✔ | ✔ | – | ✔ | S3000 Professional [2] | C-3 |
| | | | 4 | – | 2 | ✔ | ✔ | ✔ | – | ✔ | S3000 Advanced [2] | C-10 |
| | | | 1 | – | – | ✔ | ✔ | ✔ | – | ✔ | S3000 Standard [2] | C-17 |
| | | | 8 | – | – | ✔ | ✔ | ✔ | – | ✔ | S3000 Remote [2] [3] | C-24 |
| | | | 8 | 2 | 4 | ✔ | ✔ | ✔ | ✔ | ✔ | S3000 Professional CMS [2] | C-31 |
| | 2 | 270 | 4 | 2 | 2 | ✔ | ✔ | ✔ | – | ✔ | S300 Professional | C-38 |
| | | | 2 | – | 1 | ✔ | ✔ | ✔ | – | – | S300 Advanced | C-48 |
| | | | 1 | – | – | ✔ | ✔ | ✔ | – | – | S300 Standard | C-57 |
| | 1.5 | 270 | 1 | – | – | ✔ | – | – | – | – | S200 | C-65 |

[1] Field set comprising of protective field and warning field

[2] Special features of the S3000 product family on page C-2

[3] S3000 Remote can only be used in conjunction with another S3000 or a UE100 series safety controller



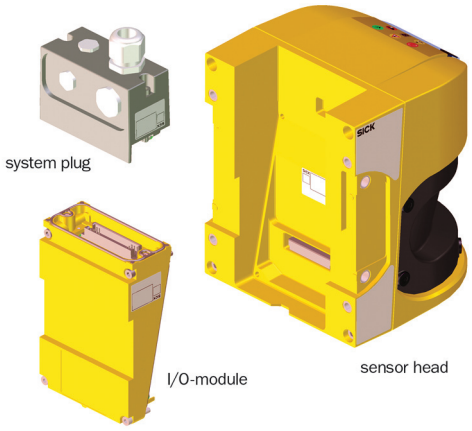
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C

# Special features of the safety laser scanners

## S3000 - the modular system

- Modular concept
  - S3000 solutions grow with your needs
  - Security of investment due to configurable variants
  - Easy to service
- Largest achievable scanning range is 7 m for safety applications
- Configuration memory in the system plug
- Selectable resolution makes it possible to adapt the devices to a very wide range of application requirements
- Certified for vertical use for access control or entry/exit applications, as well as hand protection
- 7-segment display
- Integrated external device monitoring (EDM)
- Safe integration in bus systems
- Up to 8 switchable protective/warning fields (field sets)
- Formation of host/guest systems with S3000/S300
- Direct connection of incremental encoders
- Certified according to IEC/EN 61496-3 (type 3) and IEC/EN 61508 (SIL2)
- Measured data output via RS-422 interface
- Reflector mark detection




Modular concept

## S300/S200 — Compact. Flexible. Intelligent.

- Extremely compact
  - S300 is the smallest laser scanner in the world
  - S200 — the first laser scanner for cat. 2 applications
  - Easy to service
- 8 m warning field and 2 m protective field
- Superior 270° scan angle
- Configuration memory in the system plug
- Selectable resolution makes it possible to adapt the devices to a very wide range of application requirements
- Certified for vertical use for access control or entry/exit applications, as well as hand protection
- 7-segment display
- Integrated external device monitoring (EDM)
- Safe integration in bus systems
- Up to 4 switchable protective/warning fields (field sets)
- Formation of host/guest systems with S300/S3000
- Direct connection of incremental encoders
- Adjustable object resolution
- Stand-by input
- RS-422 data interface





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## Overview of technical specifications

| | |
|---|---|
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Number of field sets** | 8 |
| **Scan angle** | 190° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Response time** | 60 ms, 120 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

The S3000 Professional can be used for a wide range of applications for the protection of machines and systems. The field sets can be conveniently defined using a PC or laptop.

- For complex applications with up to 8 protective fields/warning fields
- Static and dynamic protective field switching
- Incremental encoder connections
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

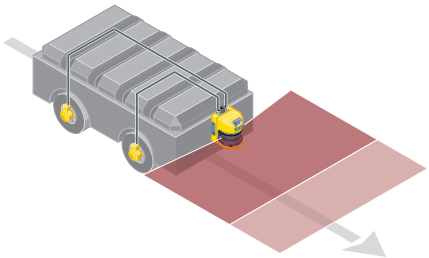
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

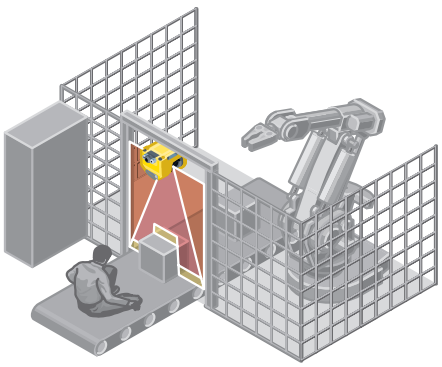
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



Velocity-dependent vehicle monitoring



Vertical access protection (entry/exit) with "contour as reference"



C




- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)

| Further information | Page |
|---|---|
| → Ordering information | C-4 |
| → Technical specifications | C-4 |
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| → Connection diagrams | C-7 |
| → Accessories | C-8 |
| → Services | A-2 |



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# Ordering information

Delivery S3000 systems:
- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diganostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

C

→ Ordering information for system plug and accessories, see page C-8

| System part | Protective field range | Type | Part number |
|---|---|---|---|
| Sensor head with I/O module | 4 m | S30A-4011DA | 1028936 |
| | 5.5 m | S30A-6011DA | 1019600 |
| | 7 m | S30A-7011DA | 1023892 |
| Sensor head | 4 m | Sensor head short range | 2034999 |
| | 5.5 m | Sensor head medium range | 2022972 |
| | 7 m | Sensor head long range | 2026747 |
| I/O module | – | I/O module Professional | 2022872 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Front screen material** | Polycarbonate |
| **Front screen surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 155 mm x 185 mm x 160 mm |
| **Weight** | 3.3 kg |


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## Functional data

| | |
|---|---|
| **Scan angle** | 190° |
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 60 ms, 120 ms [1] |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Angular resolution** | 0.5°/0.25° (depending on range and resolution) |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Distance measuring range** | 49 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

[1] Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

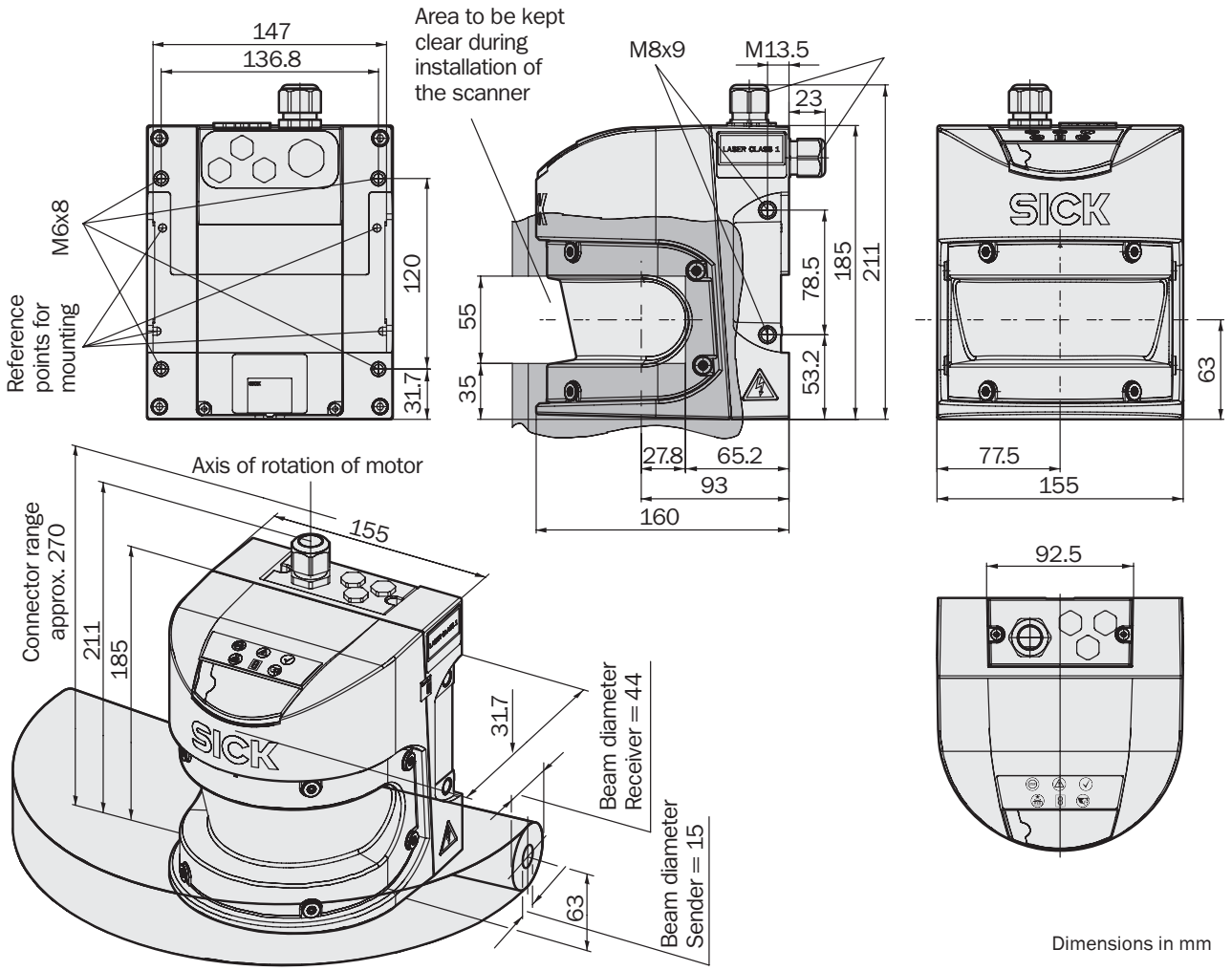
| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) |
| **Power consumption** | 0.8 A (24 V DC) |
| **Power consumption** | 2.3 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Static switching signals** | 2, 4 |
| **Dynamic encoder signals (incremental encoder)** | 2 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 500 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 9.6 kBaud, 19.2 kBaud, 38.4 kBaud |
| **Data interface** | RS-422 (≤500 kBaud) |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | ≤500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.34 mm² |

[1] Including maximum output load


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C

## Dimensional drawings



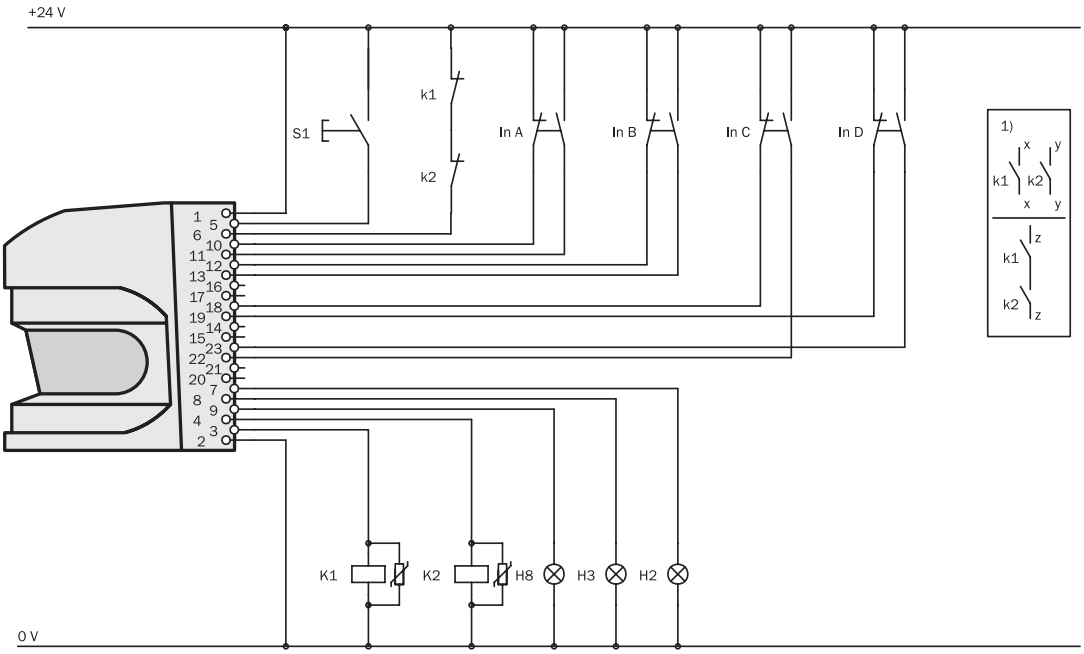

Dimensions in mm


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# Connection diagrams

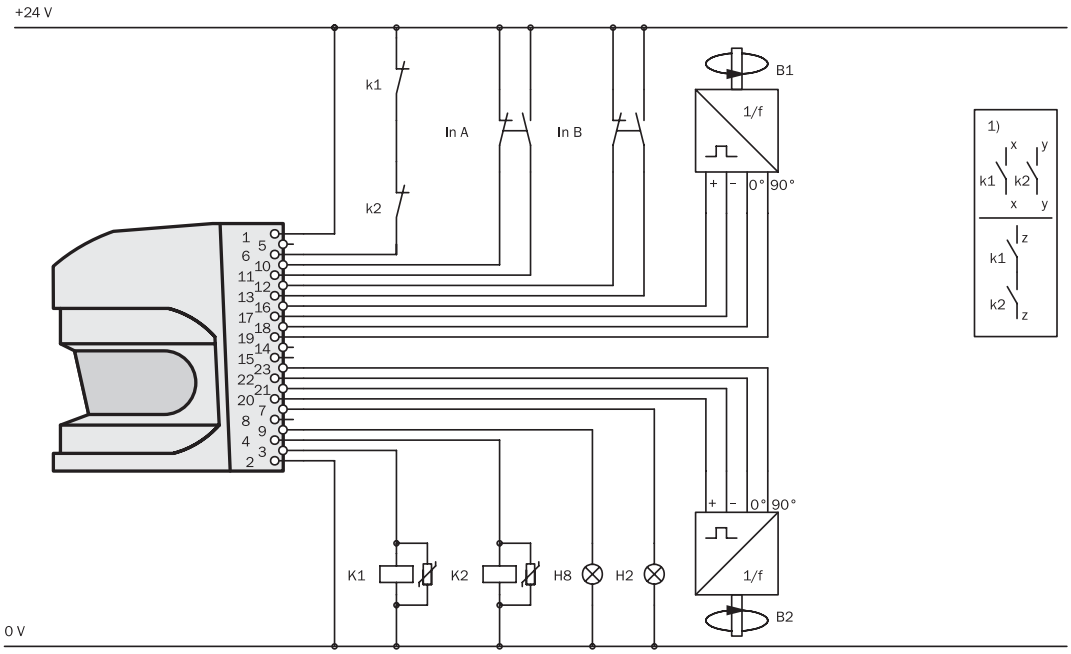
➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Protective field switching with four static inputs




- S3000 Professional in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)
- Static protective field switching by means of the control inputs A, B, C and D

## Protective field switching with static and dynamic inputs




- S3000 Professional in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)
- Dynamic protective field switching using B1 and B2 as well as static protective field switching using the control inputs A and B


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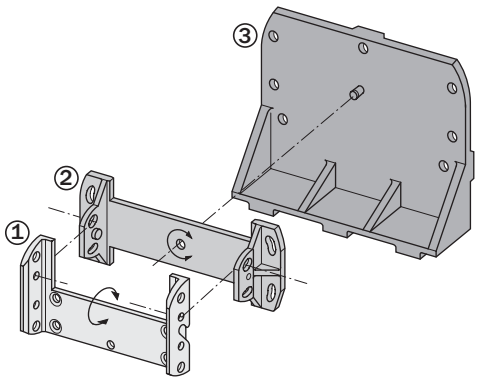
C

# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

# Accessories

### Mounting systems

| Description | | Type | Part number |
|---|---|---|---|
| Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility |  | Mounting kit 1 | 2015623 |
| Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 2 | 2015624 |
| Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 3 | 2015625 |
| Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible | | Mounting bracket | 7087514 |

### System plugs

| Direction of cable outlet | Usage | Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|---|---|
| Upward | Not for use with incremental encoders | Without cable | – | – | SX0A-A0000B | 2023797 |
| | | Pre-assembled | 17 | 5 m | SX0A-B1705B | 2027174 |
| | | | | 10 m | SX0A-B1710B | 2027175 |
| | | | | 20 m | SX0A-B1720B | 2027816 |
| | For use with incremental encoders | Without cable | – | – | SX0A-A0000D | 2023310 |
| | | Pre-assembled | 13 | 5 m | SX0A-B1305D | 2027176 |
| | | | | 10 m | SX0A-B1310D | 2027177 |


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### Connection cables

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 13 | 100 m | 6025729 |
| | 17 | 100 m | 6025730 |
| EFI connection cable | – | 50 m | 6026675 |

### Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

### Configuration connection cables

| Note | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### SDL connection cables

| Note | Direction of cable outlet | Connection type | Number of cores | Cable length | Part number |
|---|---|---|---|---|---|
| For the connection of safety bus modules to S3000 | Straight | Interconnectron plug M23 x 12 | 12 | 2.5 m | 2029337 |
| | | | | 5 m | 2029338 |
| | | | | 10 m | 2029339 |
| | | | | 15 m | 2029340 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Front screen | Spare parts set for front screen with replacement seal and screws | 2027180 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |


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C




- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)

## Overview of technical specifications

| | |
|---|---|
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Number of field sets** | 4 |
| **Scan angle** | 190° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Response time** | 60 ms, 120 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

S3000 Advanced safety laser scanners are used for the horizontal and vertical protection of hazardous areas, hazardous points and accesses.

- For complex applications with up to 4 protective fields/warning fields
- Static protective field switching
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

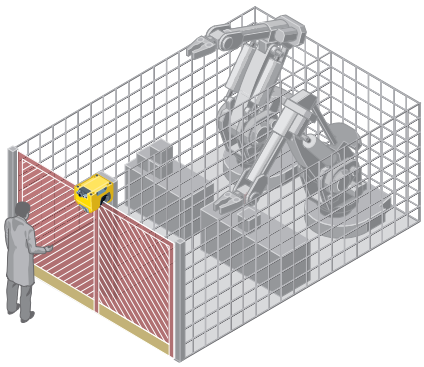
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

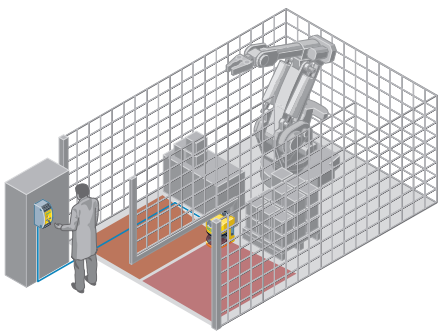
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



Access protection on a robot cell with several working areas with "contour as reference"



Protection of two separate working areas with one S3000 and a SICK safety controller


| Further information | Page |
|---|---|
| → Dimensional drawings | C-13 |
| → Connection diagrams | C-14 |
| → Accessories | C-15 |
| → Services | A-2 |




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# Ordering information

Delivery S3000 systems:
- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diganostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information for system plug and accessories, see page C-15

C

| System part | Protective field range | Type | Part number |
|---|---|---|---|
| Sensor head with I/O module | 4 m | S30A-4011CA | 1028935 |
| | 5.5 m | S30A-6011CA | 1023547 |
| | 7 m | S30A-7011CA | 1023891 |
| Sensor head | 4 m | Sensor head short range | 2034999 |
| | 5.5 m | Sensor head medium range | 2022972 |
| | 7 m | Sensor head long range | 2026747 |
| I/O module | – | I/O module Advanced | 2026802 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Front screen material** | Polycarbonate |
| **Front screen surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 155 mm x 185 mm x 160 mm |
| **Weight** | 3.3 kg |

Continued on next page


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C

## Functional data

| | |
|---|---|
| **Scan angle** | 190° |
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 60 ms, 120 ms [1] |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Angular resolution** | 0.5°/0.25° (depending on range and resolution) |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Distance measuring range** | 49 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

[1] Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

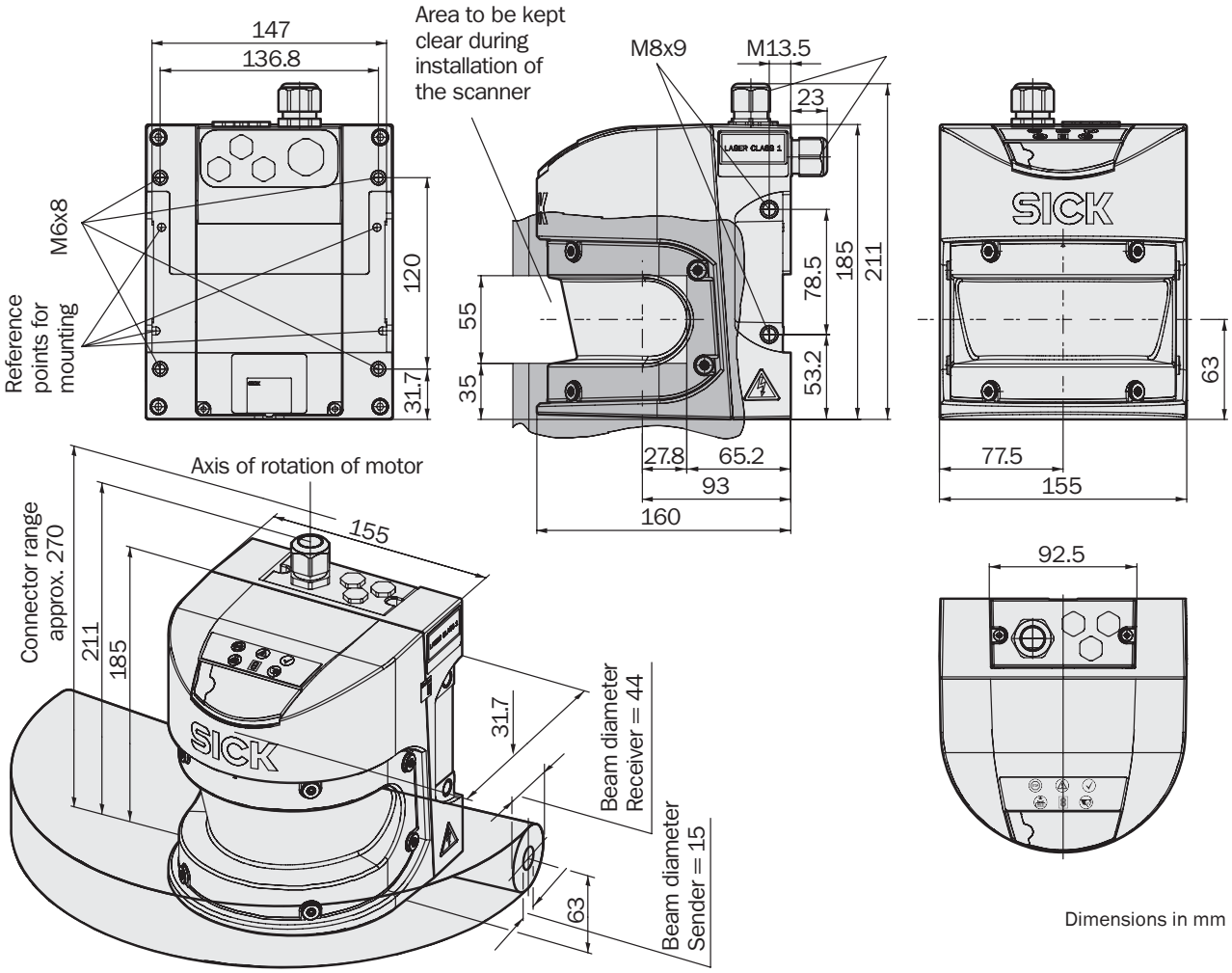
| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) |
| **Power consumption** | 0.8 A (24 V DC) |
| **Power consumption** | 2.3 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Static switching signals** | 2 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 500 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 9.6 kBaud, 19.2 kBaud, 38.4 kBaud |
| **Data interface** | RS-422 (≤500 kBaud) |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | ≤500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.34 mm² |

[1] Including maximum output load


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# Dimensional drawings



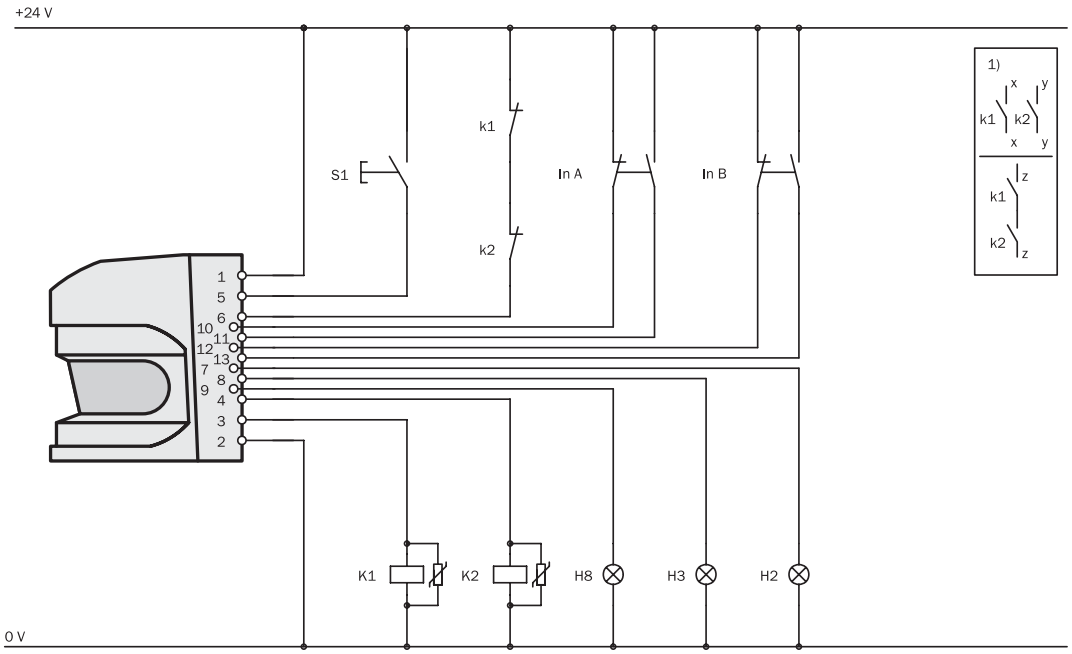

Dimensions in mm


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# Connection diagrams

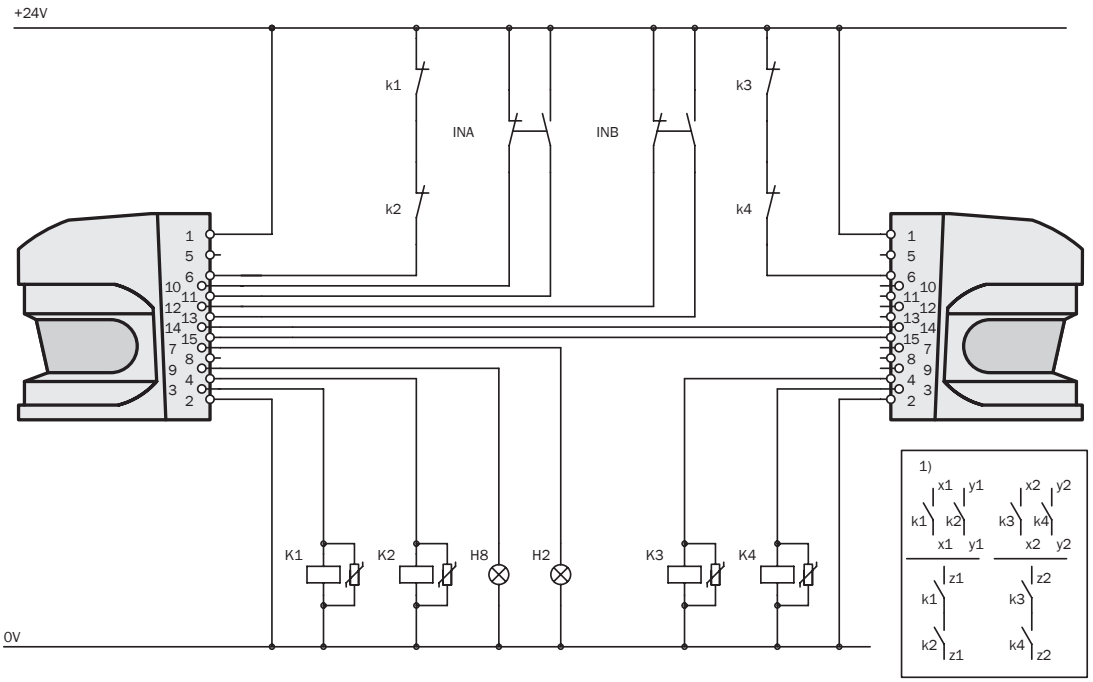
→ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Protective field switching with two static inputs




- S3000 Advanced in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)
- Protective field switching by means of control inputs A and B

## Protective field switching between two S3000 with static inputs




- S3000 Advanced with S3000 Advanced in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)
- Protective field switching by means of control input A and control input B on separate OSSD pairs (simultaneous monitoring)


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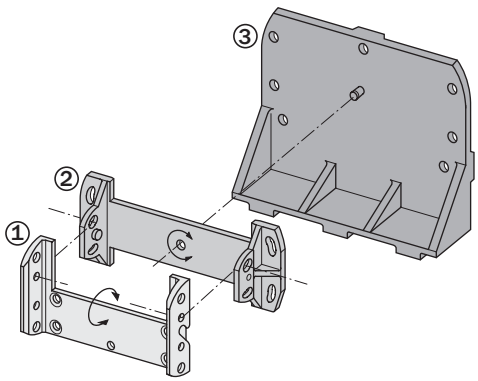
# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants become easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

C

# Accessories

### Mounting systems

| Description | | Type | Part number |
|---|---|---|---|
| Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility |  | Mounting kit 1 | 2015623 |
| Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 2 | 2015624 |
| Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 3 | 2015625 |
| Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible | | Mounting bracket | 7087514 |

### System plugs

| Direction of cable outlet | Usage | Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|---|---|
| Upward | Not for use with incremental encoders | Without cable | – | – | SX0A-A0000B | 2023797 |
| | | Pre-assembled | 13 | 5 m | SX0A-B1305B | 2027172 |
| | | | | 10 m | SX0A-B1310B | 2027173 |
| | | | | 20 m | SX0A-B1320B | 2027815 |


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### Connection cables

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 13 | 100 m | 6025729 |
| EFI connection cable | – | 50 m | 6026675 |

### Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

### Configuration connection cables

| Note | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### SDL connection cables

| Note | Direction of cable outlet | Connection type | Number of cores | Cable length | Part number |
|---|---|---|---|---|---|
| For the connection of safety bus modules to S3000 | Straight | Interconnectron plug M23 x 12 | 12 | 2.5 m | 2029337 |
| | | | | 5 m | 2029338 |
| | | | | 10 m | 2029339 |
| | | | | 15 m | 2029340 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Front screen | Spare parts set for front screen with replacement seal and screws | 2027180 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |


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## Overview of technical specifications

| | |
|---|---|
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Number of field sets** | 1 |
| **Scan angle** | 190° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Response time** | 60 ms, 120 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

S3000 Standard safety laser scanners are used for the horizontal and vertical protection of hazardous areas, hazardous points and accesses as well as to protect automated guided vehicles.

- 1 protective and warning field
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

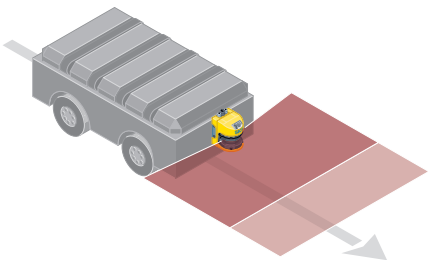
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

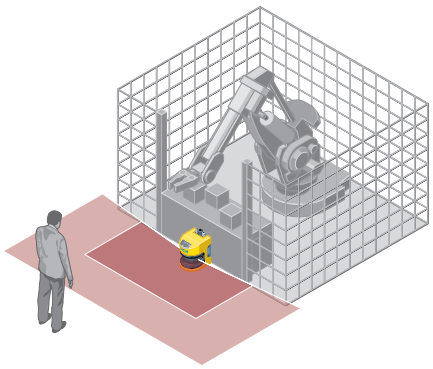
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



Hazardous area protection on an AGV with one direction of travel



Hazardous area protection on a robot cell






- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)

C

| Further information | Page |
|---|---|
| → Ordering information | C-18 |
| → Technical specifications | C-18 |
| → Dimensional drawings | C-20 |
| → Connection diagrams | C-21 |
| → Accessories | C-22 |
| → Services | A-2 |



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# Ordering information

Delivery S3000 systems:
- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diganostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

C

→ Ordering information for system plug and accessories, see page C-22

| System part | Protective field range | Type | Part number |
|---|---|---|---|
| Sensor head with I/O module | 4 m | S30A-4011BA | 1028934 |
| | 5.5 m | S30A-6011BA | 1023546 |
| | 7 m | S30A-7011BA | 1023890 |
| Sensor head | 4 m | Sensor head short range | 2034999 |
| | 5.5 m | Sensor head medium range | 2022972 |
| | 7 m | Sensor head long range | 2026747 |
| I/O module | – | I/O module Standard | 2026801 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Front screen material** | Polycarbonate |
| **Front screen surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 155 mm x 185 mm x 160 mm |
| **Weight** | 3.3 kg |


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## Functional data

| | |
|---|---|
| **Scan angle** | 190° |
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 60 ms, 120 ms [1] |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Angular resolution** | 0.5°/0.25° (depending on range and resolution) |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Distance measuring range** | 49 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

[1] Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) |
| **Power consumption** | 0.8 A (24 V DC) |
| **Power consumption** | 2.3 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 500 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 9.6 kBaud, 19.2 kBaud, 38.4 kBaud |
| **Data interface** | RS-422 (≤500 kBaud) |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | ≤500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.34 mm² |

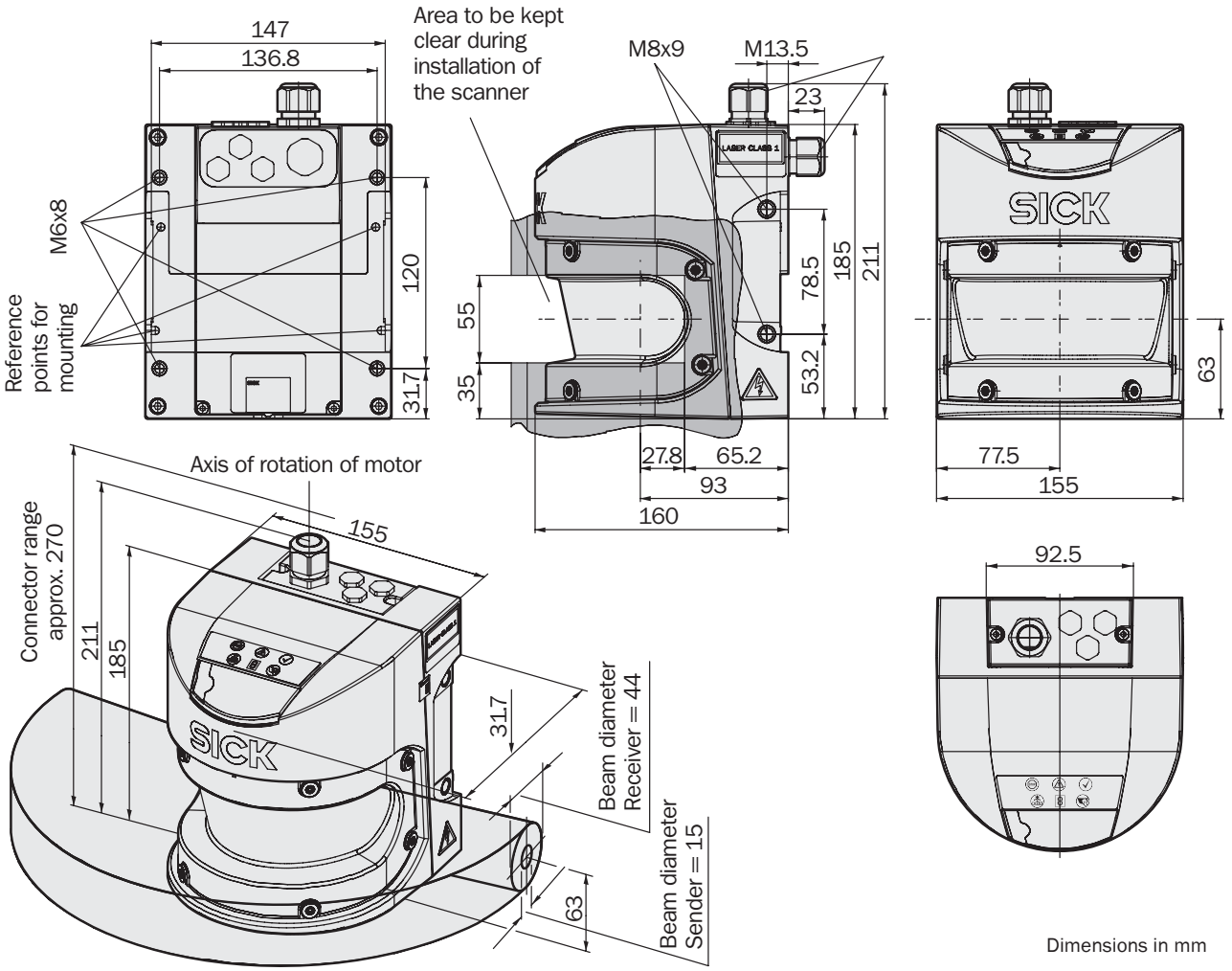
[1] Including maximum output load

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C

## Dimensional drawings



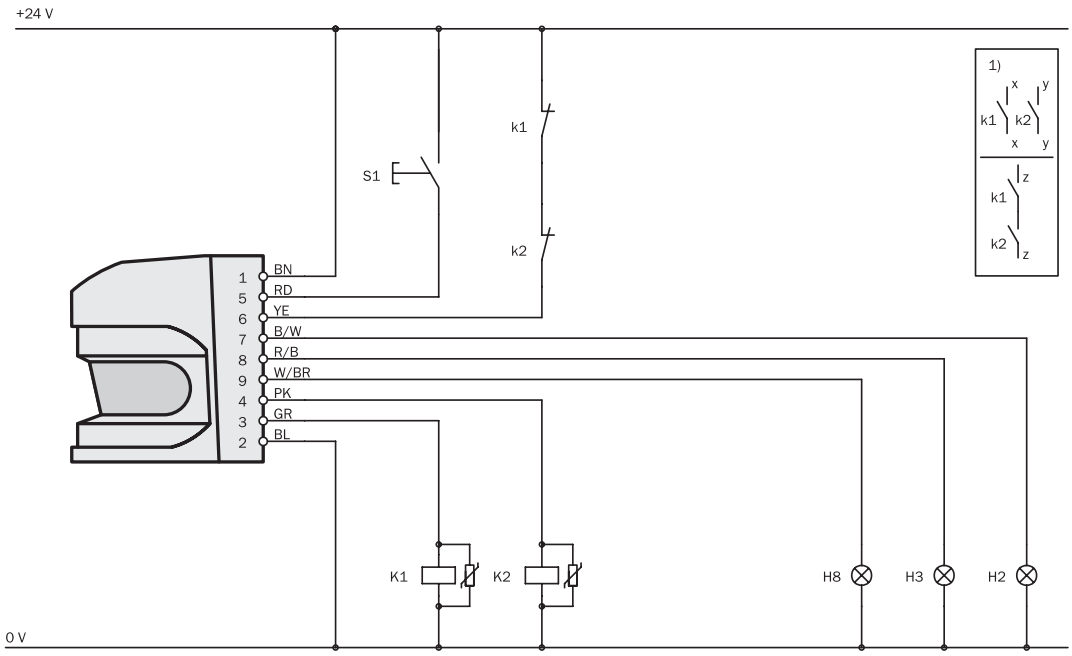

Dimensions in mm


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# Connection diagrams

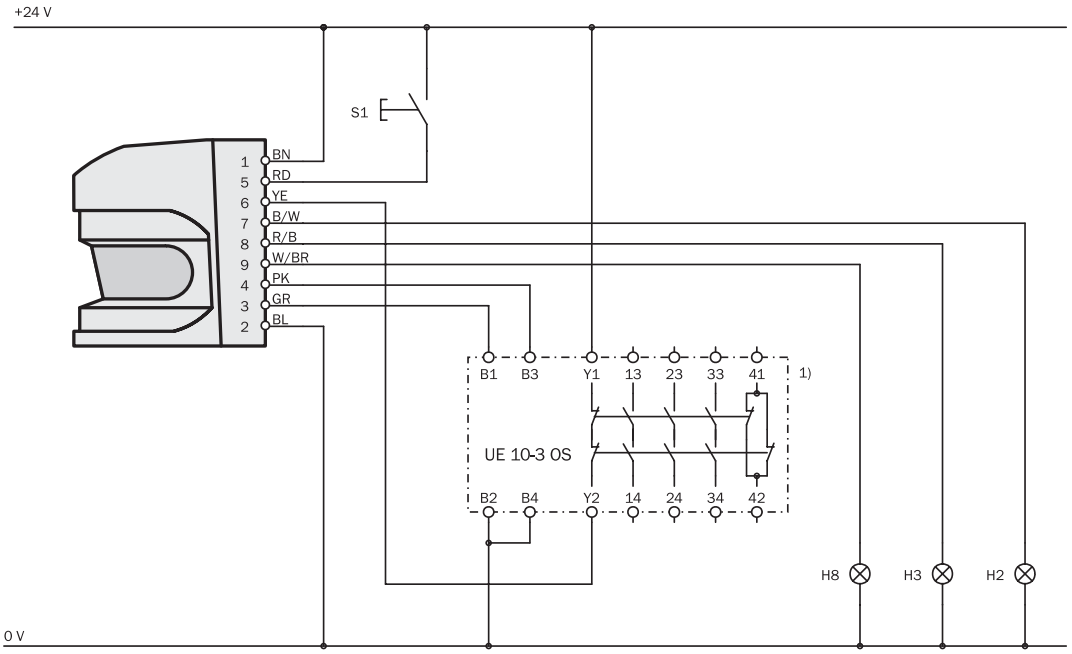
➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## With restart interlock and external device monitoring




- S3000 Standard in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

## Restart interlock and external device monitoring (EDM) with safety relay UE10-3OS




- S3000 Standard in conjunction with UE10-3OS
- Operating mode: with restart interlock and external device monitoring (EDM)


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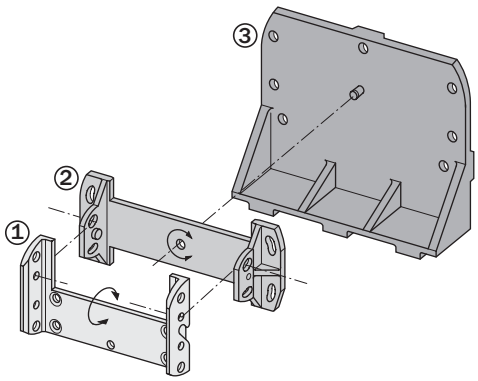
C

# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

# Accessories

### Mounting systems

| Description | | Type | Part number |
|---|---|---|---|
| Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility |  | Mounting kit 1 | 2015623 |
| Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 2 | 2015624 |
| Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 3 | 2015625 |
| Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible | | Mounting bracket | 7087514 |

### System plugs

| Direction of cable outlet | Usage | Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|---|---|
| Upward | Not for use with incremental encoders | Without cable | – | – | SX0A-A0000B | 2023797 |
| | | Pre-assembled | 9 | 5 m | SX0A-B0905B | 2027170 |
| | | | | 10 m | SX0A-B0910B | 2027171 |
| | | | | 20 m | SX0A-B0920B | 2027814 |


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### Connection cables

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 9 | 100 m | 6022651 |
| EFI connection cable | – | 50 m | 6026675 |

### Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

C

### Configuration connection cables

| Note | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### SDL connection cables

| Note | Direction of cable outlet | Connection type | Number of cores | Cable length | Part number |
|---|---|---|---|---|---|
| For the connection of safety bus modules to S3000 | Straight | Interconnectron plug M23 x 12 | 12 | 2.5 m | 2029337 |
| | | | | 5 m | 2029338 |
| | | | | 10 m | 2029339 |
| | | | | 15 m | 2029340 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Front screen | Spare parts set for front screen with replacement seal and screws | 2027180 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |


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- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)

# Overview of technical specifications

**Note:** S3000 Remote can only be used in conjunction with another S3000 or a UE100 series safety controller

| | |
|---|---|
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Number of field sets** | 8, the number of field sets is dependent on the S3000 variant to which the S3000 Remote is connected |
| **Scan angle** | 190° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Response time** | 60 ms, 120 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

# Product description

Autonomous vehicle systems can be protected cost-effectively to suit the specific case using S3000 Remote.

- Up to 8 protective/warning fields
- For complex applications with host/guest combinations
- For 2 directions of travel
- New uniform "Configuration & Diagnostic Software" CDS

# In-system added value

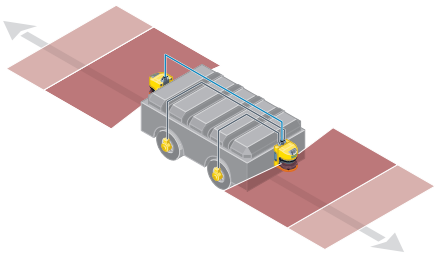
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

# Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



S3000 Professional and S3000 Remote: complex application with bidirectional travel (velocity-dependent protective field/warning field switching using incremental encoders)


| Further information | Page |
|---|---|
| → Dimensional drawings | C-27 |
| → Connection diagrams | C-28 |
| → Accessories | C-29 |
| → Services | A-2 |




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# Ordering information

Delivery S3000 systems:
- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diganostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information for system plug and accessories, see page C-29

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| System part | Protective field range | Type | Part number |
|---|---|---|---|
| Sensor head with I/O module | 4 m | S30A-4011EA | 1028938 |
| | 5.5 m | S30A-6011EA | 1023548 |
| | 7 m | S30A-7011EA | 1023893 |
| Sensor head | 4 m | Sensor head short range | 2034999 |
| | 5.5 m | Sensor head medium range | 2022972 |
| | 7 m | Sensor head long range | 2026747 |
| I/O module | – | I/O module Remote | 2026803 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Front screen material** | Polycarbonate |
| **Front screen surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 155 mm x 185 mm x 160 mm |
| **Weight** | 3.3 kg |

Continued on next page


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## Functional data

| | |
|---|---|
| **Scan angle** | 190° |
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 60 ms, 120 ms [1] |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Angular resolution** | 0.5°/0.25° (depending on range and resolution) |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Distance measuring range** | 49 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

[1] Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

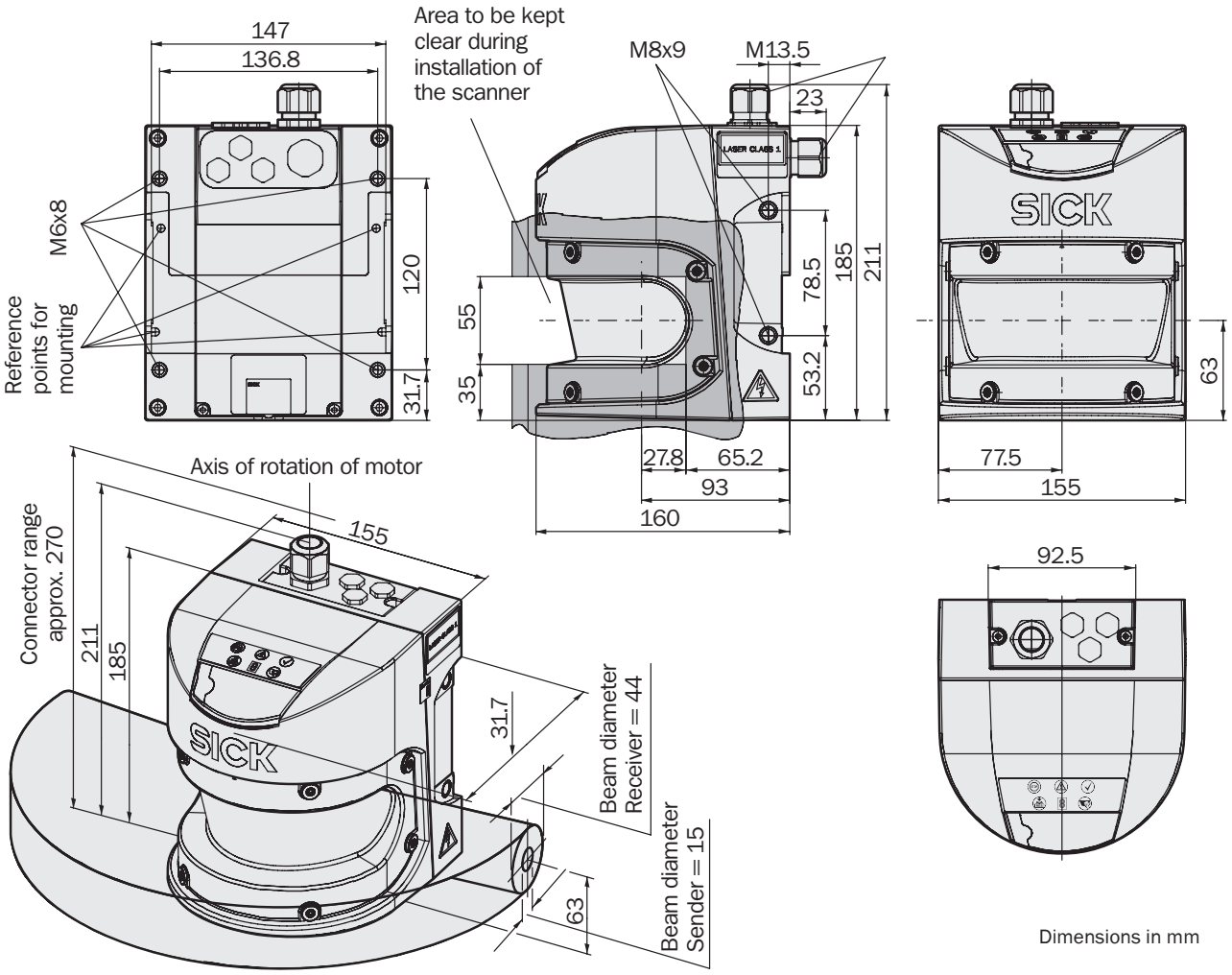
| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) |
| **Power consumption** | 0.8 A (24 V DC) |
| **Power consumption** | 2.3 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 500 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 9.6 kBaud, 19.2 kBaud, 38.4 kBaud |
| **Data interface** | RS-422 (≤500 kBaud) |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | ≤500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.34 mm² |

[1] Including maximum output load


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## Dimensional drawings




Dimensions in mm

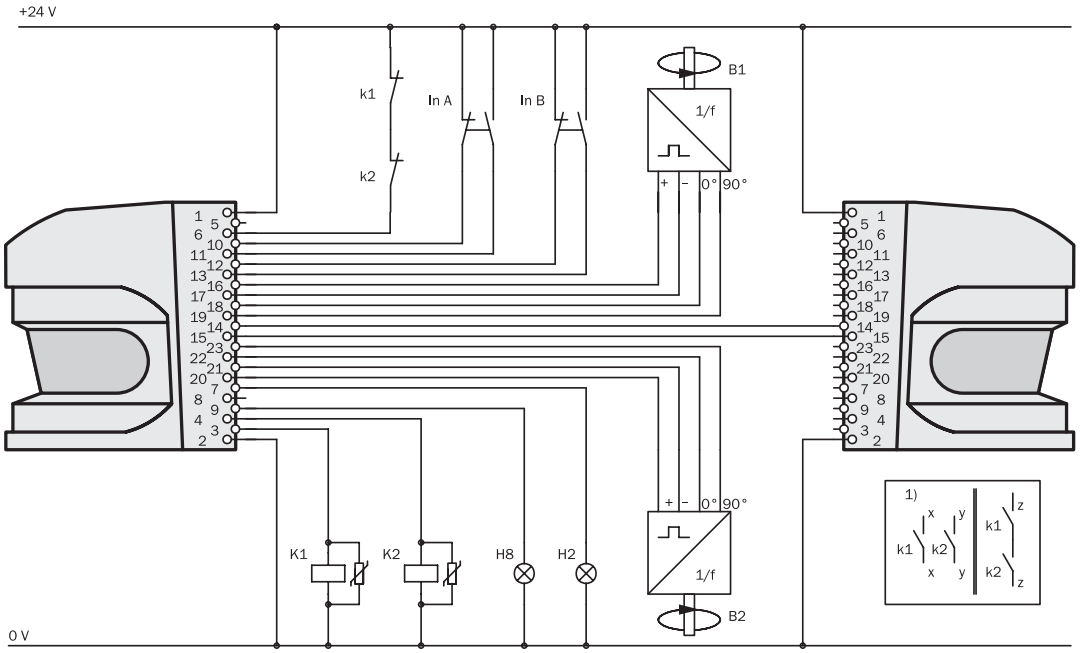

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# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Protective field switching between two S3000 with static and dynamic inputs

C




- S3000 Professional (left) and Remote (right) in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)
- Direction of travel-dependent dynamic protective field switching by means of B1 and B2 as well as static protective field switching by means of the control inputs A and B with sensor communication via EFI

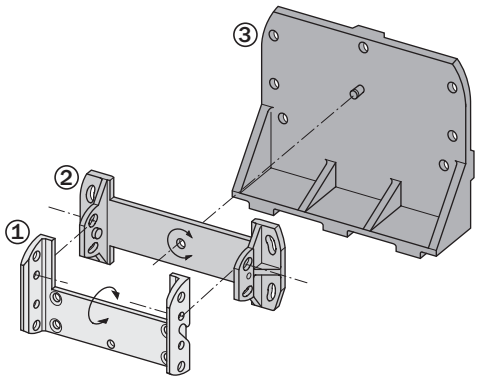
# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |


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# Accessories

## Mounting systems

| Description | | Type | Part number |
|---|---|---|---|
| Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility |  | Mounting kit 1 | 2015623 |
| Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 2 | 2015624 |
| Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 3 | 2015625 |
| Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible | | Mounting bracket | 7087514 |

## System plugs

| Direction of cable outlet | Usage | Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|---|---|
| Upward | Not for use with incremental encoders | Without cable | – | – | SX0A-A0000B | 2023797 |
| | | Pre-assembled | 9 | 5 m | SX0A-B0905B | 2027170 |
| | | | | 10 m | SX0A-B0910B | 2027171 |
| | | | | 20 m | SX0A-B0920B | 2027814 |

## Connection cable

| Type | Cable length | Part number |
|---|---|---|
| EFI connection cable | 50 m | 6026675 |

## Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

## Configuration connection cables

| Note | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |


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C

### SDL connection cables

| Note | Direction of cable outlet | Connection type | Number of cores | Cable length | Part number |
|---|---|---|---|---|---|
| For the connection of safety bus modules to S3000 | Straight | Interconnectron plug M23 x 12 | 12 | 2.5 m | 2029337 |
| | | | | 5 m | 2029338 |
| | | | | 10 m | 2029339 |
| | | | | 15 m | 2029340 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Front screen | Spare parts set for front screen with replacement seal and screws | 2027180 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |


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## Overview of technical specifications

| | |
|---|---|
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Number of field sets** | 8 |
| **Scan angle** | 190° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Response time** | 60 ms, 120 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

With S3000 Professional CMS (Contour Measurement and Safety) it is possible for the first time to combine the protection of people and the acquisition of surrounding contours. This system opens up new ways of productively achieving your objectives in the logistics and materials handling sector.

- Personnel protection and acquisition of the surrounding contour in one scanner
- Measured data output via RS-422 interface in real-time
- Reflector mark detection up to 30 m
- Velocity transfer for odometry
- 8 switchable protective/warning fields
- Static and dynamic protective field switching
- Incremental encoder connections
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

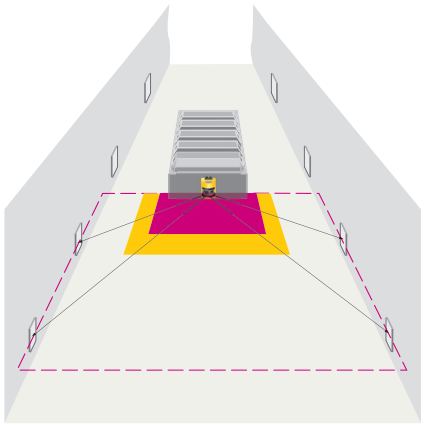
- Supports integration with multiple safety control solutions
- Safe integration to bus systems

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles



Personnel protection and acquisition of the surrounding contour with integrated reflector detection






- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)

| Further information | Page |
|---|---|
| → Ordering information | C-32 |
| → Technical specifications | C-32 |
| → Dimensional drawings | C-34 |
| → Connection diagrams | C-35 |
| → Accessories | C-36 |
| → Services | A-2 |



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# Ordering information

Delivery S3000 systems:
- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diganostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

C

→ Ordering information for system plug and accessories, see page C-36

| System part | Protective field range | Type | Part number |
|---|---|---|---|
| Sensor head with I/O module | 4 m | S30A-4011DB | 1028939 |
| | 5.5 m | S30A-6011DB | 1026401 |
| | 7 m | S30A-7011DB | 1026402 |
| Sensor head | 4 m | Sensor head short range | 2034999 |
| | 5.5 m | Sensor head medium range | 2022972 |
| | 7 m | Sensor head long range | 2026747 |
| I/O module | – | I/O module Professional CMS | 2030915 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Front screen material** | Polycarbonate |
| **Front screen surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 155 mm x 185 mm x 160 mm |
| **Weight** | 3.3 kg |


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## Functional data

| | |
|---|---|
| **Scan angle** | 190° |
| **Protective field range (depending on type)** | 4 m / 5.5 m / 7 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 60 ms, 120 ms [1] |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable |
| **Angular resolution** | 0.5°/0.25° (depending on range and resolution) |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 49 m (20 m at 20 % reflectivity) |
| **Distance measuring range** | 49 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

[1] Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) |
| **Power consumption** | 0.8 A (24 V DC) |
| **Power consumption** | 2.3 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Static switching signals** | 2, 4 |
| **Dynamic encoder signals (incremental encoder)** | 2 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 500 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 9.6 kBaud, 19.2 kBaud, 38.4 kBaud |
| **Data interface** | RS-422 (≤500 kBaud) |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | ≤500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.34 mm² |

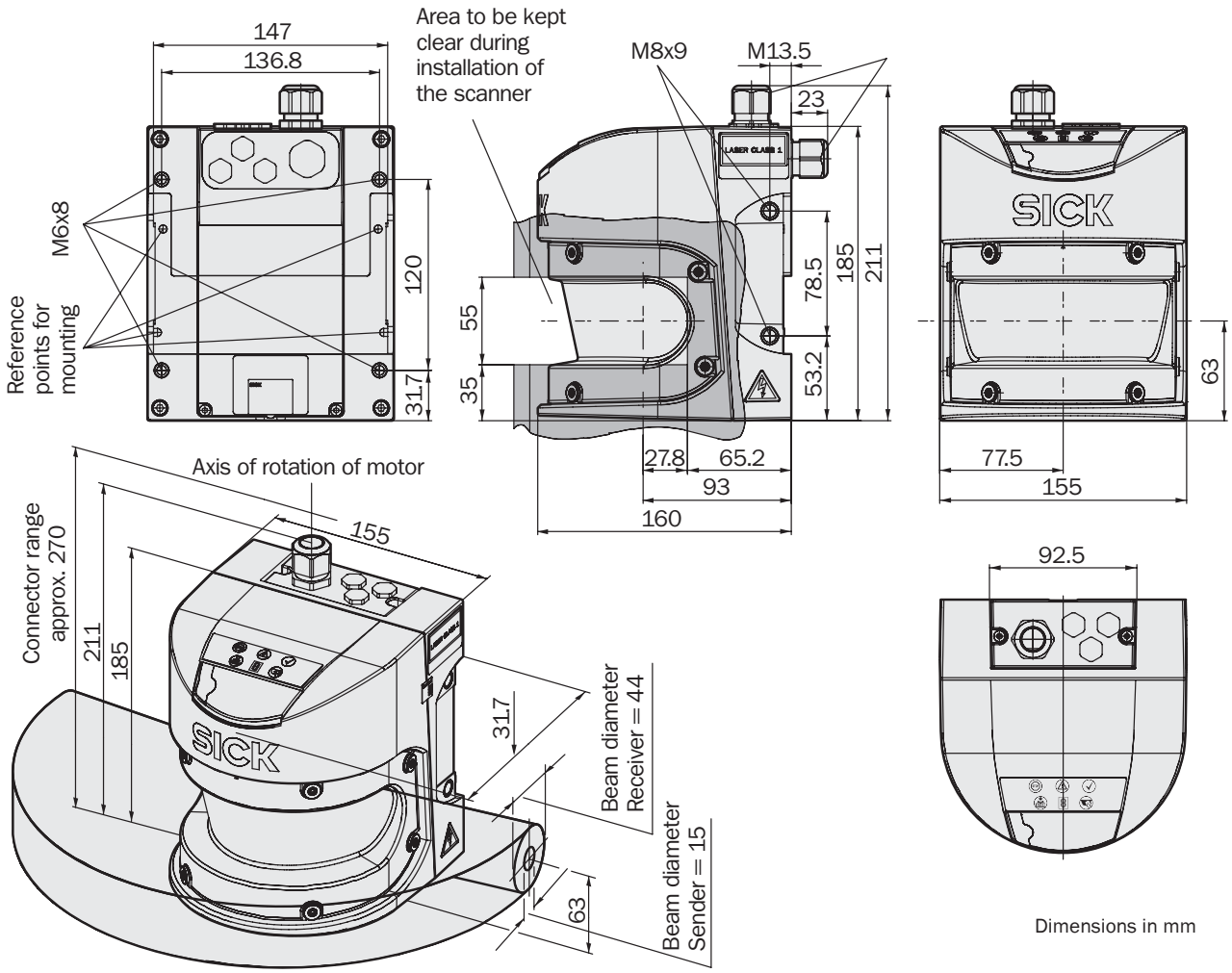
[1] Including maximum output load

C


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C

## Dimensional drawings



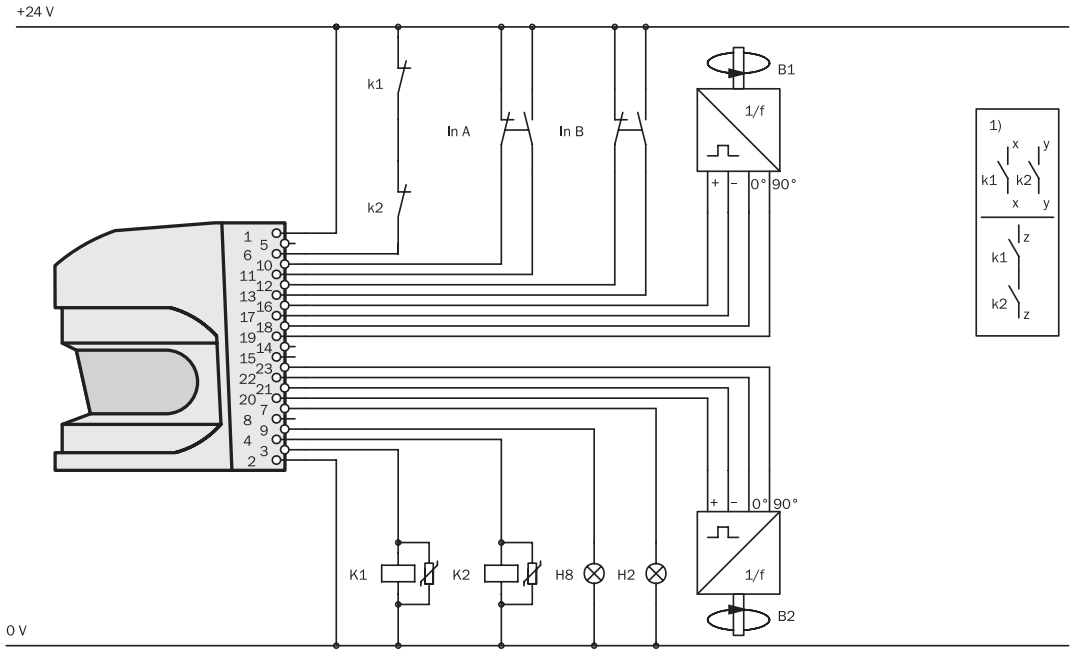

Dimensions in mm


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# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Protective field switching with static and dynamic inputs




- S3000 Professional CMS in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)
- Dynamic protective field switching using B1 and B2 as well as static protective field switching using the control inputs A and B

# Safe control solutions

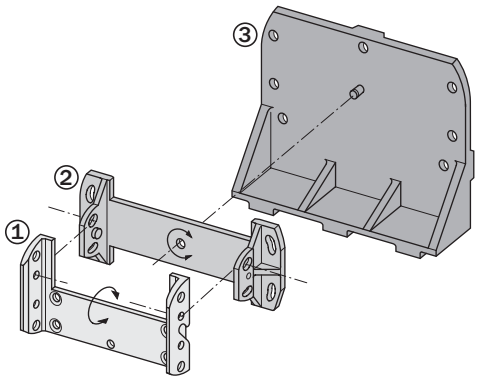
| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |


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C

# Accessories

## Mounting systems

| Description | | Type | Part number |
|---|---|---|---|
| Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility |  | Mounting kit 1 | 2015623 |
| Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 2 | 2015624 |
| Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible | | Mounting kit 3 | 2015625 |
| Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible | | Mounting bracket | 7087514 |

## System plugs

| Direction of cable outlet | Usage | Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|---|---|
| Upward | Not for use with incremental encoders | Without cable | – | – | SX0A-A0000B | 2023797 |
| | | Pre-assembled | 17 | 5 m | SX0A-B1705B | 2027174 |
| | | | | 10 m | SX0A-B1710B | 2027175 |
| | | | | 20 m | SX0A-B1720B | 2027816 |
| | For use with incremental encoders | Without cable | – | – | SX0A-A0000D | 2023310 |
| | | Pre-assembled | 13 | 5 m | SX0A-B1305D | 2027176 |
| | | | | 10 m | SX0A-B1310D | 2027177 |

## Connection cables

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 13 | 100 m | 6025729 |
| | 17 | 100 m | 6025730 |
| EFI connection cable | – | 50 m | 6026675 |

## Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

## Configuration connection cables

| Note | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |


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### SDL connection cables

| Note | Direction of cable outlet | Connection type | Number of cores | Cable length | Part number |
|---|---|---|---|---|---|
| For the connection of safety bus modules to S3000 | Straight | Interconnectron plug M23 x 12 | 12 | 2.5 m | 2029337 |
| | | | | 5 m | 2029338 |
| | | | | 10 m | 2029339 |
| | | | | 15 m | 2029340 |

C

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Front screen | Spare parts set for front screen with replacement seal and screws | 2027180 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |


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C




- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical and horizontal use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input

## Overview of technical specifications

| | |
|---|---|
| **Protective field range** | 2 m |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Number of field sets** | 4 |
| **Scan angle** | 270° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Response time** | 80 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

Small but refined-, the safety laser scanner for mobile use.
The S300 provides optimal protection for small, free-moving transport systems and service robots, specifically when protective fields must be easily adjusted to different velocities.

- 4 switchable protective/warning fields
- Adjustable object resolution
- Facility for connecting incremental encoder
- Measured data output over RS-422 data interface
- EFI – safe SICK device communication
- New multi-system "Configuration & Diagnostic Software" CDS

## In-system added value

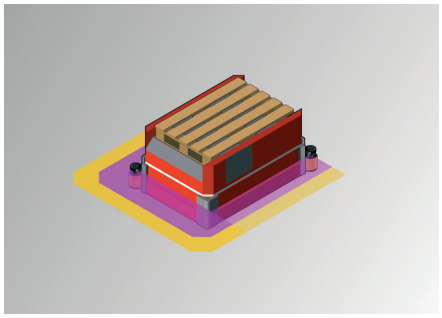
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

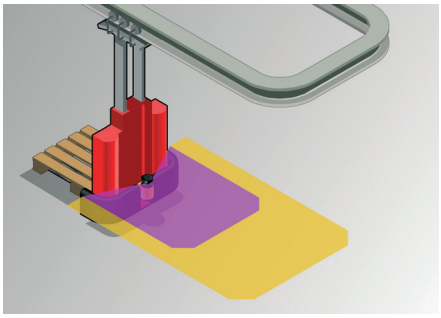
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



All-round protection on an AGV



Hazardous area protection on an electrical overhead conveyor


| Further information | Page |
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| → Dimensional drawings | C-41 |
| → Connection diagrams | C-43 |
| → Accessories | C-45 |
| → Services | A-2 |




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# Ordering information

Delivery S300
- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

→ Ordering information for system plug and accessories, see page C-45

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| Type | Part number |
|---|---|
| S30B-2011DA | 1026822 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Optics cover material** | Polycarbonate |
| **Optics cover surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 102 mm x 152 mm x 105 mm |
| **Weight** | 1.2 kg |

## Functional data

| | |
|---|---|
| **Scan angle** | 270° |
| **Protective field range** | 2 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 80 ms |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Angular resolution** | 0.5° |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Distance measuring range** | 30 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

Continued on next page


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## Electrical data

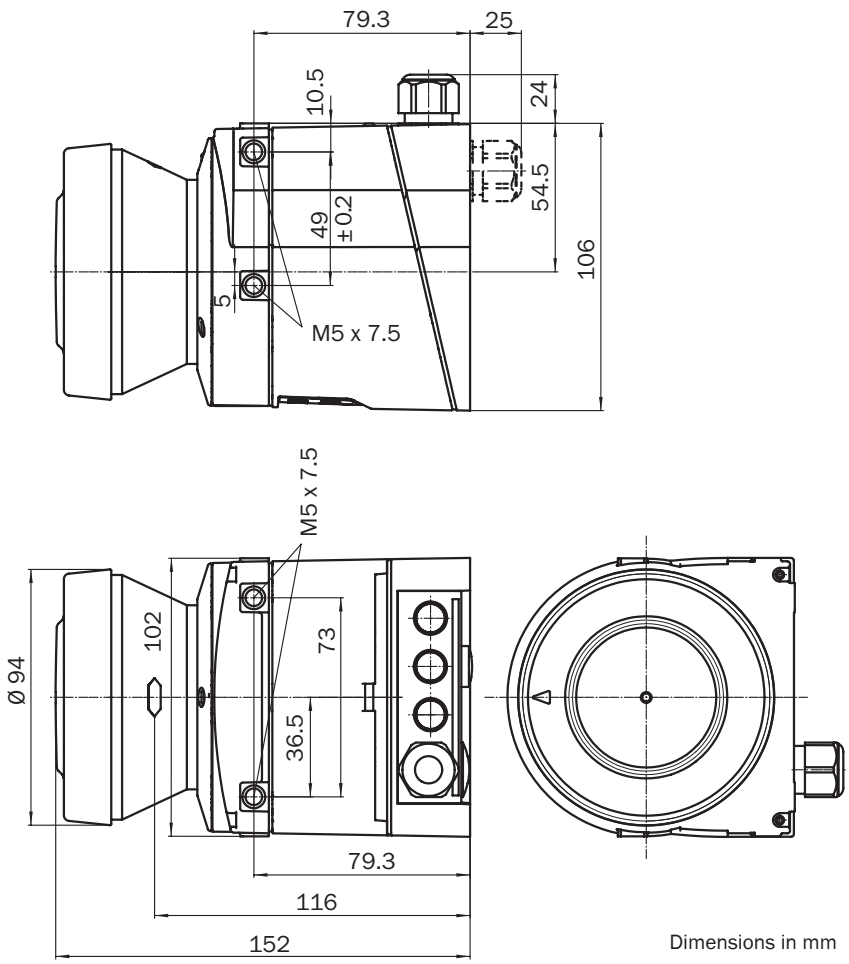
| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 30 V DC) |
| **Power consumption** | 0.33 A (24 V DC) |
| **Power consumption** | 1.65 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Static switching signals or dynamic encoder signals** | 2, dual-channel |
| **Standby** | 1 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 250 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 38.4 kBaud |
| **Data interface** | RS-422 (500 kBaud) |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | 500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.22 mm² |

[1] Including maximum output load


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# Dimensional drawings

**S300**



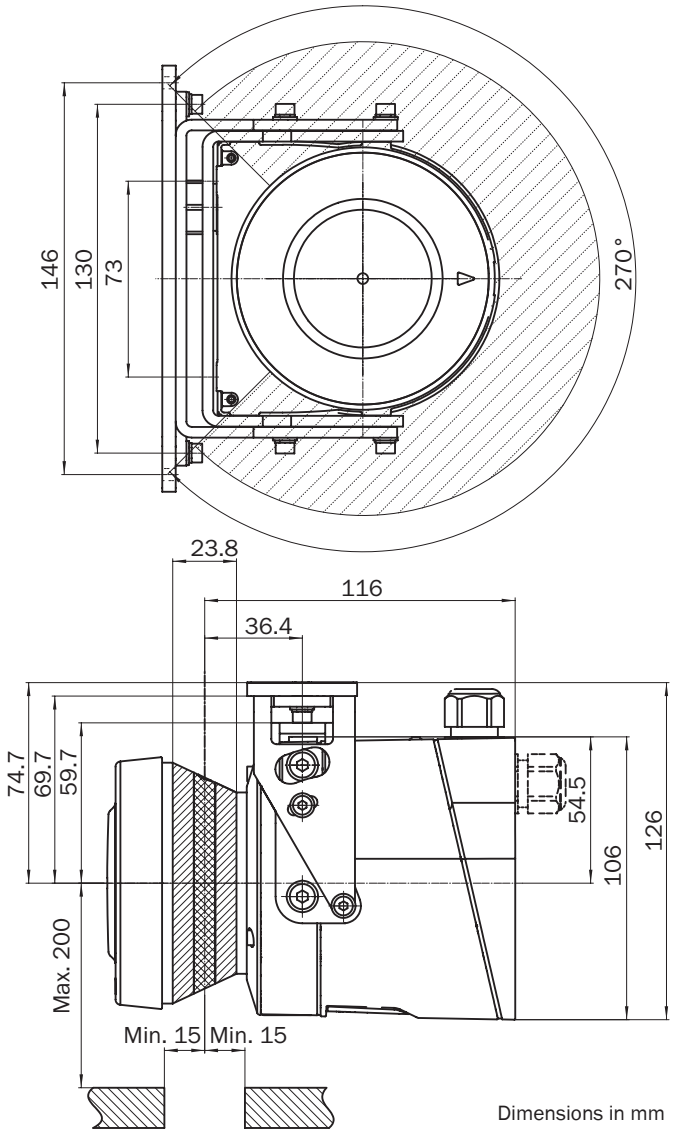

Dimensions in mm

C


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**Scan plane origin**



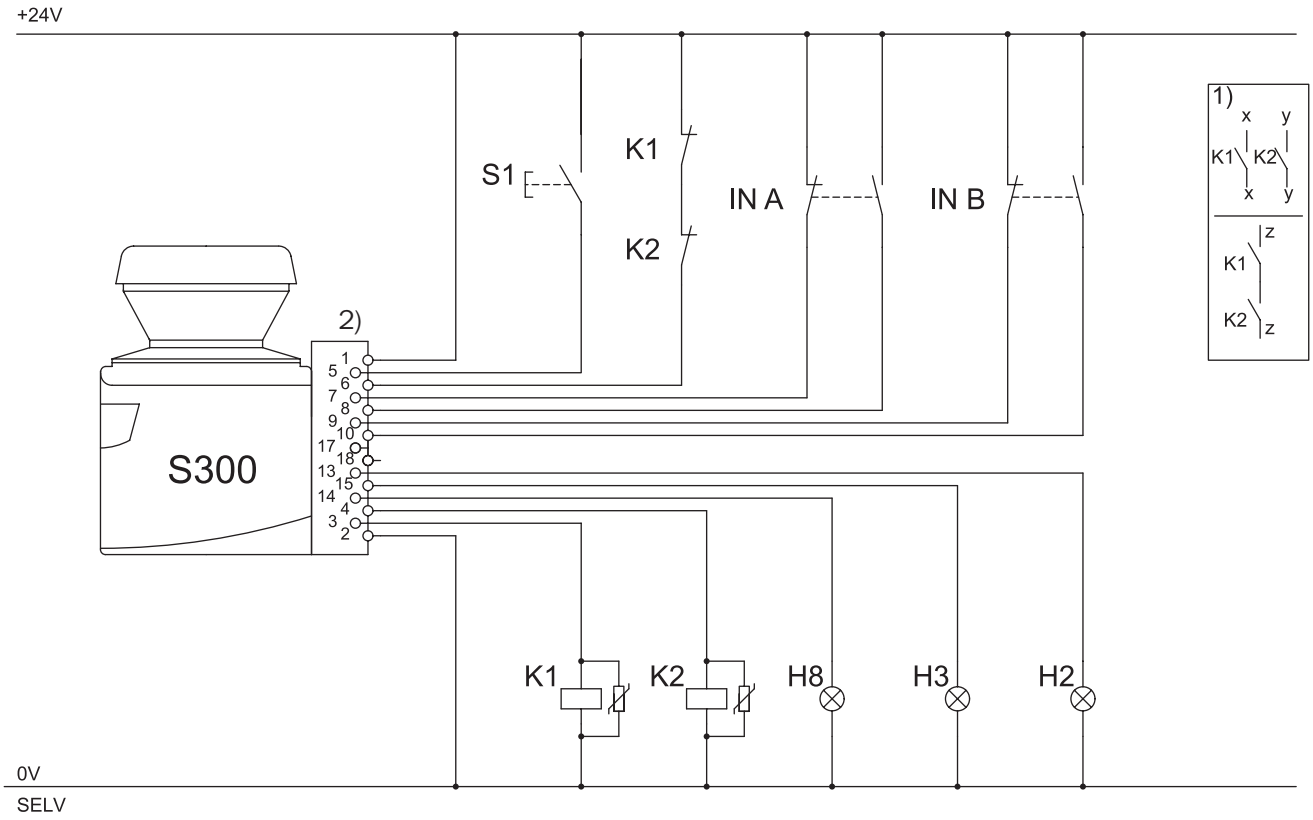

Dimensions in mm


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# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Protective field switching with two static inputs




- S300 Professional in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)
- Protective field switching using control input IN A and IN B

**Comments**

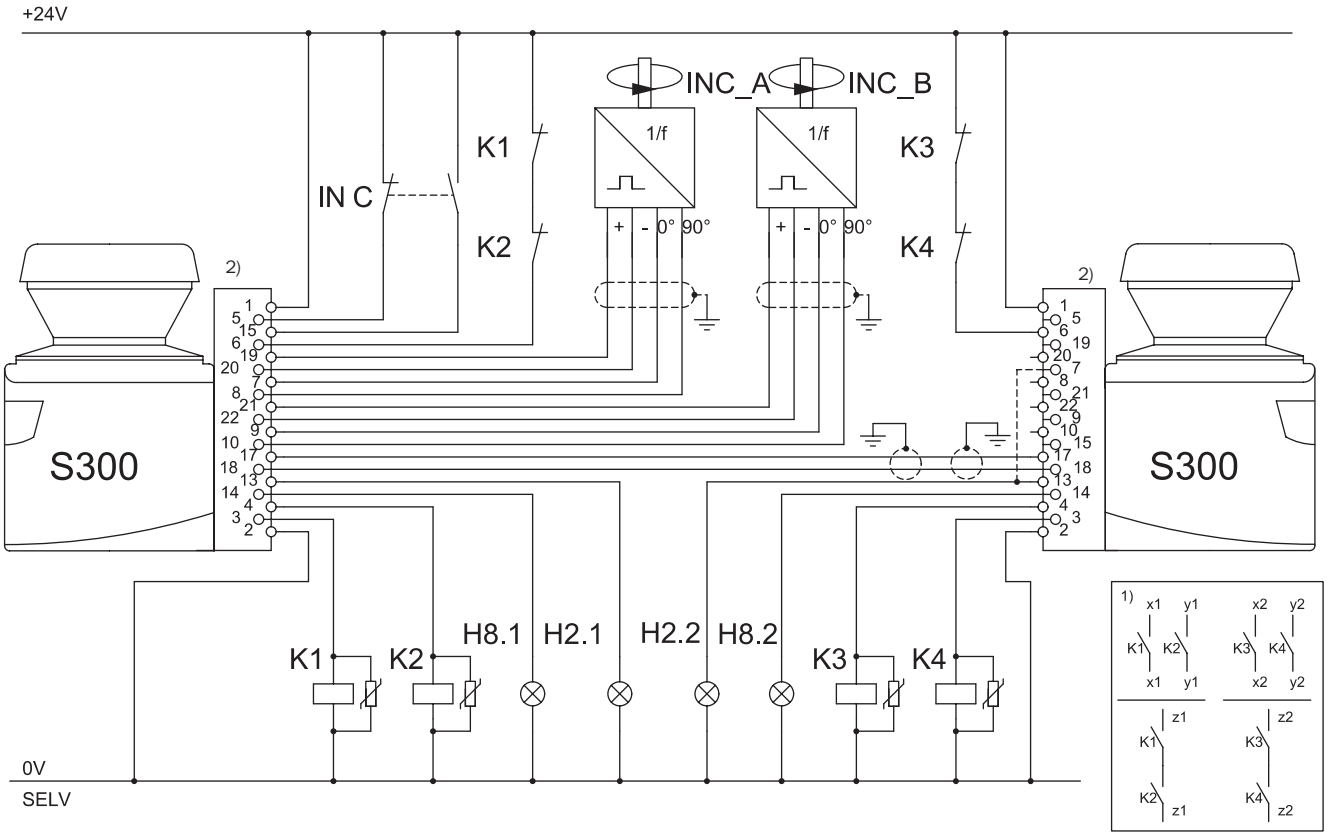
1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).


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## Protective field switching between two S300 with static and dynamic inputs




- S300 Professional with S300 Professional in master/slave connection with relays/contactors
- Operating mode: with restart interlock and external device monitoring
- Dynamic protective field switching by the incremental encoders A and B on the master
- Static protective field switching using the control input IN C on the master
- The protective fields affect the related OSSDs on master or slave

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

C

# Accessories

### Mounting systems

→ Dimensional drawings for mounting accessories, see page C-46

| Type | Mounting | Adjustment | Note | Part number |
|---|---|---|---|---|
| Mounting kit 1a | Mounting bracket for mounting at the rear on wall or machine | – | – | 2034324 |
| Mounting kit 1b | Mounting bracket for rear mounting on wall or machine with protection of optics cover | – | – | 2034325 |
| Mounting kit 2 | Mounting bracket | Cross-wise adjustment possible | Only in conjunction with mounting kit 1a or 1b | 2039302 |
| Mounting kit 3 | | Longitudinal adjustment possible | Only in conjunction with mounting kit 2 | 2039303 |

### System plugs

| Usage | Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|---|
| Not for use with incremental encoders | Without cable | – | – | SX0B-A0000G | 2032807 |
| | Pre-assembled | 15 | 5 m | SX0B-B1505G | 2034264 |
| | | | 10 m | SX0B-B1510G | 2034265 |
| For use with incremental encoders | Without cable | – | – | SX0B-A0000J | 2032856 |
| | Pre-assembled | 11 | 5 m | SX0B-B1105J | 2032857 |
| | | | 10 m | SX0B-B1110J | 2032858 |

### Connection cables

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 15 | 100 m | 6030795 |
| EFI connection cable | – | By the meter | 6029448 |


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C

### Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

### Configuration connection cables

| Description | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

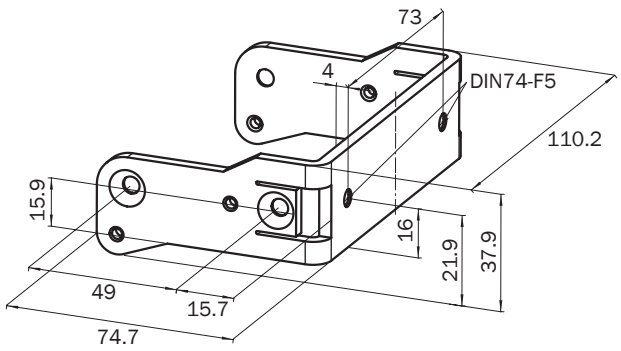
| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Optic cover | Spare parts set for optic cover with replacement seal and screws | 2039248 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |

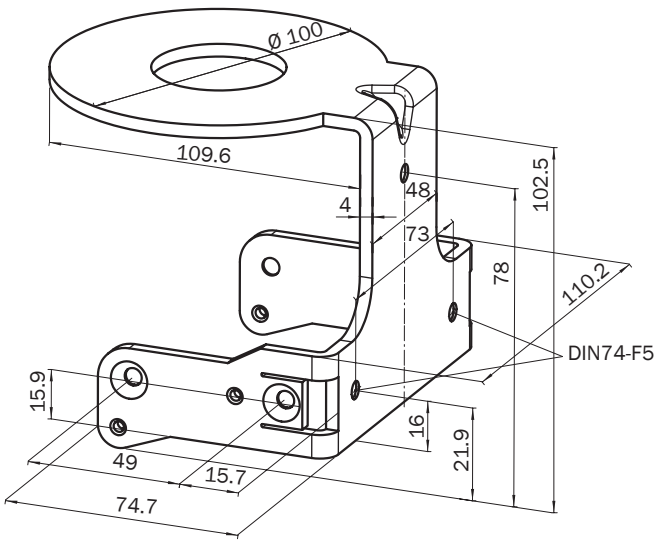
## Dimensional drawings mounting accessories

**Mounting kit 1a**




Dimensions in mm

**Mounting kit 1b**

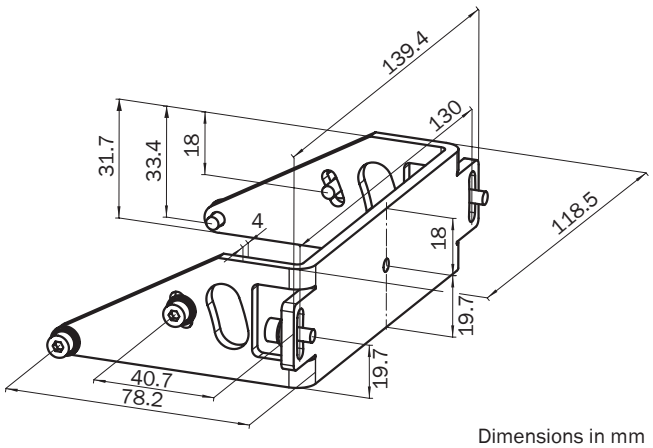




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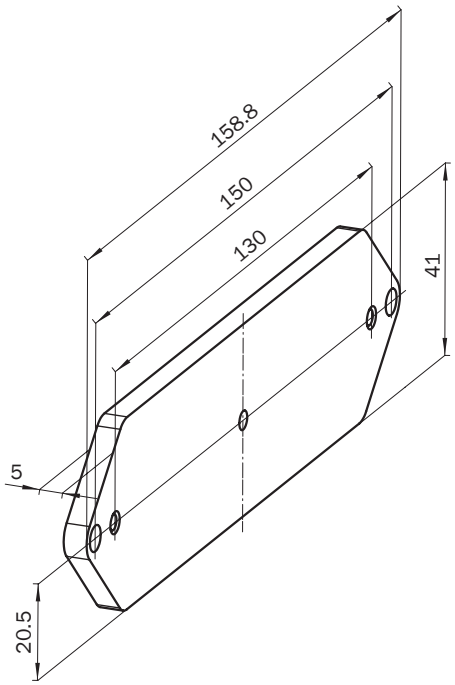
C

**Mounting kit 2**




Dimensions in mm

**Mounting kit 3**





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C



- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical and horizontal use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input

| Further information | Page |
|---|---|
| → Dimensional drawings | C-51 |
| → Connection diagrams | C-53 |
| → Accessories | C-54 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Protective field range** | 2 m |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Number of field sets** | 2 |
| **Scan angle** | 270° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Response time** | 80 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

Compact safety laser scanner for complete safety.
The S300 Advanced is the system of choice particularly for applications with changing operating positions, e.g. insertion stations, robots, moving workbenches and more.

- 2 protective/warning fields
- Possibility of connecting two S300 units to form a single system
- Static protective field switching
- New multi-system "Configuration & Diagnostic Software" CDS

## In-system added value

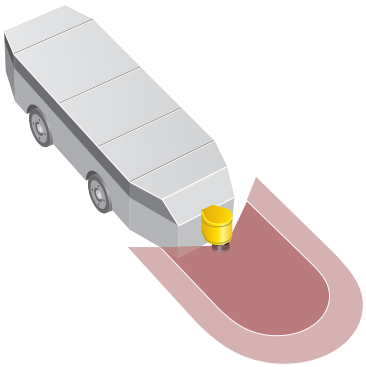
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

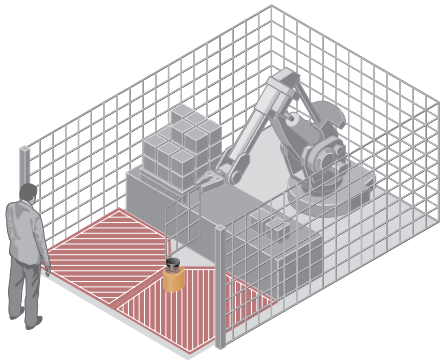
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



**Hazardous area protection on an AGV with one direction of travel**



Hazardous area protection on a robot cell with two operating areas



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# Ordering information

Delivery S300
- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

→ Ordering information for system plug and accessories, see page C-54

C

| Type | Part number |
|---|---|
| S30B-2011CA | 1026821 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Optics cover material** | Polycarbonate |
| **Optics cover surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 102 mm x 152 mm x 105 mm |
| **Weight** | 1.2 kg |

## Functional data

| | |
|---|---|
| **Scan angle** | 270° |
| **Protective field range** | 2 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 80 ms |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Angular resolution** | 0.5° |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Distance measuring range** | 30 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |

Continued on next page


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## Electrical data

| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 30 V DC) |
| **Power consumption** | 0.33 A (24 V DC) |
| **Power consumption** | 1.65 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Static switching signals** | 1, dual-channel |
| **Standby** | 1 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 250 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 38.4 kBaud |
| **EFI – safe SICK device communication** | |
| **Transmission rate** | 500 kBaud |
| **Cable length** | 50 m |
| **Connection conductor cross-section** | 0.22 mm² |

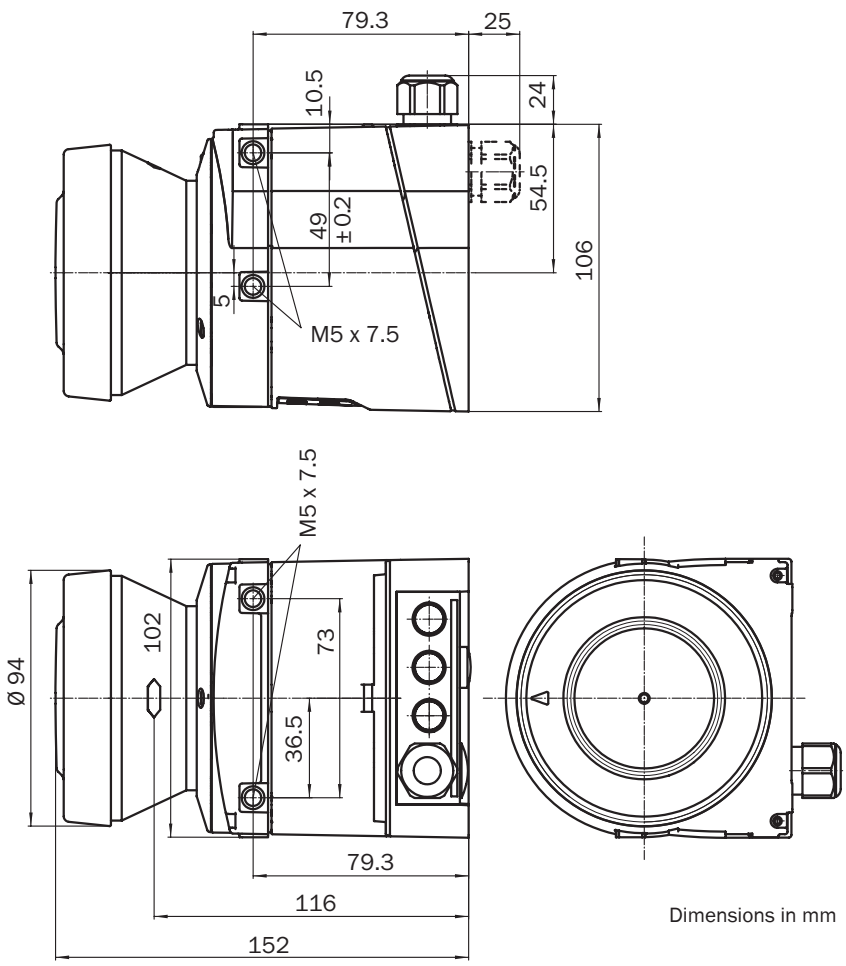
[1] Including maximum output load


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C

# Dimensional drawings

**S300**

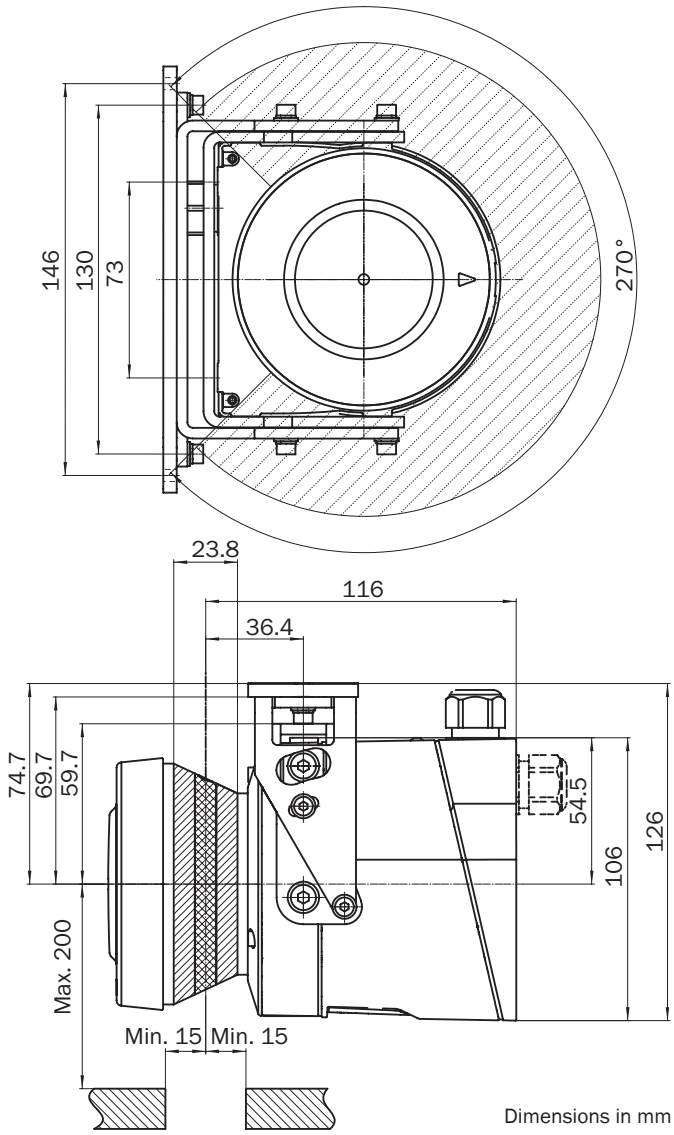



Dimensions in mm


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C

**Scan plane origin**



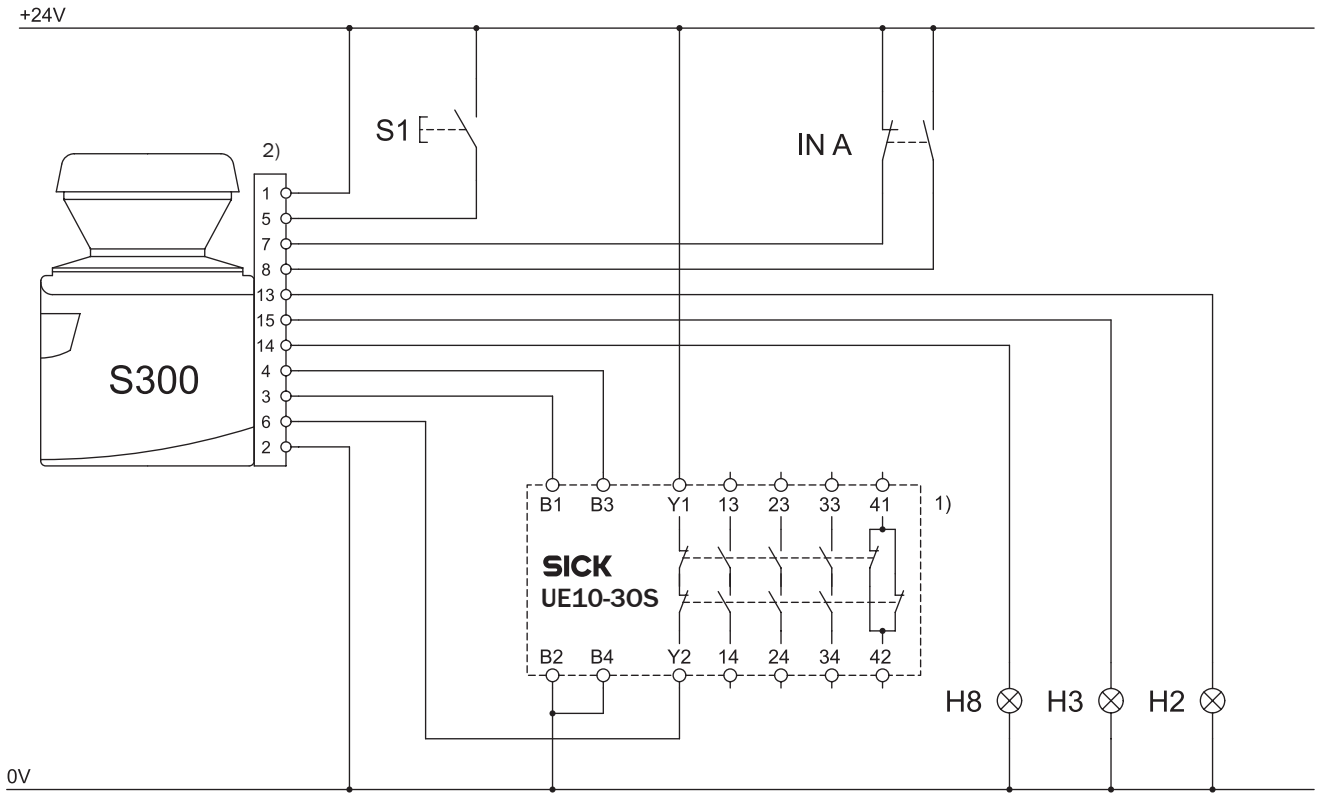

Dimensions in mm


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# Connection diagrams

You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Protective field switching with one pair of static inputs




- S300 Advanced in conjunction with UE10-3OS
- Operating mode: with restart interlock and external device monitoring (EDM)
- Protective field switching by means of control input IN A

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).


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C

# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

# Accessories

### Mounting systems

➜ Dimensional drawings for mounting accessories, see page C-55

| Type | Mounting | Adjustment | Note | Part number |
|---|---|---|---|---|
| Mounting kit 1a | Mounting bracket for mounting at the rear on wall or machine | – | – | 2034324 |
| Mounting kit 1b | Mounting bracket for rear mounting on wall or machine with protection of optics cover | – | – | 2034325 |
| Mounting kit 2 | Mounting bracket | Cross-wise adjustment possible | Only in conjunction with mounting kit 1a or 1b | 2039302 |
| Mounting kit 3 | | Longitudinal adjustment possible | Only in conjunction with mounting kit 2 | 2039303 |

### System plugs

| Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|
| Without cable | – | – | SX0B-A0000G | 2032807 |
| Pre-assembled | 15 | 5 m | SX0B-B1505G | 2034264 |
| | | 10 m | SX0B-B1510G | 2034265 |

### Connection cables

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 15 | 100 m | 6030795 |
| EFI connection cable | – | By the meter | 6029448 |


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### Cable gland

| Usage | Size of the cable gland | Part number |
|---|---|---|
| For EFI connections | M12 | 5308757 |

### Configuration connection cables

| Description | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

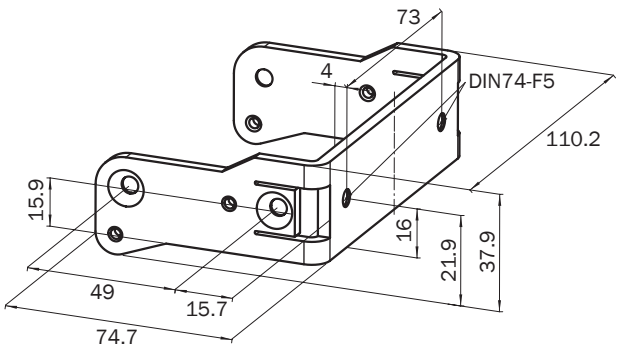
| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Optic cover | Spare parts set for optic cover with replacement seal and screws | 2039248 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |

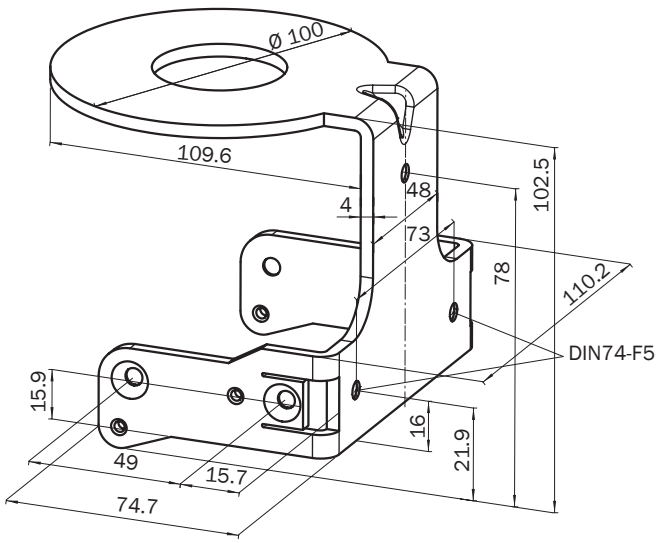
## Dimensional drawings mounting accessories

**Mounting kit 1a**




Dimensions in mm

**Mounting kit 1b**

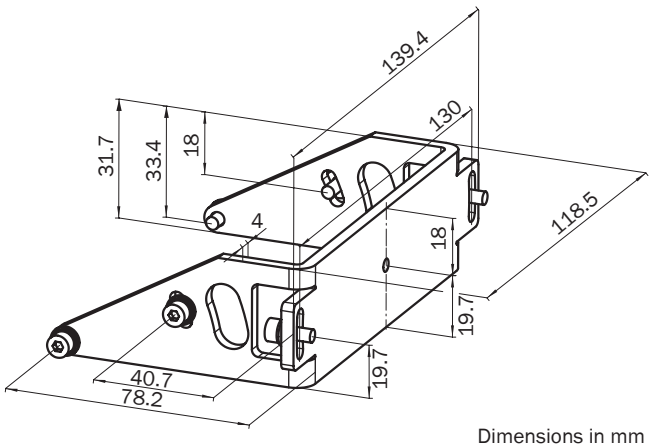




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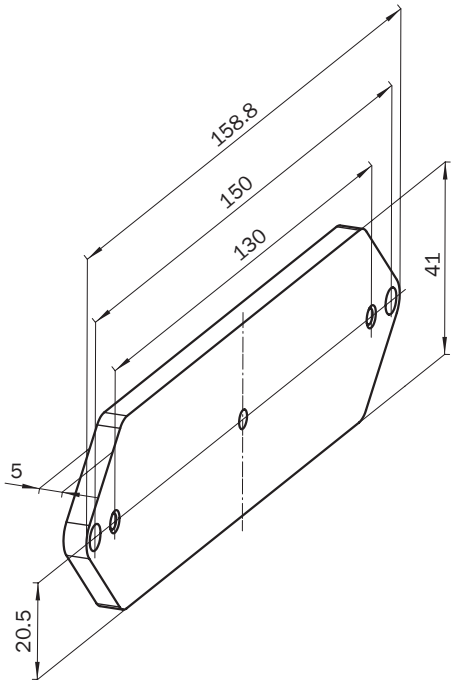
C

**Mounting kit 2**




Dimensions in mm

**Mounting kit 3**





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## Overview of technical specifications

| | |
|---|---|
| **Protective field range** | 2 m |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Number of field sets** | 1 |
| **Scan angle** | 270° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Response time** | 80 ms |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |

## Product description

High-end safety at entry level price
The low-cost solution for simple requirements with one protective field and warning field.
Ideal for the horizontal and vertical protection of hazardous areas and areas of access.

With adjustable object resolution as well as configurable "contour as reference."
- 1 protective and warning field
- New multi-system "Configuration & Diagnostic Software" CDS

## In-system added value

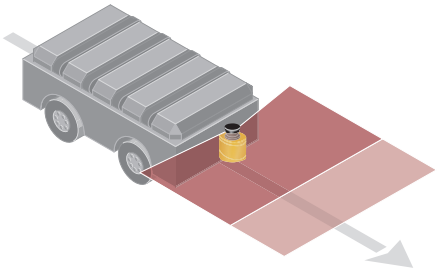
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

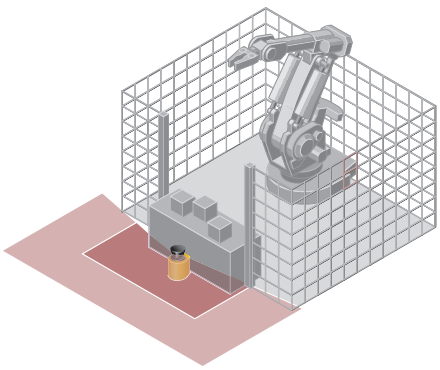
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



Hazardous area protection on an AGV with one direction of travel



Hazardous area protection on a robot cell



C




- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical and horizontal use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input

| Further information | Page |
|---|---|
| → Ordering information | C-58 |
| → Technical specifications | C-58 |
| → Dimensional drawings | C-59 |
| → Connection diagrams | C-61 |
| → Accessories | C-62 |
| → Services | A-2 |



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# Ordering information

Delivery S300
- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

C

→ Ordering information for system plug and accessories, see page C-62

| Type | Part number |
|---|---|
| S30B-2011BA | 1026820 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 3 (IEC/EN 61496-3) |
| **Safety integrity level** | SIL2 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Optics cover material** | Polycarbonate |
| **Optics cover surface finish** | Outside with scratch-resistant coating |
| **System plug** | With ESD protected configuration memory |
| **Dimensions (W x H x D)** | 102 mm x 152 mm x 105 mm |
| **Weight** | 1.2 kg |

## Functional data

| | |
|---|---|
| **Scan angle** | 270° |
| **Protective field range** | 2 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 80 ms |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Angular resolution** | 0.5° |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Distance measuring range** | 30 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |


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### Electrical data

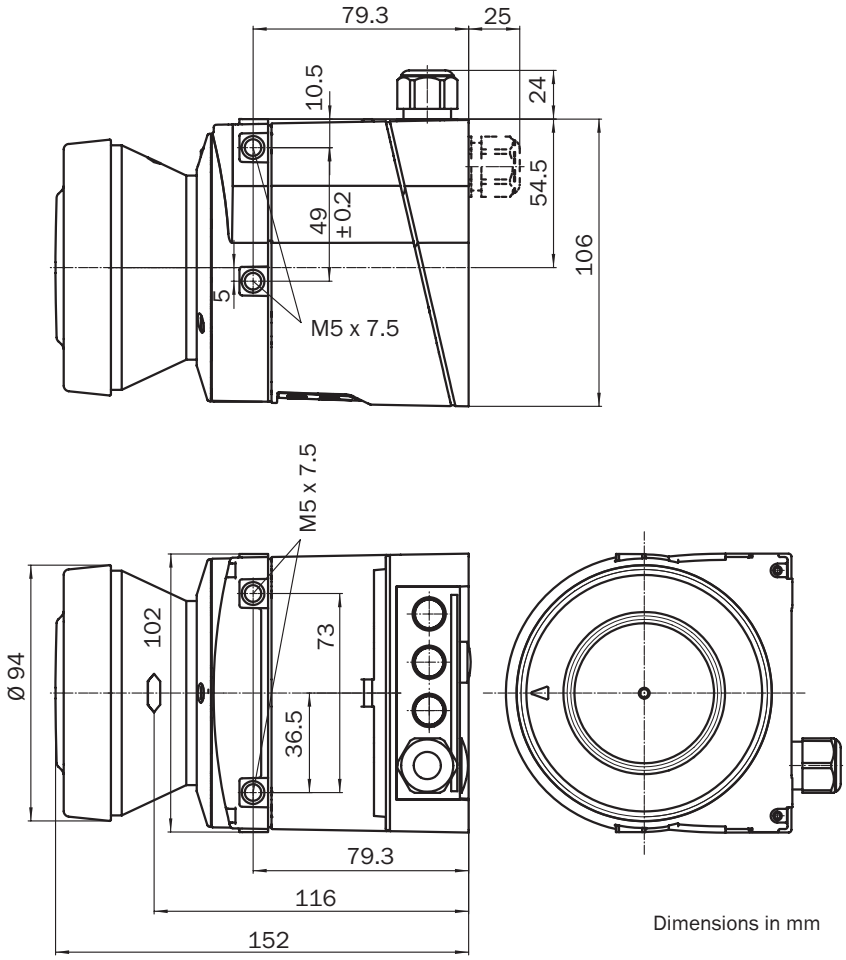
| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 30 V DC) |
| **Power consumption** | 0.33 A (24 V DC) |
| **Power consumption** | 1.65 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Standby** | 1 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 250 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 38.4 kBaud |

[1] Including maximum output load

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## Dimensional drawings

**S300**

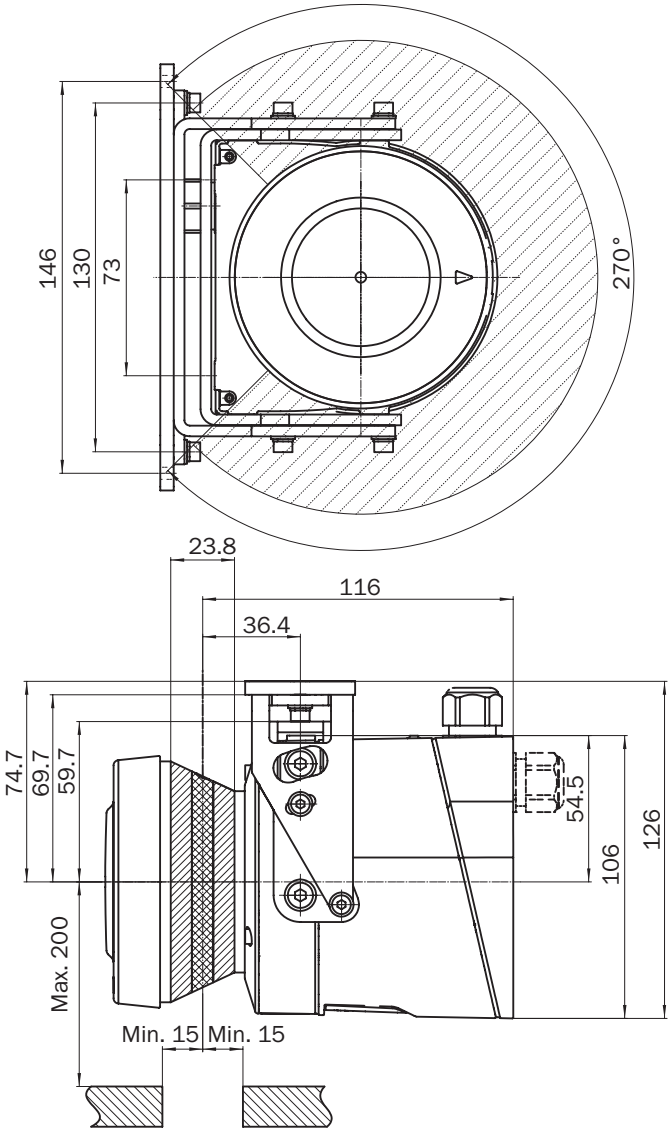



Dimensions in mm


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C

**Scan plane origin**



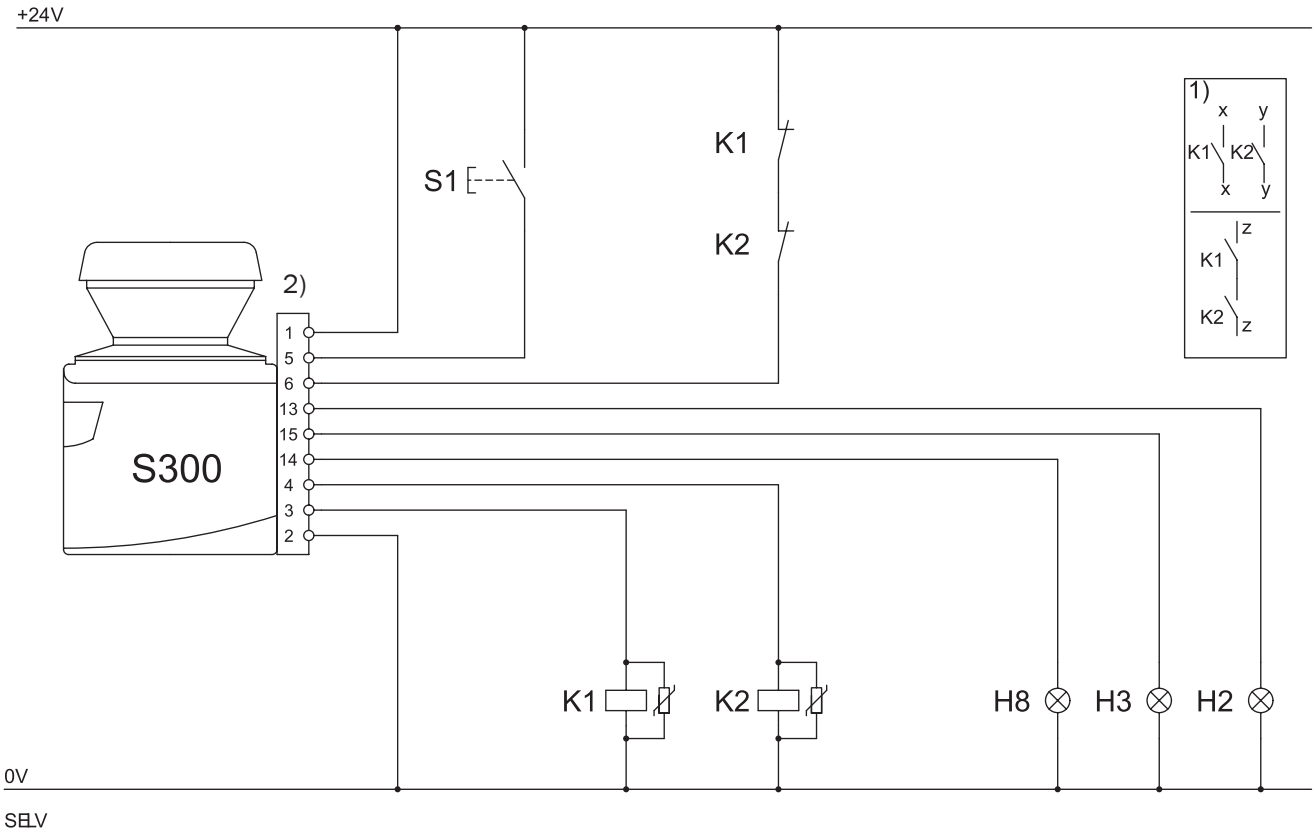

Dimensions in mm


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# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## With restart interlock and external device monitoring




- S300 Standard in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).


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C

## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Accessories

### Mounting systems

→ Dimensional drawings for mounting accessories, see page C-63

| Type | Mounting | Adjustment | Note | Part number |
|---|---|---|---|---|
| Mounting kit 1a | Mounting bracket for mounting at the rear on wall or machine | – | – | 2034324 |
| Mounting kit 1b | Mounting bracket for rear mounting on wall or machine with protection of optics cover | – | – | 2034325 |
| Mounting kit 2 | Mounting bracket | Cross-wise adjustment possible | Only in conjunction with mounting kit 1a or 1b | 2039302 |
| Mounting kit 3 | | Longitudinal adjustment possible | Only in conjunction with mounting kit 2 | 2039303 |

### System plugs

| Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|
| Without cable | – | – | SX0B-A0000G | 2032807 |
| Pre-assembled | 11 | 5 m | SX0B-B1105G | 2032859 |
| | | 10 m | SX0B-B1110G | 2032860 |
| | | 20 m | SX0B-B1120G | 2032861 |

### Connection cable

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 15 | 100 m | 6030795 |


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### Configuration connection cables

| Description | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

C

### Power supply units

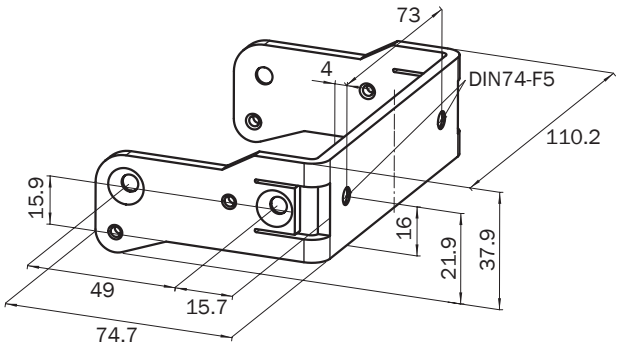
| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Optic cover | Spare parts set for optic cover with replacement seal and screws | 2039248 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |

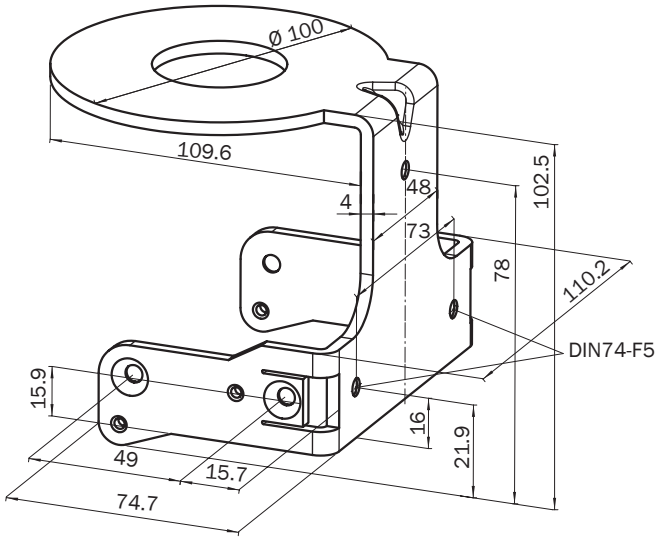
## Dimensional drawings mounting accessories

**Mounting kit 1a**




Dimensions in mm

**Mounting kit 1b**

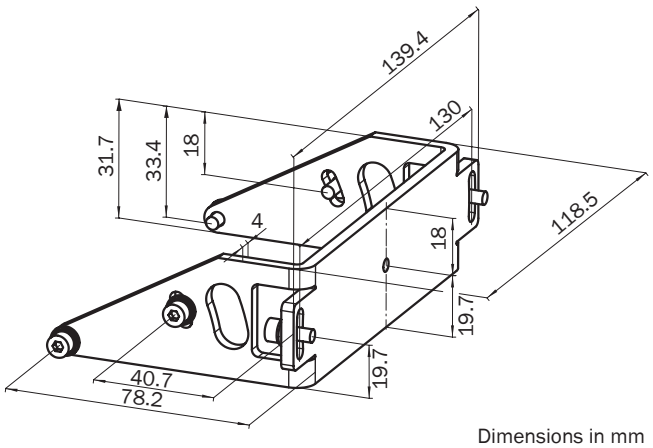




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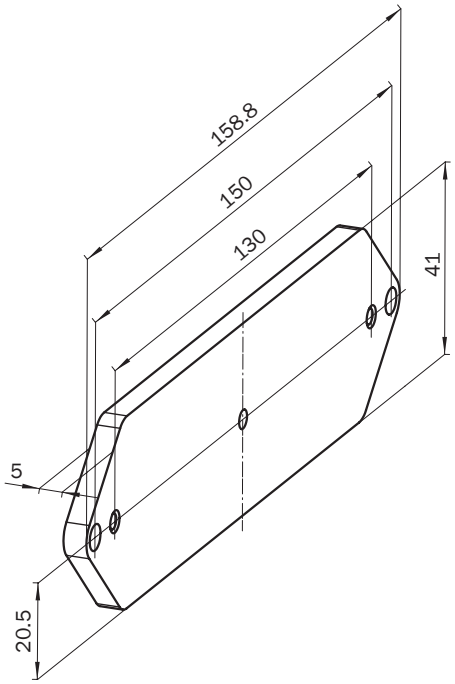
C

**Mounting kit 2**




Dimensions in mm

**Mounting kit 3**





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## Overview of technical specifications

| | |
|---|---|
| **Protective field range** | 1.5 m |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Number of field sets** | 1 |
| **Scan angle** | 270° |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Response time** | 80 ms |
| **Type** | Type 2 (IEC/EN 61496-1) |
| **Safety integrity level** | SIL1 (IEC/EN 61508) |

## Product description

State-of-the-art Type 2 solution.
Finally a system that meets the requirements of Type 2 in accordance with IEC/EN 61496 at the highest technical level and at astoundingly low cost.
The S200 is flexible and easy to integrate, can be used horizontally and vertically, and impresses with its adjustable object resolution as well as the contour as reference function.

- 1 protective/warning field (field set)
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

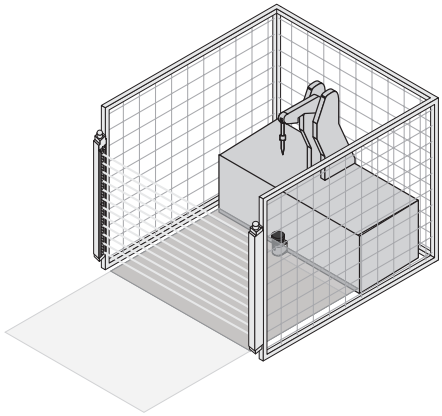
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

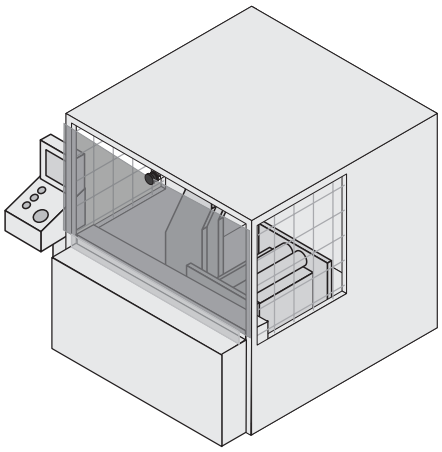
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



Point-of-operation guarding on a robot cell using S200 in conjunction with safety light curtain



Hazardous point protection on a small automatic placement machine






- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical and horizontal use
- 7-segment display
- Integrated external device monitoring (EDM)

| Further information | Page |
|---|---|
| → Ordering information | C-66 |
| → Technical specifications | C-66 |
| → Dimensional drawings | C-68 |
| → Connection diagrams | C-70 |
| → Accessories | C-71 |
| → Services | A-2 |



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# Ordering information

Delivery S200
- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

C

→ Ordering information for system plug and accessories, see page C-71

| Type | Part number |
|---|---|
| S20B-1011BA | 1026823 |

# Detailed technical specifications

→ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | |
|---|---|
| **Laser protection class** | 1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001) |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Protection class** | 2 (DIN VDE 0160, DIN EN 50178) |
| **Type** | Type 2 (IEC/EN 61496-1) |
| **Safety integrity level** | SIL1 (IEC/EN 61508) |
| **Ambient operating temperature from ... to** | –10 °C ... +50 °C |
| **Type of light** | Pulsed laser diode |
| **Wave length** | 905 nm |
| **Housing colour** | RAL 1021 |
| **Housing material** | Aluminium die-cast |
| **Optics cover material** | Polycarbonate |
| **Optics cover surface finish** | Outside with scratch-resistant coating |
| **Dimensions (W x H x D)** | 102 mm x 152 mm x 105 mm |
| **Weight** | 1.2 kg |

## Functional data

| | |
|---|---|
| **Scan angle** | 270° |
| **Protective field range** | 1.5 m |
| **Reflectivity** | Reflectors 1.8 % ... >1000 % |
| **Response time** | 80 ms |
| **Resolution** | 30 mm, 40 mm, 50 mm, 70 mm, selectable |
| **Angular resolution** | 0.5° |
| **Protective field supplement** | 100 mm |
| **Warning field range** | 8 m (at 30 % reflectivity) |
| **Distance measuring range** | 30 m |
| **Number of mulitple samplings** | 2 ... 16, configurable via CDS |
| **Reset time** | 2 s ... 60 s, configurable |


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## Electrical data

| | |
|---|---|
| **Connection type** | Plug-in connection housing with screw |
| **Connector technology** | Screw-type terminals |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 30 V DC) |
| **Power consumption** | 0.33 A (24 V DC) |
| **Power consumption** | 1.65 A [1] |
| **Number of inputs** | |
| **EDM** | 1 |
| **Restart/Reset** | 1 |
| **Standby** | 1 |
| **Number of safety capable outputs** | |
| **Safety outputs (OSSD)** | 2 x 250 mA |
| **Output for warning field** | 1 x 100 mA |
| **Diagnostic output** | 1 x 100 mA |
| **Restart/reset required** | 1 x 100 mA |
| **Configuration and diagnostics interface** | RS-232 |
| **Transmission rate** | 38.4 kBaud |

[1] Including maximum output load

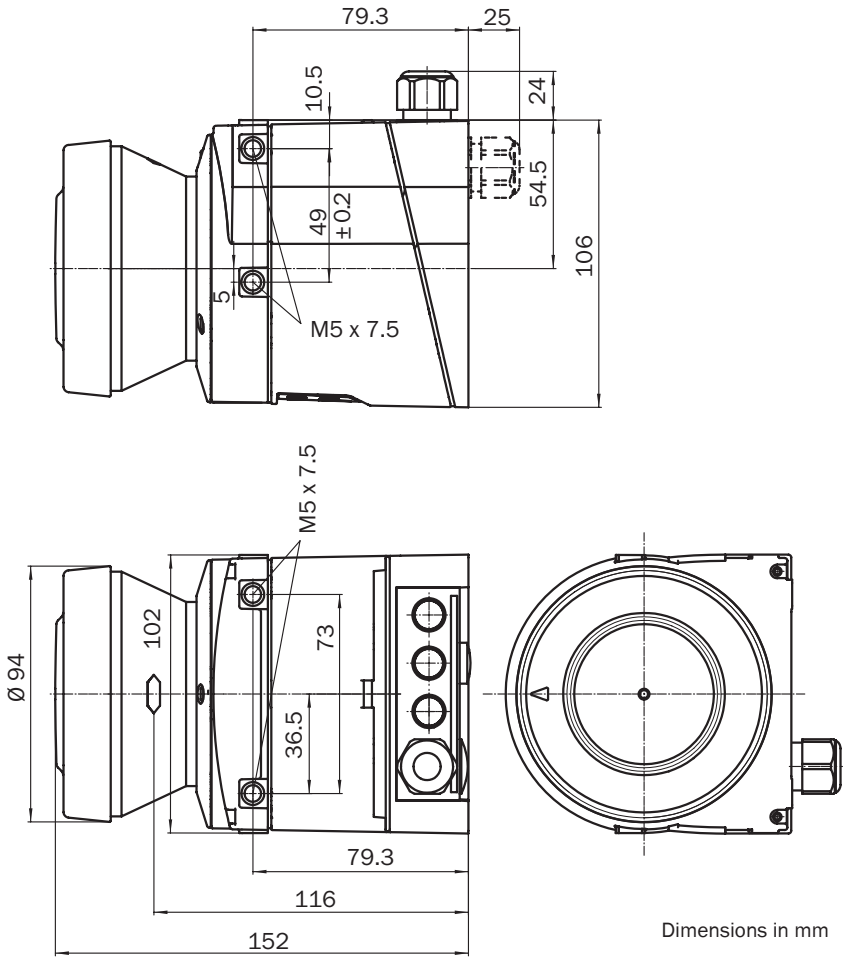
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## Dimensional drawings

**S200**

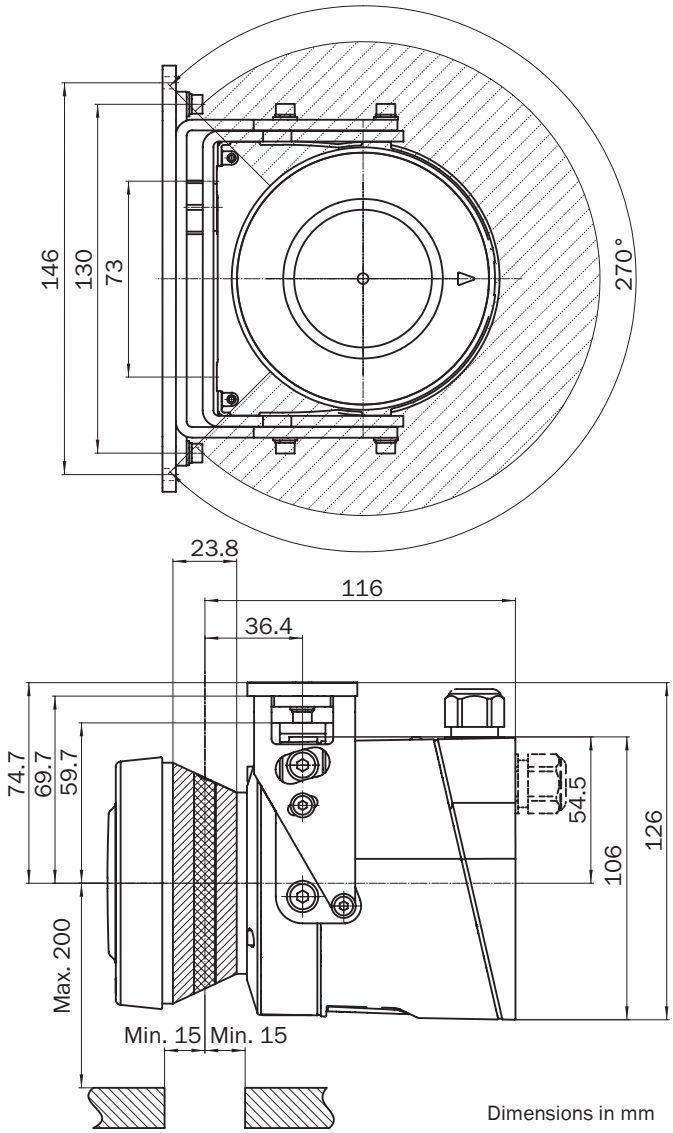



Dimensions in mm


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**Scan plane origin**




Dimensions in mm

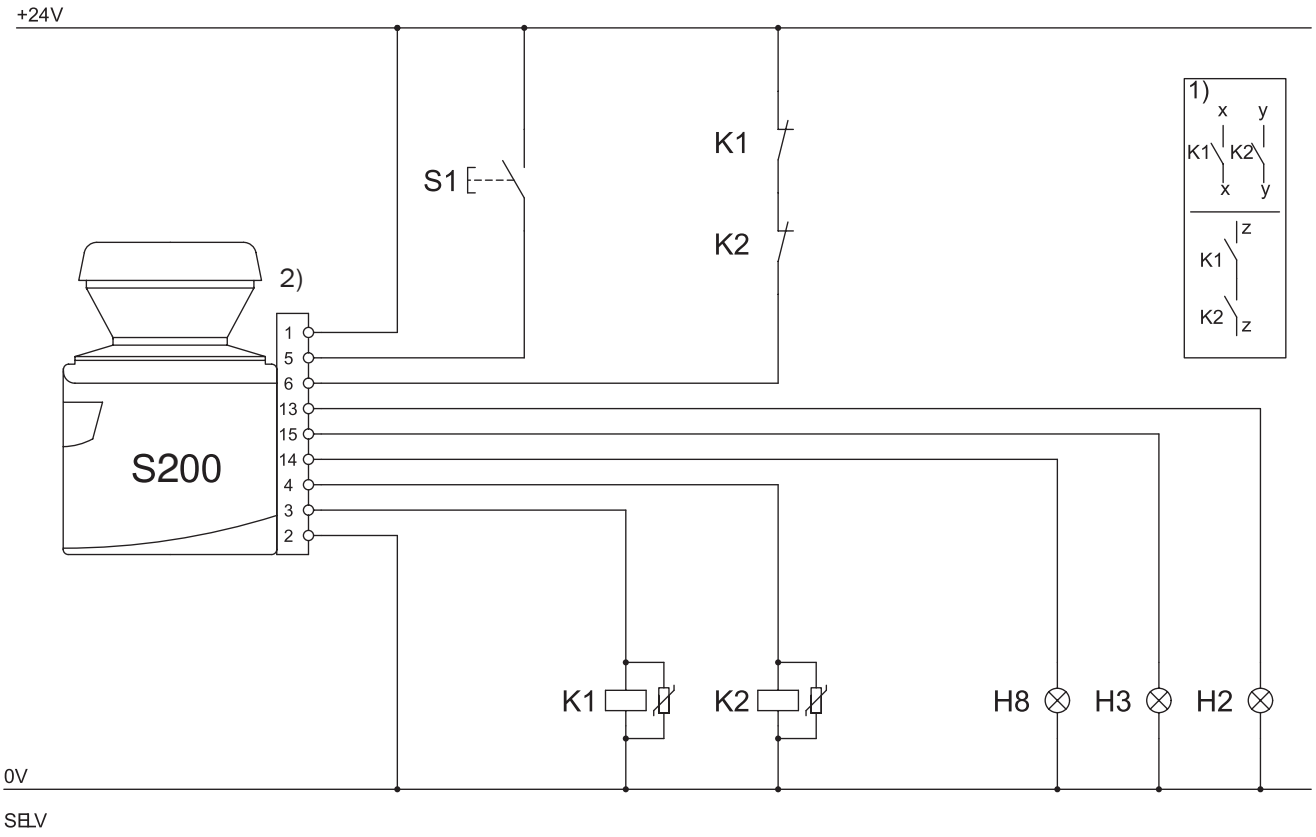

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# Connection diagrams

→ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## With restart interlock and external device monitoring

C




- S200 in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

C

# Accessories

### Mounting systems

→ Dimensional drawings for mounting accessories, see page C-72

| Type | Mounting | Adjustment | Note | Part number |
|---|---|---|---|---|
| Mounting kit 1a | Mounting bracket for mounting at the rear on wall or machine | – | – | 2034324 |
| Mounting kit 1b | Mounting bracket for rear mounting on wall or machine with protection of optics cover | – | – | 2034325 |
| Mounting kit 2 | Mounting bracket | Cross-wise adjustment possible | Only in conjunction with mounting kit 1a or 1b | 2039302 |
| Mounting kit 3 | | Longitudinal adjustment possible | Only in conjunction with mounting kit 2 | 2039303 |

### System plugs

| Connection type | Number of cores | Cable length | Type | Part number |
|---|---|---|---|---|
| Without cable | – | – | SX0B-A0000G | 2032807 |
| Pre-assembled | 11 | 5 m | SX0B-B1105G | 2032859 |
| | | 10 m | SX0B-B1110G | 2032860 |
| | | 20 m | SX0B-B1120G | 2032861 |

### Connection cable

| Type | Number of cores | Cable length | Part number |
|---|---|---|---|
| Connection cable | 15 | 100 m | 6030795 |



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### Configuration connection cables

| Description | Connection type | Cable length | Part number |
|---|---|---|---|
| For connecting the configuration connection to the PC | M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | | 8 m | 2027649 |

### Configuration software

C

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Power supply units

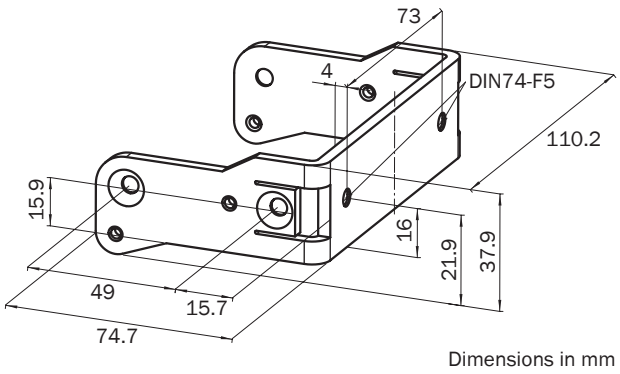
| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |
| 120 V AC, 230 V AC | | 2.5 A | 6010361 |
| | | 4 A | 6010362 |

### Miscellaneous

| Type | Description | Part number |
|---|---|---|
| Optic cover | Spare parts set for optic cover with replacement seal and screws | 2039248 |
| Plastic cleaner | Plastic cleaner and care product, anti-static | 5600006 |
| Lens cloth | Cloth for cleaning the front screen | 4003353 |

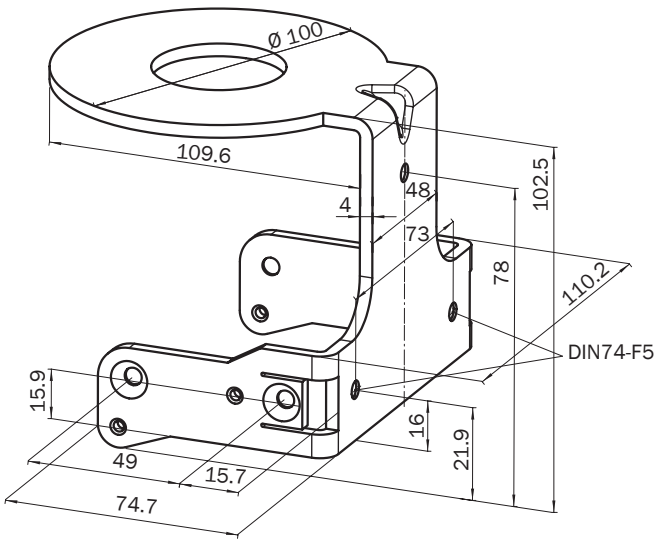
## Dimensional drawings mounting accessories

**Mounting kit 1a**




Dimensions in mm

**Mounting kit 1b**

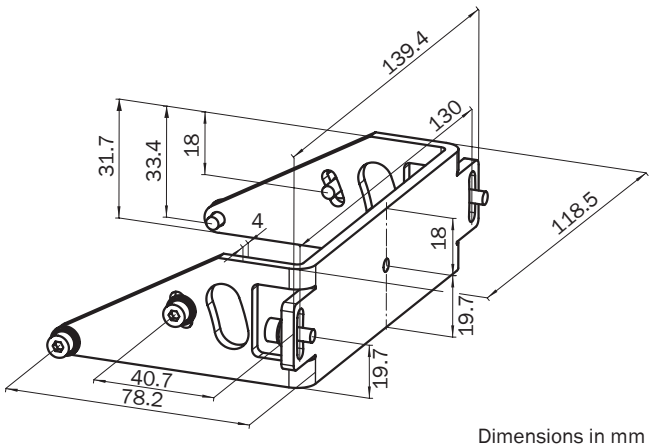




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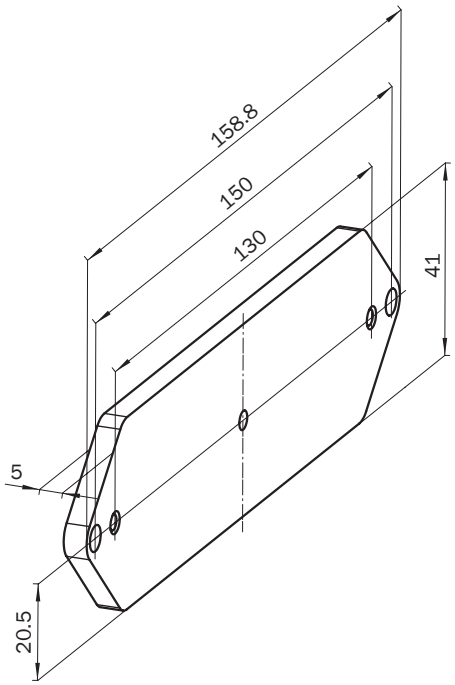
C

**Mounting kit 2**




Dimensions in mm

**Mounting kit 3**

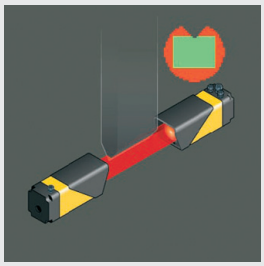


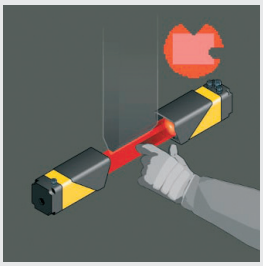



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# Principle of operation of V4000 Press Brake Safeguarding System

The V4000 is a camera-based system for complete protection of hazardous points on press brakes. It is a compact system, consisting of a sender and a receiver, mounted on the upper beam of the press to protect against the hazardous fast closing movement. It provides a safety volume below the punch line and its Output Signal Switching Devices (OSSD) deliver a stop signal to the press controller in order to stop the movement, in case a finger or hand has been detected.





**V4000 Press Brake applications**

Monitoring of the protection volume:
The V4000 monitors the protection volume directly below the upper tool.
Each infringement of the protection volume generates a dual-channel signal resulting in a safe stop of the press brake. The resolution of the V4000 is better than 14 mm.

# Advantages of V4000 Press Brake Safeguarding System

**Operator**

- Because of foot switch monitoring, both hands are free to handle the metal sheet
- Maximum safety for finger and hand protection
- Resolution better than 14 mm
- Simple and fast tool changes due to large tolerance bands
- Self-learning modes simplifies material change
- Interruption-free bending cycles
- Intuitive use
- LED and 7-segment display for fast diagnostics

**Production**

- Maximum safety at maximum speed (up to 300 mm/s)
- Simple and fast retrofitting
- Can be used on older machines
- Reduction of downtimes through powerful diagnostic functions
- Vibration immunity even at emergency stops. The result is higher reliability
- Supports even complex bending tasks
- Maximum productivity through optimised machine cycles
- Worldwide service support for commissioning, maintenance, and repair

**Machine manufacturer**

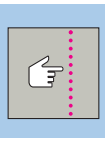
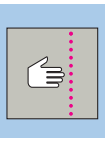
- Type 4, SIL3
- Approved technology
- Camera-based technology for protecting the hazardous area through generous protection volumes
- Compact safety solution
- Easy to integrate into all safety controllers
- Supports even complex bending sequences
- Complete integration into HMI possible
- Enables data exchange with machine controller
- Visualisation and diagnosis software


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# Safety camera system V4000 Press Brake Safeguarding System

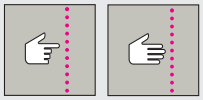



D

| Safety application | Protective field range (m) | Size of safety volume (mm) | Resolution (mm) | Safety: Type 4 (IEC/EN 61496) | Safety: Safety integrity level SIL3 (IEC/EN 61508) | Product | Page |
|---|---|---|---|---|---|---|---|
|   | 0 ... 7.5 | 40 x 26 | 14 | ✔ | ✔ | V4000 Press Brake Safeguarding System | D-2 |



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D



- Press brake protection
- Camera-based
- 7-segment display
- Integrated external device monitoring (EDM)
- Easy configuration via CDS

## Technical data overview

| | |
|---|---|
| **Protective field range** | 0 m ... 7.5 m |
| **Size of safety volume** | 40 mm x 26 mm |
| **Resolution** | 14 mm |
| **Type** | Type 4 (IEC/EN 61496) |
| **Safety integrity level** | SIL3 (IEC/EN 61508) |

## Product description

The V4000 is a camera-based system for complete protecting of press brakes. It is a compact system, consisting of a sender and a receiver, mounted on the upper beam of the press to protect against the hazardous fast closing movement. It provides a safety volume below the punch line and its Output Signal Switching Devices (OSSD) deliver a stop signal to the press controller in order to stop the movement, in case a finger or hand has been detected.

- Camera-based system able to constantly monitor and adjust safety volume
- Maximises machine availability with self-optimising algorithms
- Comprehensive self-diagnostics
- Fast and simple configuration and installation
- High immunity against vibrations and contamination
- Optimised guard-only modes for most common bending tasks
- No unnecessary machine stops, reducing machine hydraulic stress

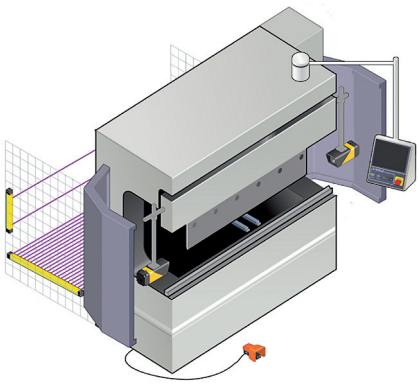
## In-system added value

- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

- Press brakes



V4000 mounted on a press brake


| Further information | Page |
|---|---|
| → Technical specifications | D-4 |
| → Dimensional drawings | D-5 |
| → Connection example | D-8 |
| → Accessories | D-9 |
| → Services | A-2 |




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# Ordering information

Delivery V4000
- V4000 sender
  and
  V4000 receiver
- Test piece
- Set of masks
- Operating instructions and CDS on CD-ROM
- Sticker: *Information for daily inspection*
- Magnetic plate for edge covering on the female die

→ Accessories see page D-9

D

| Sender | | Receiver | |
|---|---|---|---|
| **Type** | **Part number** | **Type** | **Part number** |
| V40PBS-0700000 | 1025765 | V40PBE-0700000 | 1025766 |


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# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

D

## General system data

| | |
|---|---|
| **Laser protection class** | Laser class 1M (21 CFR 1040.10 and 1040.11, IEC 60825-1:2001) |
| **Protective field range** | 0 m ... 7.5 m |
| **Size of safety volume** | 40 x 26 mm |
| **Resolution** | 10 ... 14 mm |
| **Protection class according to DIN VDE 0106, DIN EN 50178** | III |
| **Enclosure rating (IEC 60529)** | IP 54 |
| **Supply voltage $V_S$ at device** [1] | 24 V (19.2 V ... 28.8 V) |
| **Synchronisation** | Electrical |
| **Type** | Type 4 (IEC 61496 ) |
| **Safety integrity level** | SIL3 (IEC 61508 ) |

## Sender

| | |
|---|---|
| **Power consumption** | Max. 0.2 A |

## Receiver

| | |
|---|---|
| **Output signal switching devices (OSSDs)** | 2 PNP semiconductors (short-circuit protected [2]/cross-circuit monitored) |
| **Response time T1** | 10 ms |
| **Switching voltage HIGH (active, $V_{eff}$)** | 24 V ($V_S$ – 2.7 V ... $V_S$) |
| **Switching voltage LOW (inactive)** | 0 V (0 V ... 3.5 V) |
| **Switching current** | 0 mA ... 500 mA |
| **Power consumption** | Max. 0.5 A (without OSSD) |
| **Application diagnostic output for teach-in request, set speed request $V_{slow}$** | PNP semiconductor, short-circuit protected [2] |
| **Switching voltage HIGH (active)** | 24 V ($V_S$ – 3.3 V ... $V_S$) |
| **Switching voltage LOW (inactive)** | High resistance |
| **Switching current** | 0 mA ... 200 mA |

## Operating data

| | |
|---|---|
| **Connection** | Plug-in connection housing with screw terminal connections |
| **Length of cable** [3] | Max. 30 m |
| **Wire cross-section** | Min. 0.14 mm² |
| **Ambient operating temperature** | 0 °C ... +50 °C |
| **Air humidity** | 15 % ... 95 %, non-dewing |
| **Storage temperature** | –25 °C ... +70 °C (max. 24 h) |
| **Vibration resistance** | 5 g, 10 Hz ... 100 Hz (IEC 61496-1, sections 5.1.2 and 5.4.2) |
| **Shock resistance** | |
| **Single shock** | 15 g, 11 ms (EN 60068-2-27) |
| **Continuous shock** | 10 g, 16 ms (IEC/EN 61496-1, sections 5.1.2 and 5.4.4.2) |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

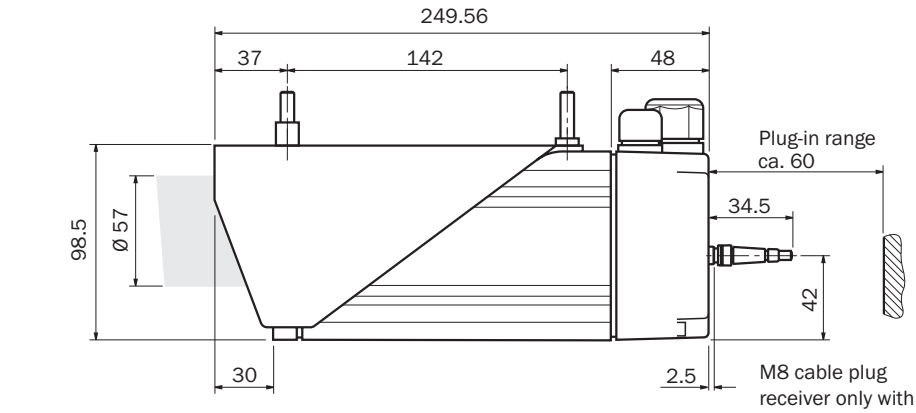
[2] Applies to the voltage range between –30 V and +30 V

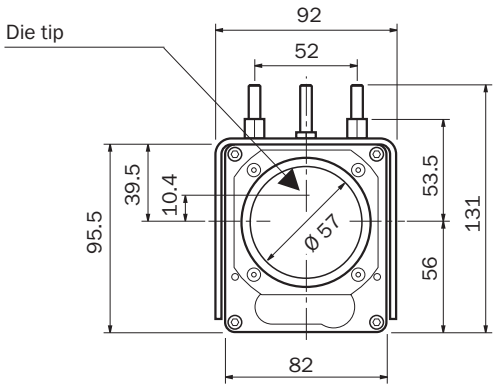
[3] Depending on load, power supply and wire cross-section. The technical specifications must be observed.


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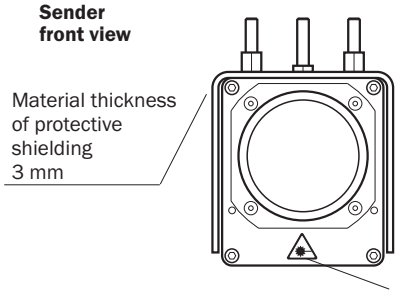
# Dimensional drawings

## Sender and receiver

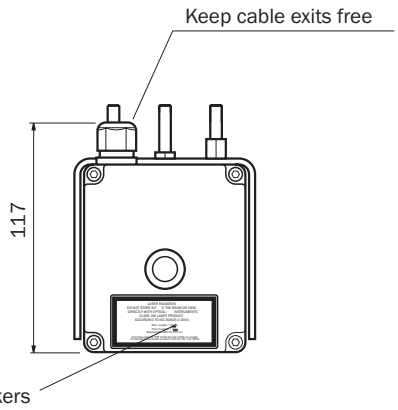


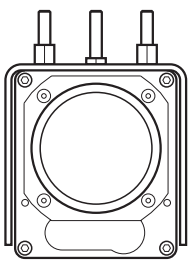

**Sender front view**



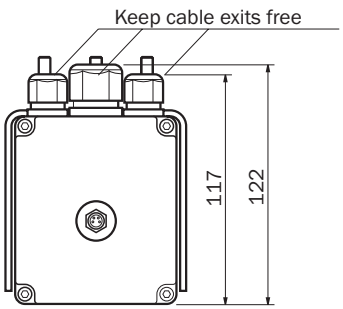

**Sender rear view**




**Receiver front view**



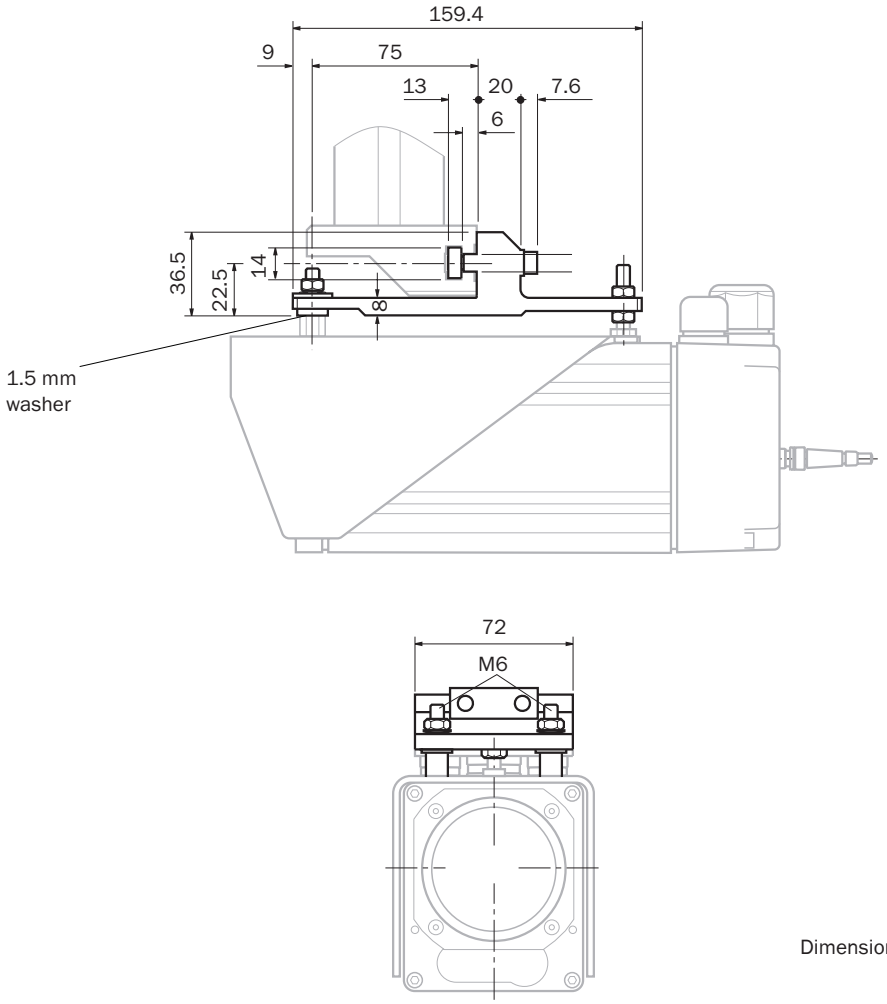
**Receiver rear view**




Dimensions in mm


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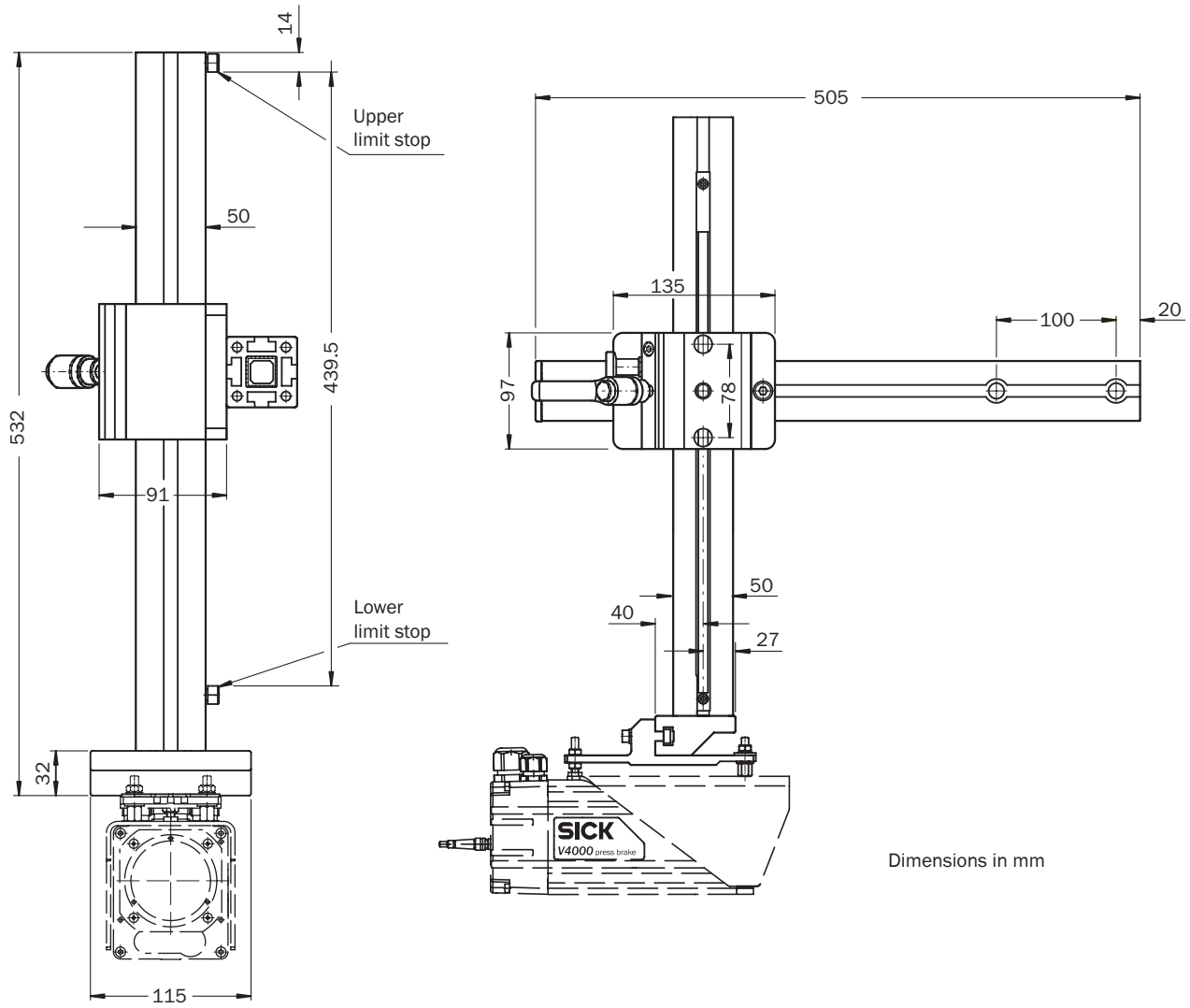
## Mounting kit 1




Dimensions in mm


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## Mounting kit 2



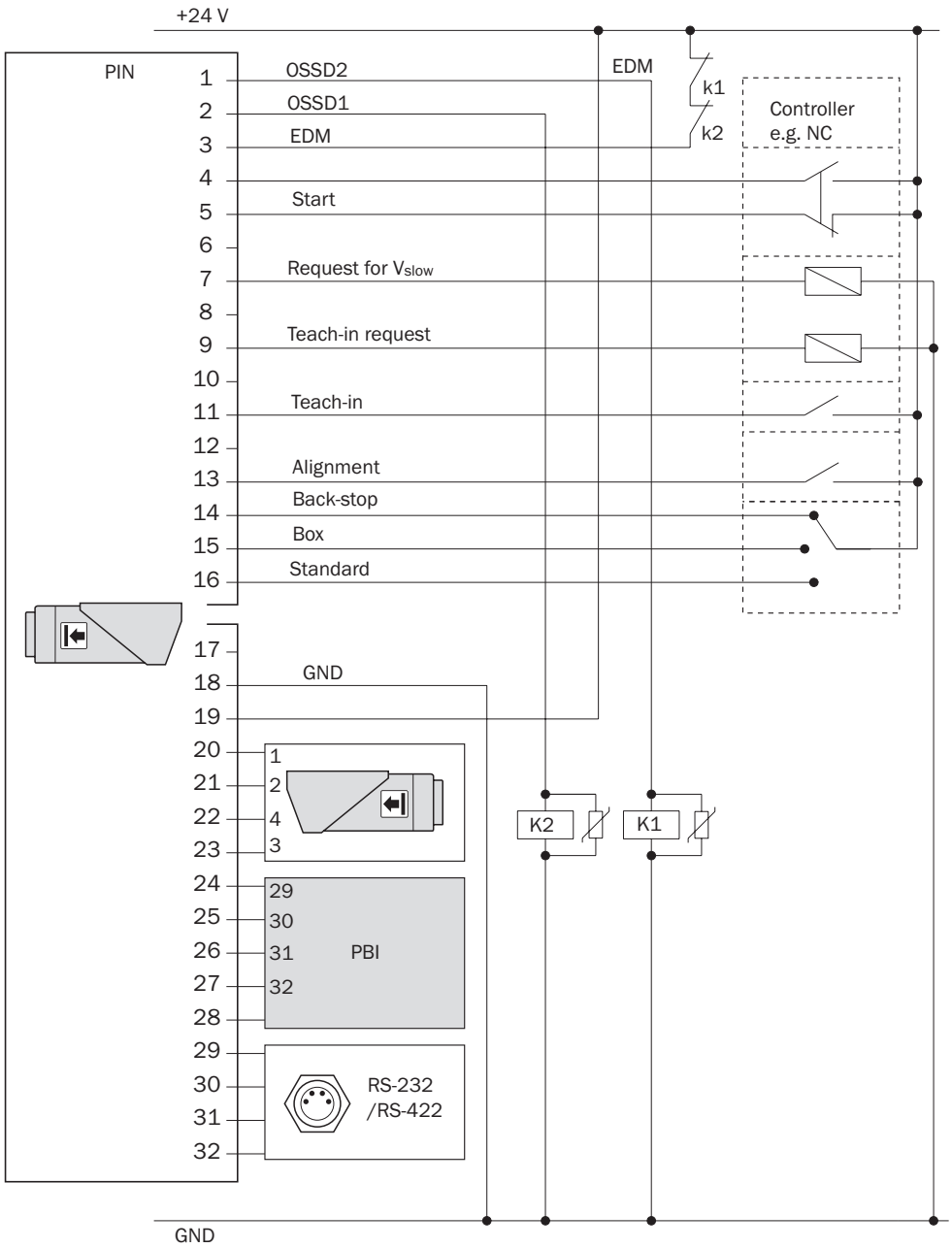

Dimensions in mm

D


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# Connection example V4000 Press Brake Safeguarding System







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# Accessories

| Part | Description | Part number |
|---|---|---|
| PBI (Press Brake Interface) | | 1026798 |
| Spare part set PBI plug | ▪ With extractor for PBI, 16-pin<br>▪ 2 pieces | 2032051 |
| Spare part set V4000 PB plug | ▪ Receiver 16-pin<br>▪ 2 pieces | 2032052 |
| Set of masks | ▪ Receiver mask, sender mask, press crosshead mask | 2030829 |
| Test object | ▪ For protection volume monitoring | 4040724 |
| Magnetic plate | ▪ For covering the female die opening below the workpiece | 4040736 |

**Mounting systems**

| Part | Description | Part number |
|---|---|---|
| Mounting kit 1 | ▪ Alignment plate<br>▪ 2 pieces | 2031126 |
| Mounting kit 2 | ▪ Mounting arm<br>▪ 2 pieces | 2031745 |

**Connector technology**

| Part | Description | Part number |
|---|---|---|
| Connecting cables (shielded) for self-configuration, yard ware, wire cross-section 0.34 mm² | ▪ Sender - receiver, 4-pin, approved for trailing cables | 6029221 |
| | ▪ Receiver - PBI, 4-pin | 6029222 |
| | ▪ Receiver - control cabinet, 18-pin, approved for trailing cables | 6029223 |
| Power supply | ▪ 24 V DC, 2.5 A | 6010361 |
| Service cable 2 m | ▪ Connecting cable between configuration connection and serial PC interface<br>▪ M8 4-pin/SUB-D 9-pin (DIN 41642) | 6021195 |
| Service cable 8 m | | 2027649 |




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# Principle of operation of safety light curtains

Safety light curtains are used for finger protection, hand protection and access protection. They comprise a sender unit and a receiver unit and are electrosensitive. Depending on the type, various machine functions are integrated or can be selected using safe control solutions: Restart interlock, external device monitoring, fixed/floating blanking, PSDI function, bypass function, operating mode selection, etc.

# Applications for safety light curtains

Presses, automatic placement machines, robot insertion stations, transfer lines, palletiser systems, textile and wood processing machines, etc.

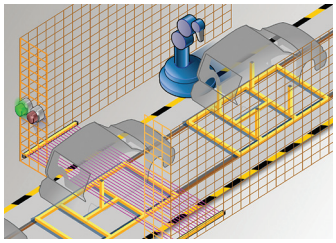
**Tell us your application!**
We will show you the most cost-effective solution.

# Advantages of the SICK safety light curtains

**Only invest in what you actually need!**
Effective protection for man and machine – irrespective of the safety task you want to address, SICK can provide a comprehensive solution with a wide range of safety light curtains.

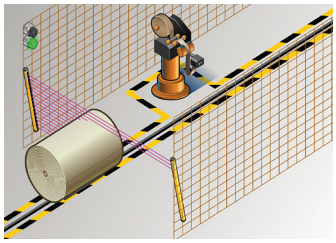
- Cost-saving complete systems with integrated functions for a wide range of requirements
- Rapid commissioning
- Individual adaptation using CDS user software or customer-specific pre-settings from the factory
- Can be used with large temperature fluctuations as well as in wet areas due to IP 67 Housing
- Reduced engineering and stock-holding costs due to universal interface for various automation environments
- Integrated PSDI mode with defined PSDI window provides up to 30% higher productivity

**Cost-effective**



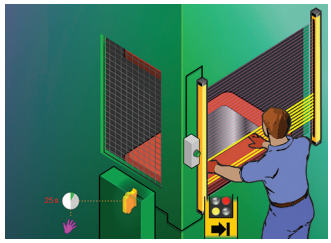
Access protection:
A safety light curtain without additional sensors and mechanics

**Available**



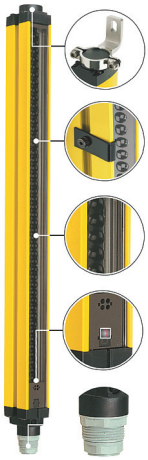
Access protection with differentiation between man and material using “blanking”

**Safe**



Classic finger/hand protection:
Defined PSDI window hinders unintentional cycle start caused by reaching over or reaching under

# Mounting and operation made easy



Comprehensive range of mounting solutions and accessories provides a wide range of installation options

Heavy-duty additional front screen for use with welding sparks

Additional package enables ATEX applications in explosion-protected zones 2 and 22 (II cat. 3G/3D)

7-segment display for device status with display that can be rotated by 180°

All peripheral technologies can be incorporated using a universal interface: from the relay through safe control to the bus.

# Safety services

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

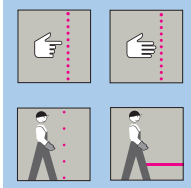
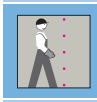
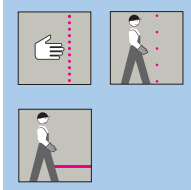


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# Safety light curtains



E

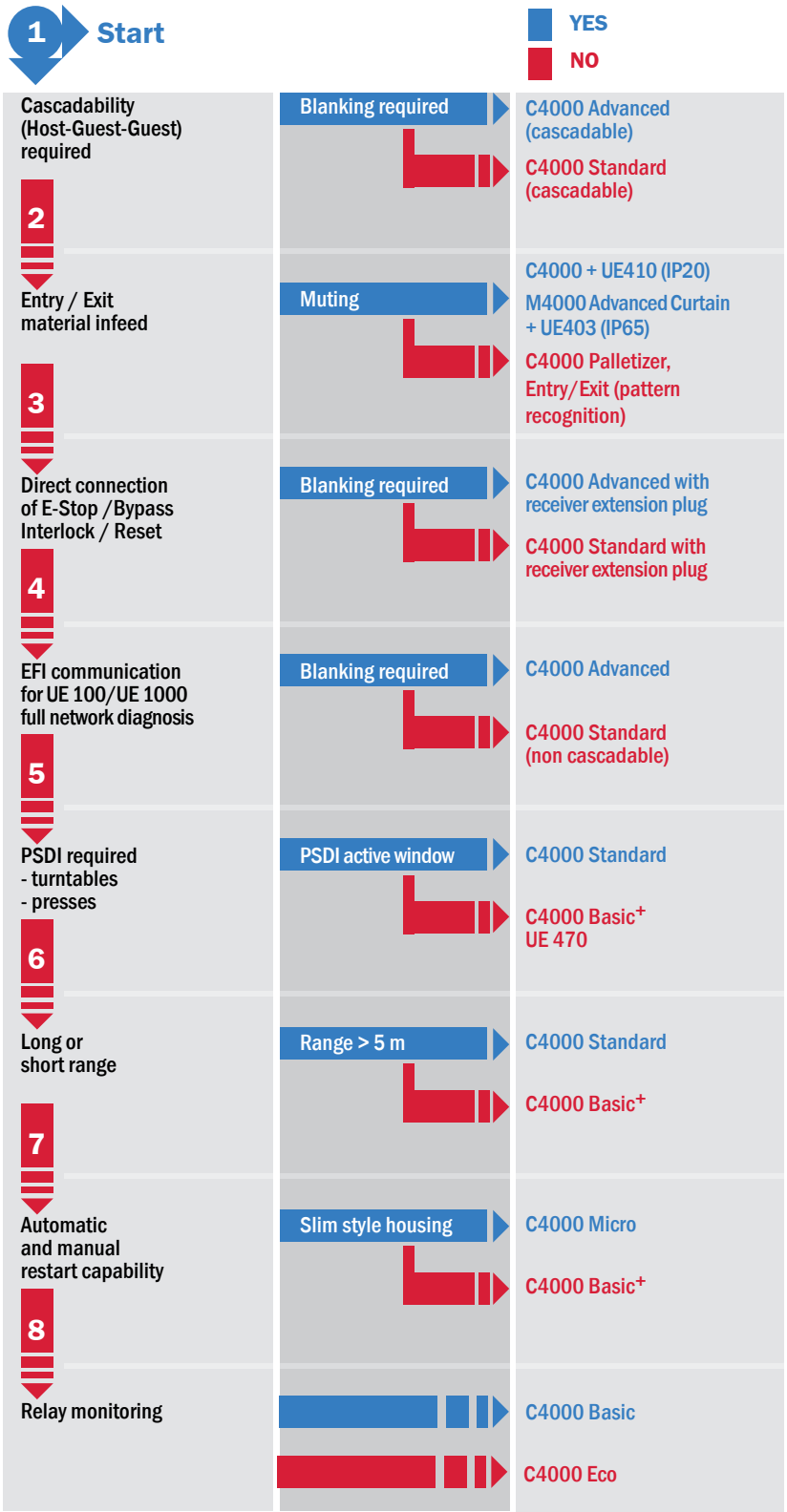
| Safety application | Type according to IEC 61496 | Resolution (mm) | Functions: External device | Restart interlock | Beam coding | Operating mode [1] | PSDI mode [1] | Blanking | Safe interface to bus systems | Muting | ATEX II 3G/3D [7] | Product | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Type 4 | 14/20/30/40 | ✔ | ✔ | ✔ | ✔ | ✔ [1] | ✔ | ✔ [6] | ✔ [3] | ✔ | C4000 Advanced | E-3 |
| | | 14/30 | ✔ | ✔ | ✔ | – | ✔ [4] | – | ✔ [6] | ✔ [2] | – | M4000 Advanced Curtain | E-18 |
| | | 14/20/30/40 | ✔ | ✔ | ✔ | ✔ | ✔ [1] | – | ✔ [6] | ✔ [3] | ✔ | C4000 Standard | E-34 |
| | | 14/30 | ✔ | ✔ | – | – | ✔ [4] | – | ✔ | ✔ [3] | – | C4000 Micro | E-50 |
| | | | ✔ | ✔ | – | – | ✔ [4] | – | ✔ | ✔ [3] | – | C4000 Micro in IP 67 Housing | E-50 |
| | | | ✔ | ✔ | – | – | ✔ [4] | – | ✔ | ✔ [3] | – | C4000 Basic Plus | E-64 |
| | | | ✔ | – | – | – | ✔ [4] | – | ✔ | ✔ [3] | – | C4000 Basic | E-73 |
| | | | – | – | – | – | ✔ [4] | – | ✔ | ✔ [3] | – | C4000 Eco | E-83 |
|  | Type 4 | 20 | ✔ | ✔ | – | ✔ | – | – | ✔ [6] | – | ✔ | C4000 Entry/Exit | E-92 |
| | | | ✔ | ✔ | ✔ | ✔ | – | – | ✔ [6] | – | ✔ | C4000 Palletizer | E-99 |
|  | Type 2 | 20/30/40 | ✔ | – | ✔ | – | – | – | ✔ | ✔ [5] | – | C2000 Standard | E-106 |
| | | 30 | ✔ | – | ✔ | – | – | – | ✔ | ✔ [5] | – | C2000 Standard in IP 67 Housing | E-119 |
| | | 20/30/40 | ✔ | ✔ | ✔ | – | – | – | ✔ | ✔ [5] | – | C2000 RES/EDM | E-124 |
| | | | ✔ | – | ✔ | – | – | – | ✔ | ✔ [5] | – | C2000 Cascadable | E-137 |
| | Type 2 [8] | 30 | ✔ | ✔ | – | – | – | ✔ | ✔ | – | – | LGT | E-147 |

[1] With UE402
[2] With UE403
[3] With UE410 Flexi
[4] With UE470
[5] With LE20 Muting
[6] Safety control solutions with SDL interface expand the functionality of the devices and allow diagnostics and configuration
[7] With ATEX package
[8] Checked according to prEN 50100

➜ Suitable device columns can be found beginning on page F-82



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## Overview of technical specifications

| | |
|---|---|
| **Protective field height (depending on type)** | 150 mm ... 1800 mm |
| **Scanning range (depending on type)** | 0 m ... 8 m / 0 m ... 19 m |
| **Resolution (depending on type)** | 14 mm / 20 mm / 30 mm / 40 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The C4000 Advanced safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection:

- Blanking functions allow defined objects to be present in the protective field, e.g. cables, benches.
- Quick teach-in on-site reduces set-up times
- Adjustable tolerances increase availability
- Emergency stop, bypass or reset directly at the extension connection
- Application diagnostic output for status information
- Configure quickly and straightforwardly using Clone Plug

## In-system added value

- Supports integration with multiple safety control solutions

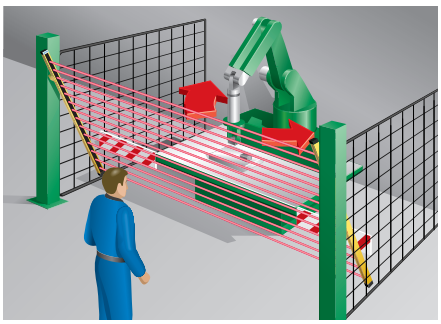
| Combination with | Restart interlock | External device monitoring | Bypass | PSDI/ PSDI window | Teach-in | Operating mode selection | Further information |
|---|---|---|---|---|---|---|---|
| **UE402** | – | – | ✔ | ✔ | ✔ | ✔ | E-13 |
| **UE48-2OS** | ✔ | ✔ | – | – | – | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | – | – | – | N-48 |
| **UE10-3OS** | **Relay module** | | | | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

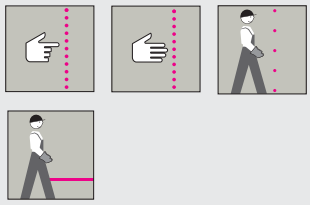
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Plastic and rubber industry
- Shaping machine tools
- Electronics industry
- Car and vehicle manufacture
- Robots
- Printing and paper industry
- Wood processing
- Palletiser



Hazardous point protection on an industrial robot






- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding
- Teach-in blanking
- Floating blanking
- Fixed blanking
- Reduced resolution
- Up to 3 systems can be cascaded
- Alignment and diagnostics via 7-segment display
- ATEX II 3 G/3D
- Configuration and diagnostics via PC

| Further information | Page |
|---|---|
| → Ordering information | E-4 |
| → Technical specifications | E-8 |
| → Dimensional drawings | E-9 |
| → Connection diagrams | E-11 |
| → Accessories | E-12 |
| → Services | A-2 |





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# Ordering information

## C4000 Advanced without extension connection

→ Ordering information C4000 Advanced with extension connection, see page E-6

| | |
|---|---|
| **Housing cross-section** | 48 mm × 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass (with UE402), operating mode switching (with UE402) |
| **Consisting of** | Sender and receiver unit |
| **Usage** | Last system in a cascade or stand-alone system |
| **Connections** | System connection: Hirschmann plug M26 × 11 + FE<br>Configuration connection: M8 × 4 |

E

### Resolution 14 mm, scanning range 0 m ... 8 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301CA010 | 1018591 | C40E-0301CB010 | 1018781 | C40P-0301CB010 | 7026368 |
| 450 | C40S-0401CA010 | 1018347 | C40E-0401CB010 | 1018782 | C40P-0401CB010 | 7026369 |
| 600 | C40S-0601CA010 | 1018593 | C40E-0601CB010 | 1018783 | C40P-0601CB010 | 7026370 |
| 750 | C40S-0701CA010 | 1018595 | C40E-0701CB010 | 1018784 | C40P-0701CB010 | 7026371 |
| 900 | C40S-0901CA010 | 1018597 | C40E-0901CB010 | 1018785 | C40P-0901CB010 | 7026372 |
| 1050 | C40S-1001CA010 | 1018599 | C40E-1001CB010 | 1018786 | C40P-1001CB010 | 7026373 |
| 1200 | C40S-1201CA010 | 1018601 | C40E-1201CB010 | 1018787 | C40P-1201CB010 | 7026374 |
| 1350 | C40S-1301CA010 | 1018603 | C40E-1301CB010 | 1018788 | C40P-1301CB010 | 7026375 |
| 1500 | C40S-1501CA010 | 1018605 | C40E-1501CB010 | 1018789 | C40P-1501CB010 | 7026376 |
| 1650 | C40S-1601CA010 | 1018607 | C40E-1601CB010 | 1018790 | C40P-1601CB010 | 7027033 |
| 1800 | C40S-1801CA010 | 1018609 | C40E-1801CB010 | 1018791 | C40P-1801CB010 | 7026377 |

### Resolution 20 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0302CA010 | 1018613 | C40E-0302CB010 | 1018792 | C40P-0302CB010 | 7026378 |
| 450 | C40S-0402CA010 | 1018615 | C40E-0402CB010 | 1018793 | C40P-0402CB010 | 7026379 |
| 600 | C40S-0602CA010 | 1018617 | C40E-0602CB010 | 1018794 | C40P-0602CB010 | 7026380 |
| 750 | C40S-0702CA010 | 1018619 | C40E-0702CB010 | 1018795 | C40P-0702CB010 | 7026381 |
| 900 | C40S-0902CA010 | 1018621 | C40E-0902CB010 | 1018796 | C40P-0902CB010 | 7026382 |
| 1050 | C40S-1002CA010 | 1018623 | C40E-1002CB010 | 1018797 | C40P-1002CB010 | 7026383 |
| 1200 | C40S-1202CA010 | 1018625 | C40E-1202CB010 | 1018798 | C40P-1202CB010 | 7026384 |
| 1350 | C40S-1302CA010 | 1018627 | C40E-1302CB010 | 1018799 | C40P-1302CB010 | 7026385 |
| 1500 | C40S-1502CA010 | 1018629 | C40E-1502CB010 | 1018800 | C40P-1502CB010 | 7026386 |
| 1650 | C40S-1602CA010 | 1018631 | C40E-1602CB010 | 1018801 | C40P-1602CB010 | 7027034 |
| 1800 | C40S-1802CA010 | 1018633 | C40E-1802CB010 | 1018802 | C40P-1802CB010 | 7026387 |

Continued on next page


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### Resolution 30 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303CA010 | 1018635 | C40E-0303CB010 | 1018803 | C40P-0303CB010 | 7026388 |
| 450 | C40S-0403CA010 | 1018637 | C40E-0403CB010 | 1018804 | C40P-0403CB010 | 7026389 |
| 600 | C40S-0603CA010 | 1018639 | C40E-0603CB010 | 1018805 | C40P-0603CB010 | 7026390 |
| 750 | C40S-0703CA010 | 1018641 | C40E-0703CB010 | 1018806 | C40P-0703CB010 | 7026391 |
| 900 | C40S-0903CA010 | 1018643 | C40E-0903CB010 | 1018807 | C40P-0903CB010 | 7026392 |
| 1050 | C40S-1003CA010 | 1018645 | C40E-1003CB010 | 1018809 | C40P-1003CB010 | 7026393 |
| 1200 | C40S-1203CA010 | 1018647 | C40E-1203CB010 | 1018810 | C40P-1203CB010 | 7026394 |
| 1350 | C40S-1303CA010 | 1018649 | C40E-1303CB010 | 1018811 | C40P-1303CB010 | 7026395 |
| 1500 | C40S-1503CA010 | 1018651 | C40E-1503CB010 | 1018812 | C40P-1503CB010 | 7026396 |
| 1650 | C40S-1603CA010 | 1018653 | C40E-1603CB010 | 1018813 | C40P-1603CB010 | 7027035 |
| 1800 | C40S-1803CA010 | 1018655 | C40E-1803CB010 | 1018814 | C40P-1803CB010 | 7026397 |

### Resolution 40 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0304CA010 | 1018657 | C40E-0304CB010 | 1018815 | C40P-0304CB010 | 7026398 |
| 450 | C40S-0404CA010 | 1018659 | C40E-0404CB010 | 1018816 | C40P-0404CB010 | 7026399 |
| 600 | C40S-0604CA010 | 1018661 | C40E-0604CB010 | 1018817 | C40P-0604CB010 | 7026400 |
| 750 | C40S-0704CA010 | 1018663 | C40E-0704CB010 | 1018818 | C40P-0704CB010 | 7026401 |
| 900 | C40S-0904CA010 | 1018665 | C40E-0904CB010 | 1018819 | C40P-0904CB010 | 7026402 |
| 1050 | C40S-1004CA010 | 1018667 | C40E-1004CB010 | 1018820 | C40P-1004CB010 | 7026403 |
| 1200 | C40S-1204CA010 | 1018669 | C40E-1204CB010 | 1018821 | C40P-1204CB010 | 7026404 |
| 1350 | C40S-1304CA010 | 1018671 | C40E-1304CB010 | 1018822 | C40P-1304CB010 | 7026405 |
| 1500 | C40S-1504CA010 | 1018673 | C40E-1504CB010 | 1018823 | C40P-1504CB010 | 7026406 |
| 1650 | C40S-1604CA010 | 1018675 | C40E-1604CB010 | 1018824 | C40P-1604CB010 | 7027036 |
| 1800 | C40S-1804CA010 | 1018677 | C40E-1804CB010 | 1018825 | C40P-1804CB010 | 7026407 |




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## C4000 Advanced with extension connection M26×11 + FE

→ Ordering information C4000 Advanced without extension connection, see page E-4

| | |
|---|---|
| **Housing cross-section** | 48 mm× 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass or emergency stop, operating mode switching (with UE402) |
| **Consisting of** | Sender and receiver unit |
| **Usage** | First system in cascade, middle system in cascade |
| **Connections** | System connection: Hirschmann plug M26×11 + FE<br>Extension connection: Hirschmann socket M26×11 + FE<br>Configuration connection: M8×4 |

E

### Resolution 14 mm, scanning range 0 m ... 8 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301DA010 | 1018690 | C40E-0301DB010 | 1018827 | C40P-0301DB010 | 7026448 |
| 450 | C40S-0401DA010 | 1018349 | C40E-0401DB010 | 1018828 | C40P-0401DB010 | 7026449 |
| 600 | C40S-0601DA010 | 1018692 | C40E-0601DB010 | 1018829 | C40P-0601DB010 | 7026450 |
| 750 | C40S-0701DA010 | 1018694 | C40E-0701DB010 | 1018830 | C40P-0701DB010 | 7026451 |
| 900 | C40S-0901DA010 | 1018696 | C40E-0901DB010 | 1018831 | C40P-0901DB010 | 7026452 |
| 1050 | C40S-1001DA010 | 1018698 | C40E-1001DB010 | 1018832 | C40P-1001DB010 | 7026453 |
| 1200 | C40S-1201DA010 | 1018700 | C40E-1201DB010 | 1018833 | C40P-1201DB010 | 7026454 |
| 1350 | C40S-1301DA010 | 1018702 | C40E-1301DB010 | 1018834 | C40P-1301DB010 | 7026455 |
| 1500 | C40S-1501DA010 | 1018704 | C40E-1501DB010 | 1018835 | C40P-1501DB010 | 7026456 |
| 1650 | C40S-1601DA010 | 1018706 | C40E-1601DB010 | 1018836 | C40P-1601DB010 | 7027041 |
| 1800 | C40S-1801DA010 | 1018708 | C40E-1801DB010 | 1018837 | C40P-1801DB010 | 7026457 |

### Resolution 20 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0302DA010 | 1018710 | C40E-0302DB010 | 1018838 | C40P-0302DB010 | 7026458 |
| 450 | C40S-0402DA010 | 1018712 | C40E-0402DB010 | 1018839 | C40P-0402DB010 | 7026459 |
| 600 | C40S-0602DA010 | 1018714 | C40E-0602DB010 | 1018840 | C40P-0602DB010 | 7026460 |
| 750 | C40S-0702DA010 | 1018716 | C40E-0702DB010 | 1018841 | C40P-0702DB010 | 7026461 |
| 900 | C40S-0902DA010 | 1018718 | C40E-0902DB010 | 1018842 | C40P-0902DB010 | 7026462 |
| 1050 | C40S-1002DA010 | 1018720 | C40E-1002DB010 | 1018843 | C40P-1002DB010 | 7026463 |
| 1200 | C40S-1202DA010 | 1018722 | C40E-1202DB010 | 1018844 | C40P-1202DB010 | 7026464 |
| 1350 | C40S-1302DA010 | 1018724 | C40E-1302DB010 | 1018845 | C40P-1302DB010 | 7026465 |
| 1500 | C40S-1502DA010 | 1018726 | C40E-1502DB010 | 1018846 | C40P-1502DB010 | 7026466 |
| 1650 | C40S-1602DA010 | 1018728 | C40E-1602DB010 | 1018847 | C40P-1602DB010 | 7027042 |
| 1800 | C40S-1802DA010 | 1018730 | C40E-1802DB010 | 1018848 | C40P-1802DB010 | 7026467 |

Continued on next page


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### Resolution 30 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303DA010 | 1018733 | C40E-0303DB010 | 1018849 | C40P-0303DB010 | 7026468 |
| 450 | C40S-0403DA010 | 1018735 | C40E-0403DB010 | 1018850 | C40P-0403DB010 | 7026469 |
| 600 | C40S-0603DA010 | 1018737 | C40E-0603DB010 | 1018851 | C40P-0603DB010 | 7026470 |
| 750 | C40S-0703DA010 | 1018739 | C40E-0703DB010 | 1018852 | C40P-0703DB010 | 7026471 |
| 900 | C40S-0903DA010 | 1018741 | C40E-0903DB010 | 1018853 | C40P-0903DB010 | 7026472 |
| 1050 | C40S-1003DA010 | 1018743 | C40E-1003DB010 | 1018854 | C40P-1003DB010 | 7026473 |
| 1200 | C40S-1203DA010 | 1018745 | C40E-1203DB010 | 1018855 | C40P-1203DB010 | 7026474 |
| 1350 | C40S-1303DA010 | 1018747 | C40E-1303DB010 | 1018856 | C40P-1303DB010 | 7026475 |
| 1500 | C40S-1503DA010 | 1018749 | C40E-1503DB010 | 1018857 | C40P-1503DB010 | 7026476 |
| 1650 | C40S-1603DA010 | 1018751 | C40E-1603DB010 | 1018858 | C40P-1603DB010 | 7027043 |
| 1800 | C40S-1803DA010 | 1018753 | C40E-1803DB010 | 1018859 | C40P-1803DB010 | 7026477 |

### Resolution 40 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0304DA010 | 1018755 | C40E-0304DB010 | 1018860 | C40P-0304DB010 | 7026478 |
| 450 | C40S-0404DA010 | 1018757 | C40E-0404DB010 | 1018861 | C40P-0404DB010 | 7026479 |
| 600 | C40S-0604DA010 | 1018759 | C40E-0604DB010 | 1018862 | C40P-0604DB010 | 7026480 |
| 750 | C40S-0704DA010 | 1018762 | C40E-0704DB010 | 1018863 | C40P-0704DB010 | 7026481 |
| 900 | C40S-0904DA010 | 1018765 | C40E-0904DB010 | 1018864 | C40P-0904DB010 | 7026482 |
| 1050 | C40S-1004DA010 | 1018767 | C40E-1004DB010 | 1018865 | C40P-1004DB010 | 7026483 |
| 1200 | C40S-1204DA010 | 1018769 | C40E-1204DB010 | 1018866 | C40P-1204DB010 | 7026484 |
| 1350 | C40S-1304DA010 | 1018771 | C40E-1304DB010 | 1018867 | C40P-1304DB010 | 7026485 |
| 1500 | C40S-1504DA010 | 1018773 | C40E-1504DB010 | 1018868 | C40P-1504DB010 | 7026486 |
| 1650 | C40S-1604DA010 | 1018775 | C40E-1604DB010 | 1018869 | C40P-1604DB010 | 7027044 |
| 1800 | C40S-1804DA010 | 1018777 | C40E-1804DB010 | 1018870 | C40P-1804DB010 | 7026487 |




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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## C4000 Advanced

### General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 8 m / 0 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 14 mm ... 40 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

| | |
|---|---|
| **Output signal switching devices (OSSDs)** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Response time (depending on type)** | 9 ms ... 56 ms (stand-alone system, without beam coding, without blanking) |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 3.5 V |
| **Switching current max.** | 500 mA |
| **Power consumption** | ≤3 A |

### Sender unit

| | |
|---|---|
| **Power consumption** | ≤2 A |

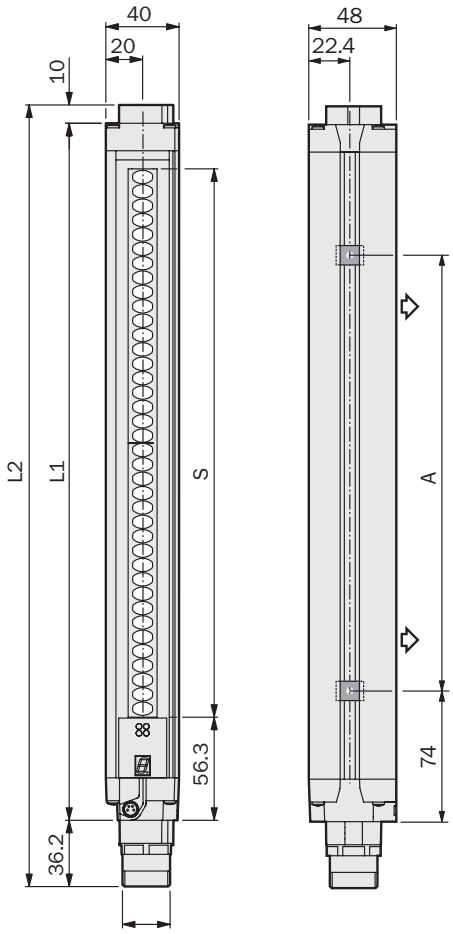
### General operating data

| | |
|---|---|
| **Connection type system connection** | Hirschmann plug M26×11 + FE |
| **Connection type extension connection (depending on type)** | Hirschmann socket M26×11 + FE<br>Hirschmann socket M12×7 + FE |
| **Connection type configuration connection** | M8×4 |
| **Connecting cable length** | Max. 50 m |
| **Connecting cable wire cross-section** | |
| **M26×11 + FE** | 0.75 mm² |
| **M12×7 + FE** | 0.25 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm× 40 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Weight (depending on type)** | 0.82 kg ... 3.71 kg |

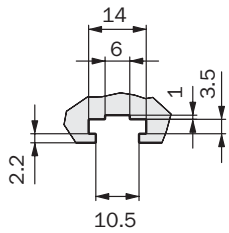

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# Dimensional drawings

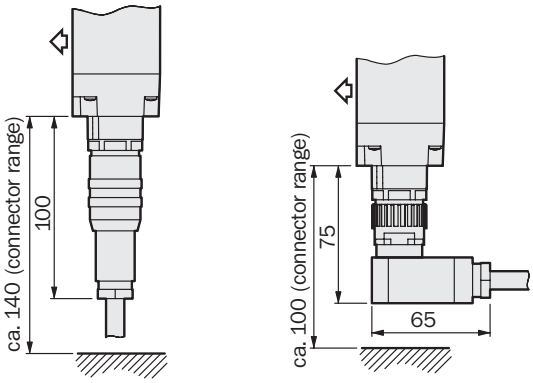
## C4000 Advanced without extension connection




DIN 43651 plug
(M26 x 11 + FE)




Sliding nut groove for side mounting




Cable sockets M26 × 11 + FE with crimp contacts

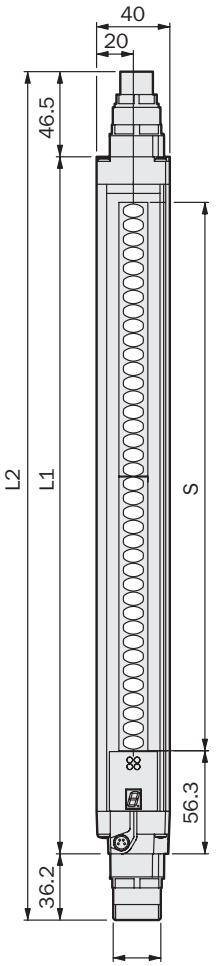
Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **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 |

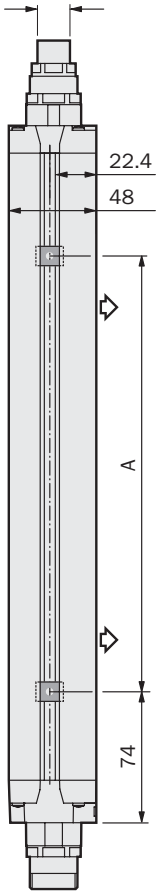
Dimensions in mm

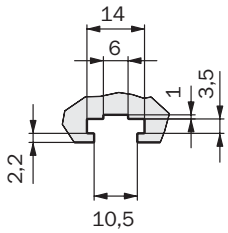

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## C4000 Advanced with extension connection M26×11 + FE

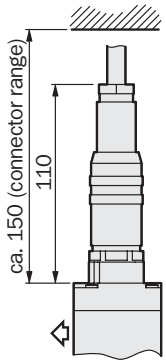



DIN 43651 plug
(M26 x 11 + FE)

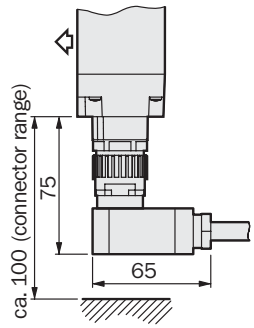


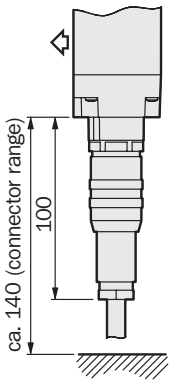




Sliding nut groove for side mounting




Cable plug M26×11 + FE with
crimp contacts




Cable sockets M26×11 + FE with crimp contacts

Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **300** | 381 | 464 | 224 |
| **450** | 532 | 614 | 374 |
| **600** | 682 | 765 | 524 |
| **750** | 833 | 915 | 674 |
| **900** | 984 | 1066 | 824 |
| **1050** | 1134 | 1216 | 974 |
| **1200** | 1283 | 1366 | 1124 |
| **1350** | 1435 | 1517 | 1274 |
| **1500** | 1586 | 1669 | 1424 |
| **1650** | 1736 | 1818 | 1574 |
| **1800** | 1887 | 1969 | 1724 |

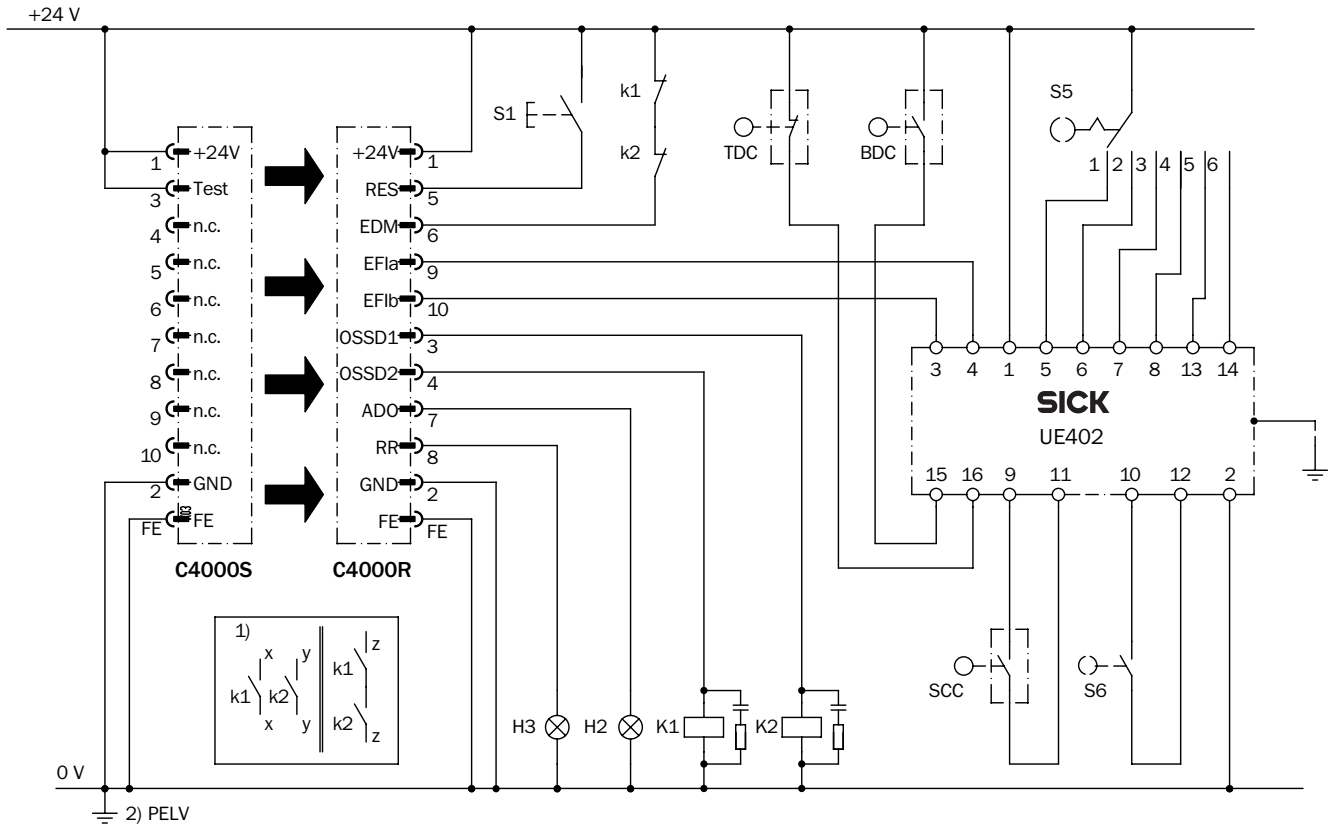
Dimensions in mm


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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagramms

## C4000 Advanced on UE402 safety switching amplifier




**Task**

Integration of a C4000 Advanced safety light curtain with UE402 in a controller. Six configurable operating modes with restart interlock and external device monitoring. PSDI mode with TDC, BDC, SCC. Teachable blanking areas.

**Function**

If no object is detected in the active protective field and the contactors K1 and K2 are in the de-energised position, the lamp H3 flashes as a prompt to operate control switch S1. The OSSDs are switched on when S1 is operated (button is pressed and released). These outputs activate contactors K1 and K2. On the detection of an object in an active protective field, the OSSDs deactivate contactors K1 and K2.

**Possible faults**

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). Jamming of the S1 button prevents output circuit to enable.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4.

Please see the operating instructions for the related devices to obtain information on the effects of the functions with configurable parameters. This information is to be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

→ Dimensional drawings for mounting systems, see page E-15

### Mounting systems

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Cable sockets

| Connection type | Connector technology | Direction of the cable outlet | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Crimp contacts | Straight | 6020757 |
| | | Angled | 6020758 |

### Cable plugs

| Connection type | Connector technology | Direction of the cable outlet on the plug | Part number |
|---|---|---|---|
| Hirschmann cable plug M26×11 + FE | Crimp contacts | Straight | 6021191 |
| | | Angled | 6021192 |

Continued on next page


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### Connecting cables

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |

### Connection cables cascade

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Plug connection, M26×11 + FE | Plug straight/socket straight | 0.25 m | 2022278 |
| | | 0.5 m | 2021838 |
| | | 1 m | 2022279 |
| | | 1.5 m | 2022280 |
| | | 2 m | 2022281 |
| | | 2.5 m | 2022282 |
| | | 3 m | 2022283 |
| | Plug straight, socket angled | 0.25 m | 2022284 |
| | | 0.5 m | 2022285 |
| | | 1 m | 2022286 |
| | | 1.5 m | 2022287 |
| | | 2 m | 2022288 |
| | | 2.5 m | 2022289 |
| | | 3 m | 2022290 |

### Connection cables emergency stop, reset button, door switch

| Connector technology | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Stripped | Plug straight | 2.5 m | 2026869 |
| | | 10 m | 2026870 |

### Cables without plug/socket

| Comment | Part number |
|---|---|
| Self assembly cable (suitable for EFI communication) | 6021437 |

### Connection cables configuration

| Comment | Cable length | Part number |
|---|---|---|
| For connecting the configuration interface to the serial interface on the PC | 2 m | 6021195 |
| | 8 m | 2027649 |

### Interfaces

| Designation | Enclosure rating | Description | Type | Part number |
|---|---|---|---|---|
| Safety interface | IP 20 | Expands C4000 Standard/Advanced with the functions PSDI mode, bypass, operating mode selection | UE402 | 1023577 |



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### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns

➜ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field height | Part number |
|---|---|
| 300 mm | 2022412 |
| 450 mm | 2022413 |
| 600 mm | 2022414 |
| 750 mm | 2022415 |
| 900 mm | 2022416 |
| 1050 mm | 2022417 |
| 1200 mm | 2022418 |
| 1350 mm | 2022419 |
| 1500 mm | 2022420 |
| 1650 mm | 2022421 |
| 1800 mm | 2022422 |

### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

Continued on next page


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### Sliding nuts for deflector mirrors

| Suitable for | Packing unit | Part number |
|---|---|---|
| PNS75 and PNS125 | 6 | 2030600 |

### Explosion protection

| Designation | Comment | Part number |
|---|---|---|
| ATEX package | Can be used in zone 2/22, 3G 3D | 2029961 |

### Laser alignment aid

| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 | – | – | 4032461 |

### Configuration software

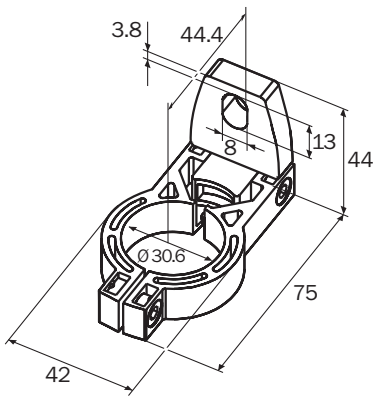
| Designation | Comment | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages | 2032314 |

### Configuration tools

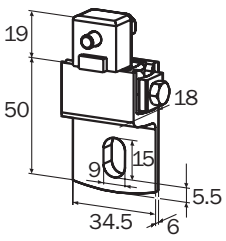
| Designation | Comment | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced | 1029665 |
| Host-Guest Plug for C4000 | For C4000 Standard / Advanced | 1029717 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host-Guest Plug | 5318293 |

## Dimensional drawings mounting systems

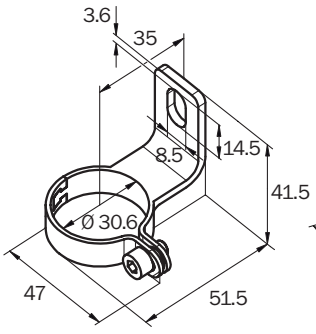
Dimensions in mm



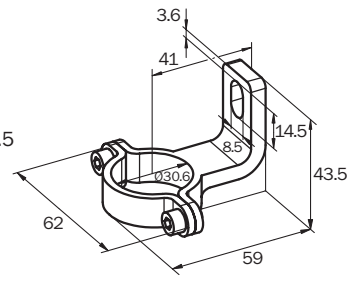

Swivel mount, mounting kit 2




Side bracket, mounting kit 6



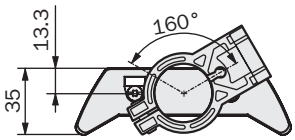

Stainless steel bracket



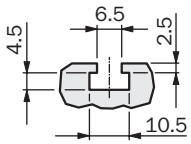

Reinforced stainless steel bracket


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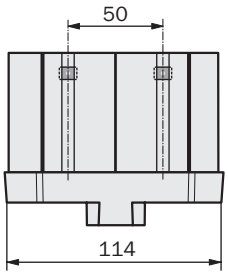
## Dimensional drawings deflector mirror PNS75

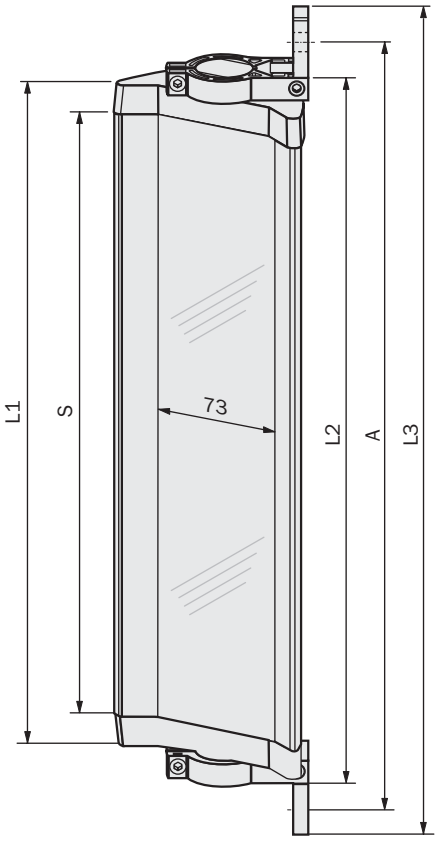



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



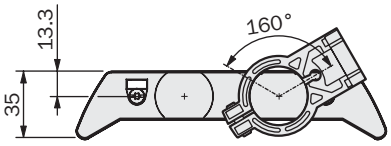

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

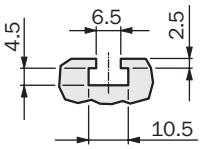
Dimensions in mm


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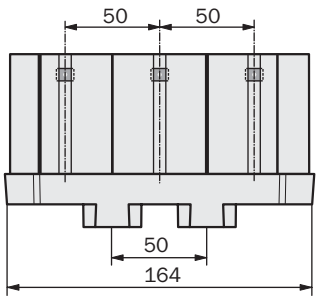
## Dimensional drawings deflector mirror PNS125

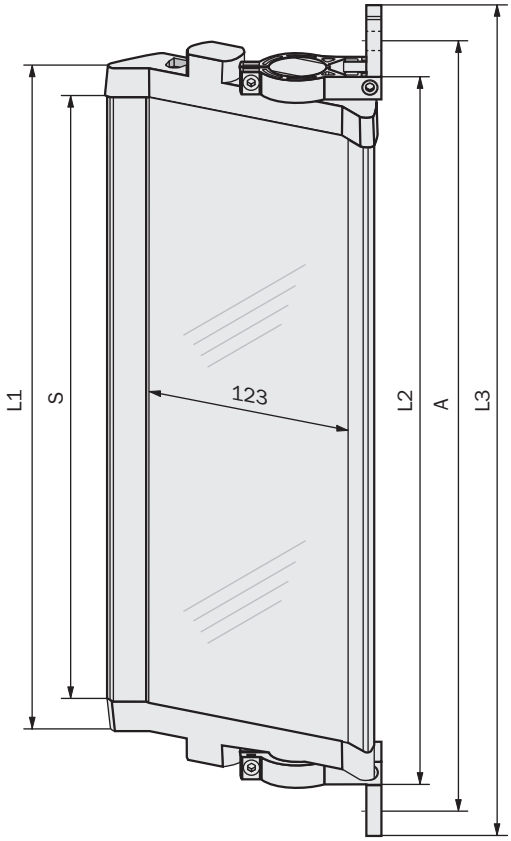



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



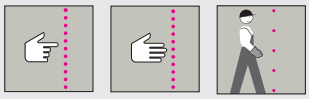

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

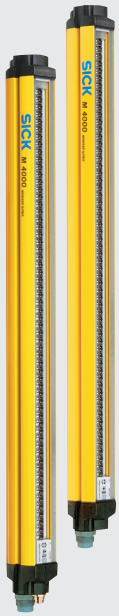
Dimensions in mm

E


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- 14/30 mm resolution
- 300 to 1800 mm protective field height
- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Configuration and diagnosis via PC
- SDL interface
- Muting configurable in conjunction with UE403
- End cap with integrated LED (optional)

| Further information | Page |
|---|---|
| → Technical specifications | E-21 |
| → Dimensional drawings | E-24 |
| → Connection diagrams | E-26 |
| → Accessories | E-27 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 8 m / 0 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The M4000 Advanced Curtain multiple light beam safety device together with the UE403 switching amplifier form the efficient solution for decentralised conventional muting applications involving automatic material transport which require safety light curtains with high resolution (14/30 mm) due to a short safety distance. Access protection with muting can be achieved with maximum availability thanks to their integrated functions, easily configured by PC via the RS-232 interface, and the simple in-situ connection of muting signals and control switches to the UE403.

The integrated functions, and status and diagnostic information, permit rapid commissioning and prevent unnecessary machine downtimes.

The modular concept provides a high level of machine safety that takes economic efficiency into account as device properties can be adapted to meet specific requirements.

## In-system added value

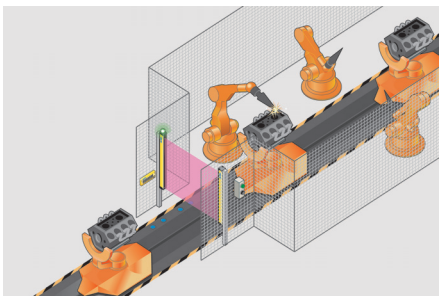
- Combination with safe control solutions by SICK
- M4000 Advanced with UE403 for the connection of:
  - 2 to 4 muting sensors
  - External muting lamp
  - Reset- and override control switch
  - Conveyor belt stop signal
- Further functions:
  - Concurrence monitoring
  - Total muting time monitoring
  - Sensor gap monitoring
  - Sensor test
  - Partial blanking
  - Muting end via ESPE
  - Integrated override

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

Provides access protection with or without muting on robot systems, machine centres in mechanical engineering applications, automated conveying storage and transport systems.



Access protection with muting on a motor machining station



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# Ordering information

## M4000 Advanced Curtain, resolution 14 mm

| Protective field height (mm) | End cap with integrated LED | Sender | | Receiver | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 300 | – | M40S-60A503AA0 | – [1] | M40E-60A503RB0 | – [1] |
| | ✔ | M40S-60A503AA0 | – [1] | M40E-60A523RB0 | – [1] |
| 450 | – | M40S-61A503AA0 | – [1] | M40E-61A503RB0 | – [1] |
| | ✔ | M40S-61A503AA0 | – [1] | M40E-61A523RB0 | – [1] |
| 600 | – | M40S-62A503AA0 | – [1] | M40E-62A503RB0 | – [1] |
| | ✔ | M40S-62A503AA0 | – [1] | M40E-62A523RB0 | – [1] |
| 750 | – | M40S-63A503AA0 | – [1] | M40E-63A503RB0 | – [1] |
| | ✔ | M40S-63A503AA0 | – [1] | M40E-63A523RB0 | – [1] |
| 900 | – | M40S-64A503AA0 | – [1] | M40E-64A503RB0 | – [1] |
| | ✔ | M40S-64A503AA0 | – [1] | M40E-64A523RB0 | – [1] |
| 1050 | – | M40S-65A503AA0 | – [1] | M40E-65A503RB0 | – [1] |
| | ✔ | M40S-65A503AA0 | – [1] | M40E-65A523RB0 | – [1] |
| 1200 | – | M40S-66A503AA0 | – [1] | M40E-66A503RB0 | – [1] |
| | ✔ | M40S-66A503AA0 | – [1] | M40E-66A523RB0 | – [1] |
| 1350 | – | M40S-67A503AA0 | – [1] | M40E-67A503RB0 | – [1] |
| | ✔ | M40S-67A503AA0 | – [1] | M40E-67A523RB0 | – [1] |
| 1500 | – | M40S-68A503AA0 | – [1] | M40E-68A503RB0 | – [1] |
| | ✔ | M40S-68A503AA0 | – [1] | M40E-68A523RB0 | – [1] |
| 1650 | – | M40S-69A503AA0 | – [1] | M40E-69A503RB0 | – [1] |
| | ✔ | M40S-69A503AA0 | – [1] | M40E-69A523RB0 | – [1] |
| 1800 | – | M40S-70A503AA0 | – [1] | M40E-70A503RB0 | – [1] |
| | ✔ | M40S-70A503AA0 | – [1] | M40E-70A523RB0 | – [1] |

[1] When ordering first time, please use the expression in column "Type" instead of "Part number".




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## M4000 Advanced Curtain, resolution 30 mm

| Protective field height (mm) | End cap with integrated LED | Sender | | Receiver | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 300 | – | M40S-60A303AA0 | 1201570 | M40E-60A303RB0 | 1201572 |
| | ✔ | M40S-60A303AA0 | 1201570 | M40E-60A323RB0 | – [1] |
| 450 | – | M40S-61A303AA0 | 1201127 | M40E-61A303RB0 | 1201214 |
| | ✔ | M40S-61A303AA0 | 1201127 | M40E-61A323RB0 | – [1] |
| 600 | – | M40S-62A303AA0 | 1201463 | M40E-62A303RB0 | 1201464 |
| | ✔ | M40S-62A303AA0 | 1201463 | M40E-62A323RB0 | – [1] |
| 750 | – | M40S-63A303AA0 | 1201571 | M40E-63A303RB0 | 1201573 |
| | ✔ | M40S-63A303AA0 | 1201571 | M40E-63A323RB0 | – [1] |
| 900 | – | M40S-64A303AA0 | 1201441 | M40E-64A303RB0 | 1201442 |
| | ✔ | M40S-64A303AA0 | 1201441 | M40E-64A323RB0 | – [1] |
| 1050 | – | M40S-65A303AA0 | 1201482 | M40E-65A303RB0 | 1201483 |
| | ✔ | M40S-65A303AA0 | 1201482 | M40E-65A323RB0 | – [1] |
| 1200 | – | M40S-66A303AA0 | 1201036 | M40E-66A303RB0 | 1201035 |
| | ✔ | M40S-66A303AA0 | 1201036 | M40E-66A323RB0 | – [1] |
| 1350 | – | M40S-67A303AA0 | – [1] | M40E-67A303RB0 | – [1] |
| | ✔ | M40S-67A303AA0 | – [1] | M40E-67A323RB0 | – [1] |
| 1500 | – | M40S-68A303AA0 | – [1] | M40E-68A303RB0 | – [1] |
| | ✔ | M40S-68A303AA0 | – [1] | M40E-68A323RB0 | – [1] |
| 1650 | – | M40S-69A303AA0 | – [1] | M40E-69A303RB0 | – [1] |
| | ✔ | M40S-69A303AA0 | – [1] | M40E-69A323RB0 | – [1] |
| 1800 | – | M40S-70A303AA0 | – [1] | M40E-70A303RB0 | – [1] |
| | ✔ | M40S-70A303AA0 | – [1] | M40E-70A323RB0 | – [1] |

[1] When ordering first time, please use the expression in column "Type" instead of "Part number".

## Muting module UE403

| Type | Part number |
|---|---|
| UE403-A0930 | 1026287 |


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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## M4000 Advanced Curtain

### General data

| | Sender | Receiver |
|---|---|---|
| **Resolution (depending on type)** | 14 mm / 30 mm | |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm | |
| **Scanning range** | | |
| **for resolution 14 mm** | – | 0 m ... 2.5 m / 2 m ... 8 m |
| **for resolution 30 mm** | – | 0 m ... 6 m / 5 m ... 19 m |
| **configurable** | – | ✔ |
| **Response time (depending on type)** | Max. 56 ms | |
| **Protection class** | III (EN 50178:1998) | |
| **Enclosure rating** | IP 65 (EN 60529) | |
| **Synchronisation** | Optical, without separate synchronisation | |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508)) | |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C | |
| **Storage temperature from ... to** | –25 °C ... +70 °C | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | |
| **Housing cross section** | 52 mm x 55.5 mm | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) | |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) | |
| **Housing material** | Aluminium alloy ALMGSI 0.5 | |
| **Front screen material** | Polycarbonate, scratch-resistant coating | |

### Electrical data

| | Sender | Receiver |
|---|---|---|
| **Connection type** | | |
| **System connection** | M26 x 11 + FE Hirschmann plug | M26 x 11 + FE Hirschmann plug |
| **Extension connection** | – | M12 x 5 Plug |
| **Cable length** | 50 m [1] | 50 m [1] |
| **Conductor cross-section** | 0.75 mm² | 0.75 mm² |
| **Supply voltage** | 24 V (19.2 V ... 28.8 V) [2] | |
| **Ripple** | ±10 % | |
| **Power consumption** | Max. 0.3 A | Max. 0.8 A |
| **Display elements** | LED/7-segment | |
| **Safety outputs (OSSD)** | | |
| **Type of output** | – | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored [3] |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 2.25 V ... $V_S$) |
| **Switching voltage LOW** | – | 0 V DC (0 V DC ... 3.5 V DC) |
| **Switching current** | – | 0 mA ... 500 mA |
| **Application diagnostic output** | | PNP semiconductor, short-circuit protected |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 4.2 V ... $V_S$) |
| **Switching voltage LOW** | – | High resistance |
| **Switching current** | – | 0 mA ... 100 mA |

[1] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

[2] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

[3] Applies to a voltage range between –30 V and +30 V.



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## Functional data

| | Sender | Receiver |
|---|---|---|
| Safe integration to bus system | ✔ | |
| Restart interlock | – | ✔ |
| Restart interlock (delivery status) | – | Internal |
| External device monitoring | – | ✔ |
| External device monitoring (delivery status) | – | Activated |
| Beam coding | ✔ | |
| Beam coding (delivery status) | Non-coded | |
| Configurable application diagnostic output | – | ✔ |
| Application diagnostic output (delivery status) | – | Contamination (OWS) |
| Sender test | ✔ | – |
| Sender test (delivery status) | Deactivated | – |
| Configurable scanning range | – | ✔ |
| Scanning range (delivery status) | – | 2.5 m / 6 m |
| End cap with integrated LED (optional) | – | ✔ |
| SDL interface | ✔ | |
| CDS configuration via RS-232 interface | ✔ | |
| Concurrence monitoring (with UE403) | – | ✔ |
| Monitoring total muting time (with UE403) | – | ✔ |
| Sensor gap monitoring (with UE403) | – | ✔ |
| Sensor test (with UE403) | – | ✔ |
| Partial blanking (with UE403) | – | ✔ |
| End of muting by ESPE (with UE403) | – | ✔ |
| Belt stop (with UE403) | – | ✔ |
| Muting with override (with UE403) | – | ✔ |




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# Muting module UE403

## General data

| | |
|---|---|
| **Type of muting sensors** | Optical sensors, inductive sensors, mechanical switches, controller signals |
| **Protection class** | III (EN 50178:1998) |
| **Enclosure rating** | IP 65 (IEC 60529) |
| **Type** | Type 4 (IEC 61496) |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Housing material** | Aluminium die-cast, powder coated |
| **Material, Connector strip** | Polyamide |
| **Mounting** | Flexible mounting to the M4000 Advanced or directly in the system |

## Electrical data

| | |
|---|---|
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC), via connected ESPE |
| **Inputs override, reset, c1, belt stop, muting sensors** | |
| **Switching voltage HIGH** | 24 V DC (11 V DC ... 30 V DC) |
| **Input current HIGH** | 10 mA (6 mA ... 15 mA) |
| **Switching voltage LOW** | 0 V DC (–30 V DC ... 5 V DC) |
| **Input current LOW** | 0 mA (–0.5 mA ... 1.5 mA) |
| **Outputs 24 V DC voltage supply for reset, override, C1, muting sensors** | |
| **Supply voltage** | 24 V DC (15 V DC ... 28.8 V DC) |
| **Output current for muting sensors** | 500 mA [1] |
| **Output current for reset, override, C1** | 400 mA [1] |
| **Muting lamp** | |
| **Output current monitored** | 20 mA ... 400 mA |
| **Output current not monitored** | 0 mA ... 400 mA |
| **Connection type** | Socket M12 x 5 |
| **Cable length** | 10 m [2] |
| **Wire cross-section** | 0.34 mm² |
| **Cable resistance** | <0.5 Ohm (per cable) |

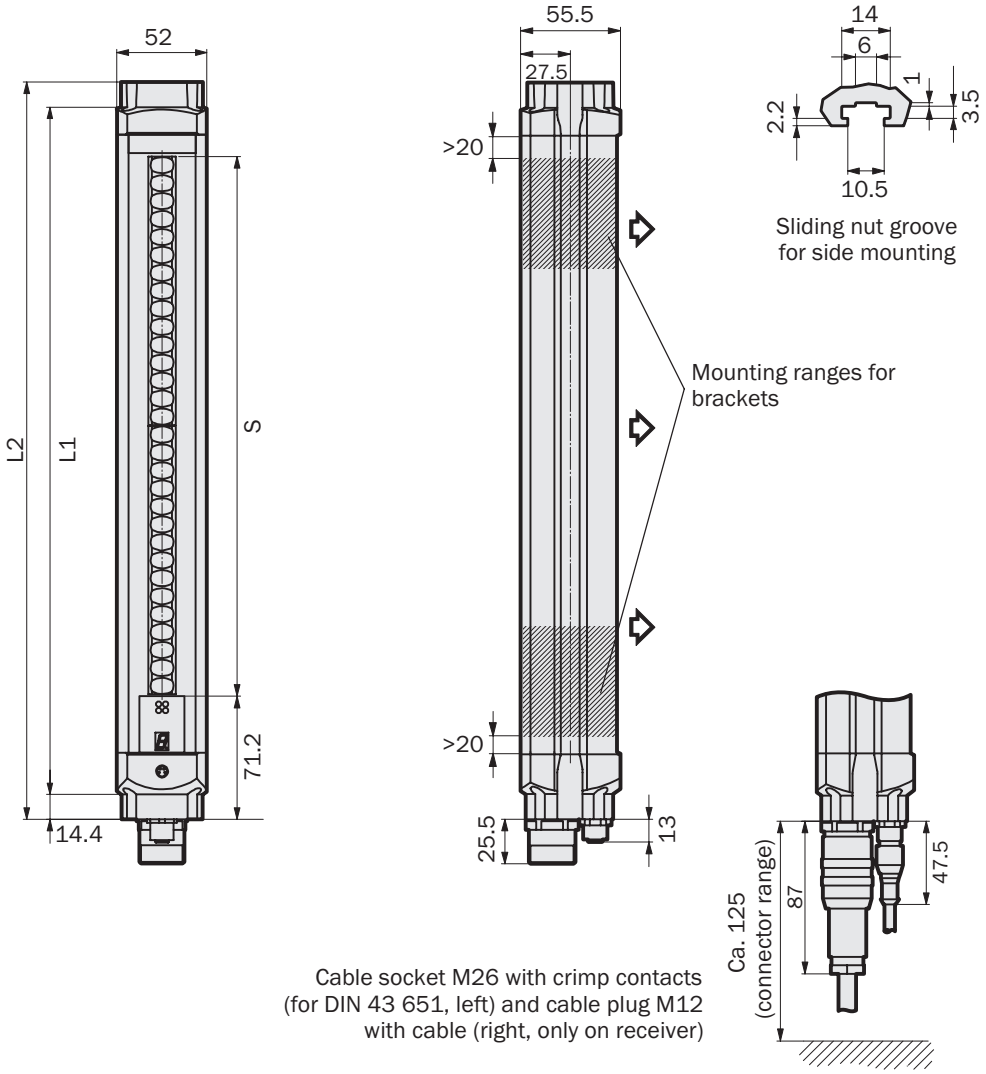
[1] Total of all supply currents from the connections RES/OVR, A1, A2, B1 and B2 (pin 1 in each case): max. 1000 mA

[2] Between UE403 and M4000 Advanced as well as between the muting sensors/control switches/muting lamp and UE403


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# Dimensional drawings

## M4000 Advanced Curtain




Cable socket M26 with crimp contacts (for DIN 43 651, left) and cable plug M12 with cable (right, only on receiver)

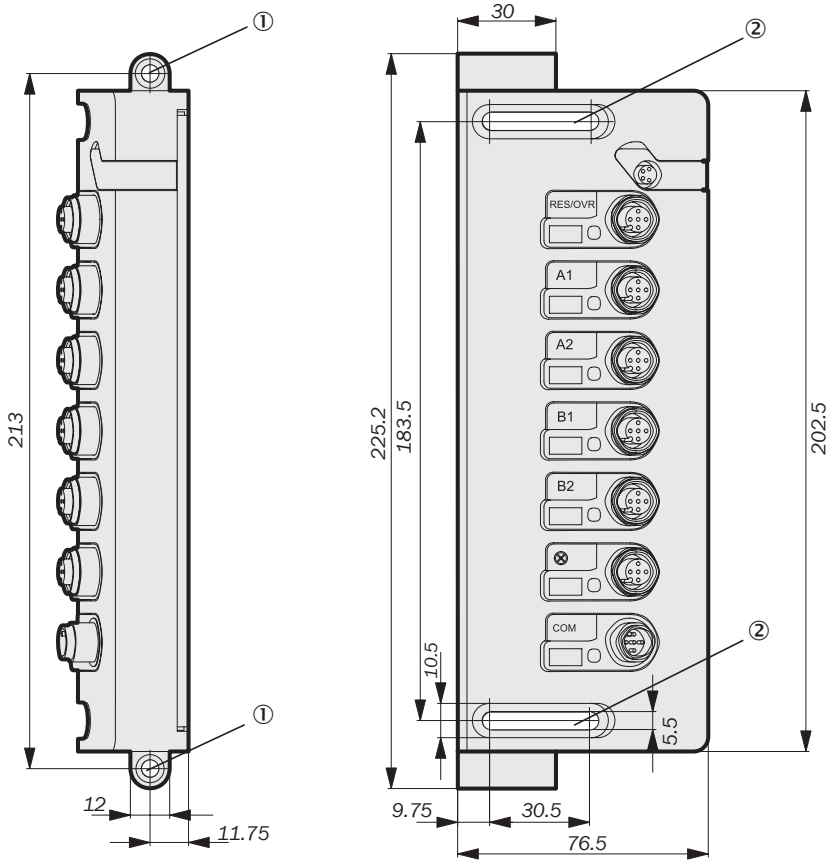
Dimensions in mm

| Protective field height S | Dimension L1 | Dimension L2 |
|---|---|---|
| 300 | 387 | 416 |
| 450 | 537 | 566 |
| 600 | 687 | 716 |
| 750 | 837 | 866 |
| 900 | 987 | 1016 |
| 1050 | 1137 | 1166 |
| 1200 | 1287 | 1316 |
| 1350 | 1437 | 1466 |
| 1500 | 1587 | 1616 |
| 1650 | 1737 | 1766 |
| 1800 | 1887 | 1916 |

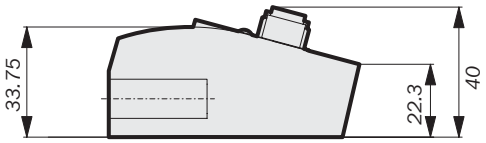
Dimensions in mm


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## Muting module UE403




**Note:**
The fixing holes ① and slots ② are suitable for cheese head screws M5 x 30 as per DIN EN ISO 4762.




Dimensions in mm

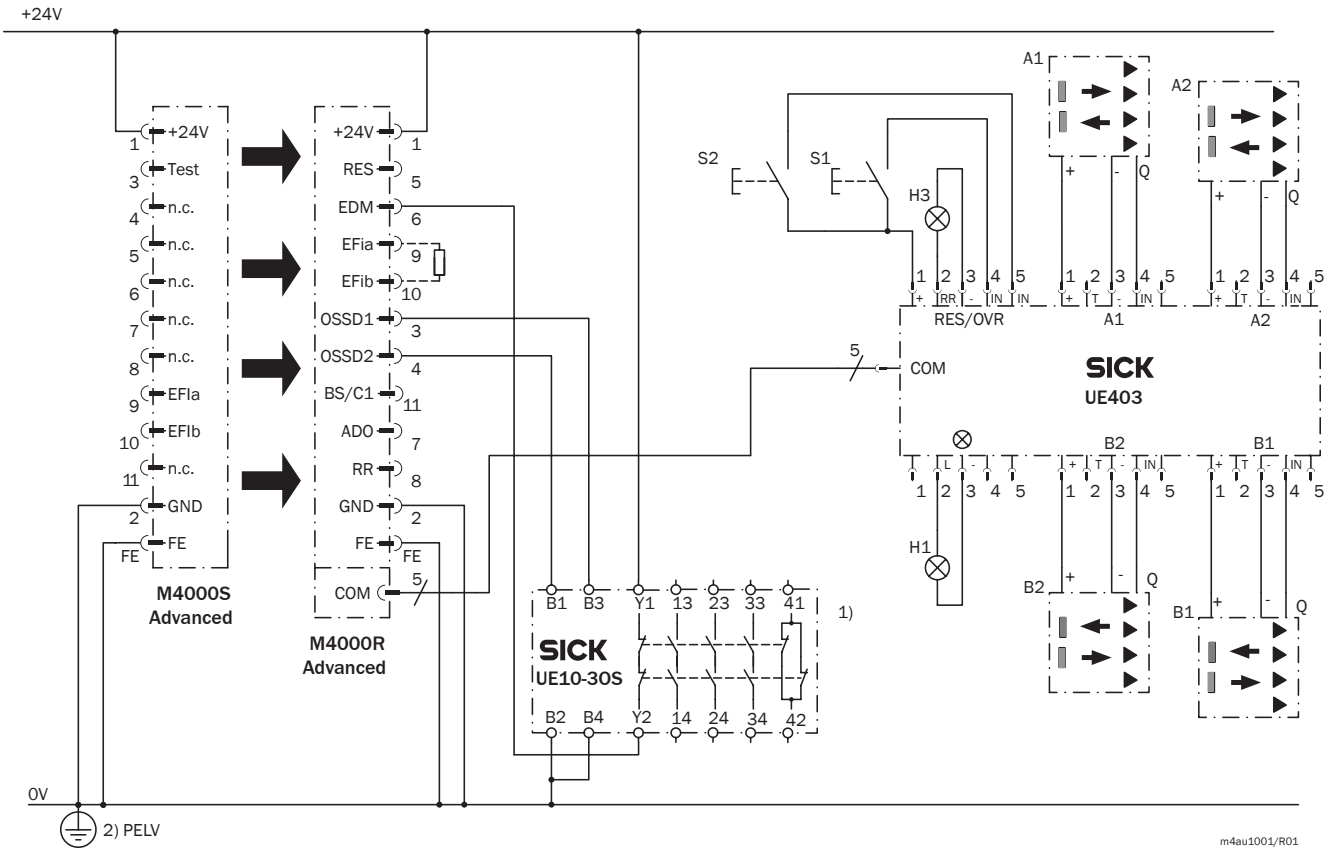
E


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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M4000 Advanced Curtain with UE403 muting module connected to UE10-3OS safety relay




### Task

Connection of an M4000 Advanced Curtain safety light curtain with muting module UE403 to an UE10-3OS safety relay.
Muting with 4 photoelectric reflex switches (dark switching, PNP). Operating mode: with restart interlock and external device monitoring.

### Operating characteristics

When the light path is clear and the UE10-3OS is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-3OS is switched on. On interruption of one or several of the light beams, the UE10-3OS is de-energised by the OSSD1 and OSSD2 outputs.

### Muting and override

When the light path is clear and the muting input conditions are valid muting starts. The muting lamp H1 illuminates. Different time and monitoring functions can be configured.
When the light path is interrupted and muting sensors are active, e. g. because of muting errors or a new power-on, override is enabled by pressing and releasing the button S2.

### Fault analysis

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-3OS will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.
The failure of one muting sensor will be detected by the muting sequence, and prohibit a new muting cycle. On manipulation (e.g. jamming) of the button S2, the system does not enable override. A permanent use of the override function will be inhibited through the device.

### Comments

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices. This applies particularly on the use of configurable functions.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

## M4000 Advanced Curtain

### Mounting systems

➜ Dimensional drawings for mounting systems, see page E-31

| Type | Property | Packing unit | Part number |
|---|---|---|---|
| Mounting kit 1 | Rigid | 4 | 7021352 |
| Mounting kit 2 | Adjustable | 4 | 2017751 |
| Mounting kit 6 | Swivel function, side bracket | 4 | 2019506 |
| Mounting kit 12 | Swivel mount | 4 | 2030510 |

### Sliding nuts/sliding blocks

| Type | Packing unit | Remark | Part number |
|---|---|---|---|
| Sliding block (sliding nuts) | 4 | Included with delivery | 2017550 |

### Connection cables

| Connection type | Cable alignment | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26 x 11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |


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### Cable receptacles

| Connection type | Cable alignment | Part number |
|---|---|---|
| Hirschmann cable socket M26 x 11 + FE | Straight | 6020757 |
| | Angled | 6020758 |

### Extension connection cables

| Connection type | Cable alignment | Remark | Cable length | Part number |
|---|---|---|---|---|
| Plug M12 x 5, socket M12 x 5 | Plug straight/socket straight | Connection cable for M4000 Advanced with M12, 5 pin connector and UE403 | 0.6 m | 6025930 |
| | | | 1 m | 6029280 |
| | | | 1.5 m | 6029281 |
| | | | 2 m | 6025931 |
| | | | 5 m | 6029282 |

### Configuration connection cable

| Connection type | Cable length | Remark | Part number |
|---|---|---|---|
| M8 x 4, SUB-D 9-pol | 2 m | For connecting the configuration connection to the PC | 6021195 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC ... 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns

→ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for | Packing unit | Remark | Part number |
|---|---|---|---|
| M40x-60xxxxxx | 2 | Including sliding blocks and mounting screws | 2033235 |
| M40x-61xxxxxx | | | 2033236 |
| M40x-62xxxxxx | | | 2033237 |
| M40x-63xxxxxx | | | 2033238 |
| M40x-64xxxxxx | | | 2033239 |
| M40x-65xxxxxx | | | 2033240 |
| M40x-66xxxxxx | | | 2033241 |
| M40x-67xxxxxx | | | 2033242 |
| M40x-68xxxxxx | | | 2033243 |
| M40x-69xxxxxx | | | 2033244 |
| M40x-70xxxxxx | | | 2033245 |

Continued on next page


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### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

E

### Laser alignment aid

| Type | Type of light | Scanning range | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | Red light | Max. 60 m | 1015741 |
| AR60 adapter for M4000 | – | – | 4040006 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Configuration Tools

| Type | Remark | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/ Exit and M4000 Advanced | 1029665 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host Guest Plug | 5318293 |


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## Muting module UE403

### Mounting systems

| Property | Packing unit | Remark | Part number |
|---|---|---|---|
| Fixing screws with sliding nuts | 2 | Included in the delivery | 2033250 |

### Muting sensor connecting cables

| Connection type | Cable alignment | Cable length | Remark | Part number |
|---|---|---|---|---|
| Plug M12 x 4 | Plug straight/ socket angled | 1 m | Suitable for muting sensor WL24 and WT24 | 6025974 |
| | | 2 m | Suitable for muting sensor WL24 and WT24 | 6025975 |
| | | 5 m | Suitable for muting sensor WL24 and WT24 | 6025087 |
| | | 1 m | Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected | 6025944 |
| | | 2 m | Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected | 6025945 |
| | | 5 m | Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected | 6025116 |
| Plug M12 x 3 | Plug straight/ socket angled | 1 m | Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected | 6026106 |
| | | 2 m | Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected | 6026107 |
| | | 5 m | Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected | 6025118 |

### Extension connection cables

| Connection type | Cable alignment | Remark | Cable length | Part number |
|---|---|---|---|---|
| Plug M12 x 5, socket M12 x 5 | Plug straight/socket straight | Connection cable for M4000 Advanced with M12, 5 pin connector and UE403 | 0.6 m | 6025930 |
| | | | 1 m | 6029280 |
| | | | 1.5 m | 6029281 |
| | | | 2 m | 6025931 |
| | | | 5 m | 6029282 |

### Configuration connection cable

| Connection type | Cable length | Remark | Part number |
|---|---|---|---|
| M8 x 4, SUB-D 9-pol | 2 m | For connecting the configuration connection to the PC | 6021195 |

### Connection cables for control switches

| Connection type | Cable alignment | Cable length | Part number |
|---|---|---|---|
| Plug M12 x 5 | Straight | 2 m | 6026133 |
| | | 5 m | 6026134 |
| | | 10 m | 6026135 |


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### Connectors

| Connection type | Cable alignment | Type | Part number |
|---|---|---|---|
| Socket M12 x 4 | Angled | DOS-1204-W | 6007303 |
| Plug M12 x 4 | Straight | STE-1204-G | 6009932 |

### Muting indicator lamp

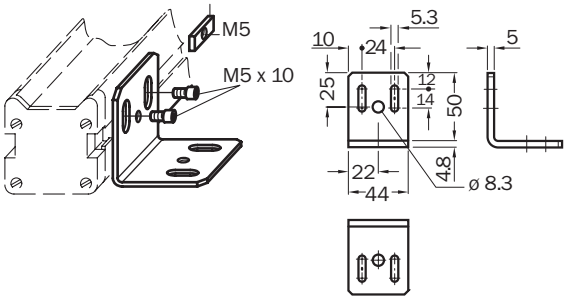
| Type of muting indicator | Connection type | Cable length | Remark | Part number |
|---|---|---|---|---|
| Incandescent lamp | Connector | 2 m | Incl. mounting bracket and mounting kit | 2033116 |
| | | 10 m | Incl. mounting bracket | 2033117 |
| LED | | 2 m | Incl. mounting bracket and mounting kit | 2033118 |
| | | 10 m | Incl. mounting bracket | 2033119 |

### Muting accessories, other

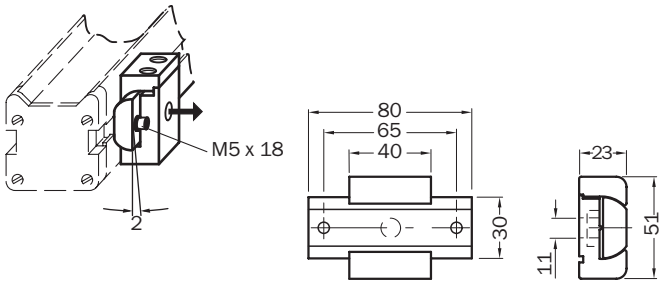
| Type | Part number |
|---|---|
| Protective cap for quick-disconnect socket on UE403 | 6011170 |

## Dimensional drawings mounting systems

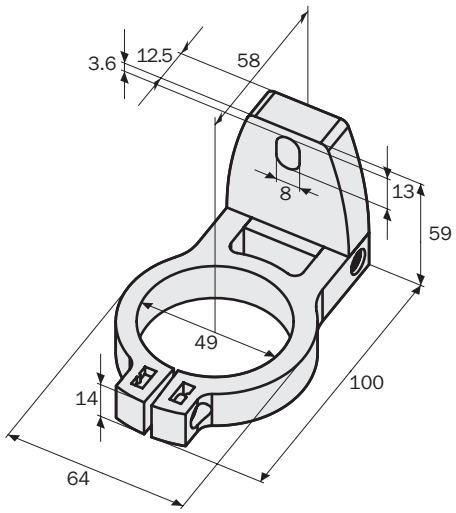
### Mounting kit 1



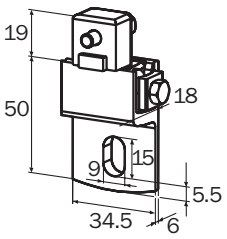

### Mounting kit 2




### Mounting kit 12



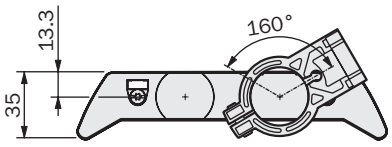

### Mounting kit 6



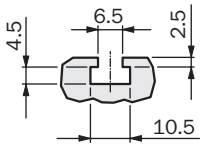

Dimensions in mm


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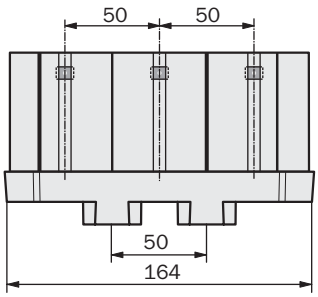
## Dimensional drawings deflector mirror PNS125

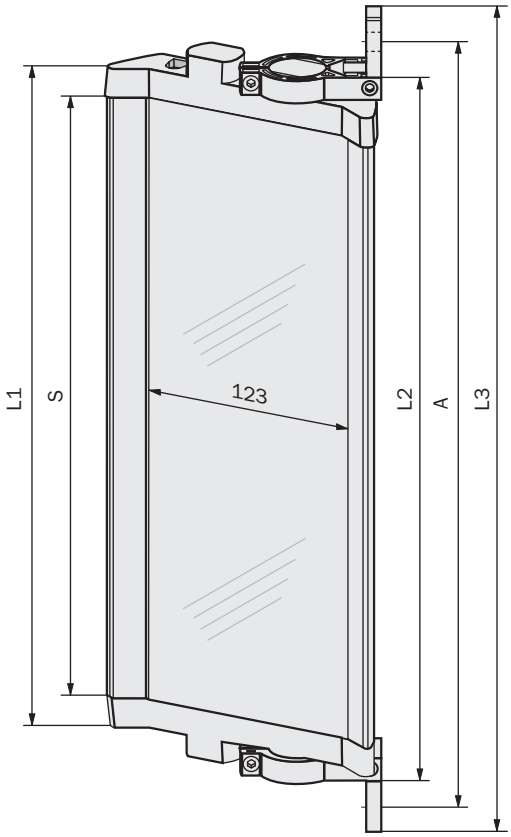



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



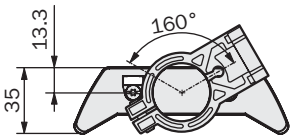

Dimensions in mm

| Mirror height S | Dimension L1 | Dimension L2 | Dimension L3 | Dimension A |
|---|---|---|---|---|
| **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 |

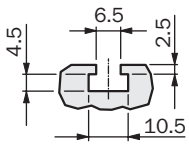
Dimensions in mm


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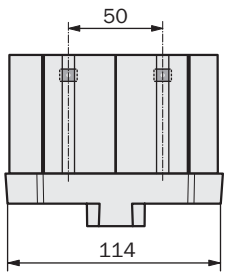
## Dimensional drawings deflector mirror PNS75

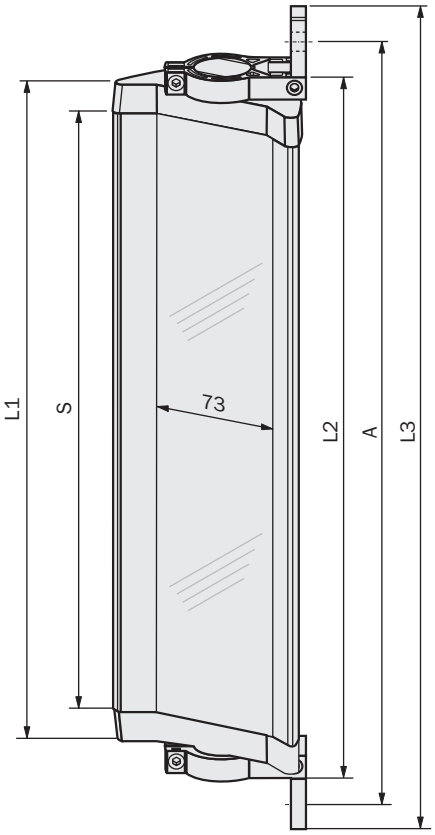



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



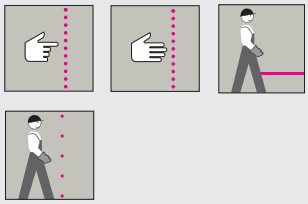

Dimensions in mm

| Mirror height S | Dimension L1 | Dimension L2 | Dimension L3 | Dimension A |
|---|---|---|---|---|
| **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 |

Dimensions in mm

E


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- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding
- Up to 3 systems can be cascaded
- Alignment and diagnostics via 7-segment display
- ATEX II 3 G/3D
- Configuration and diagnostics via PC

| Further information | Page |
|---|---|
| → Technical specifications | E-39 |
| → Dimensional drawings | E-40 |
| → Connection diagrams | E-43 |
| → Accessories | E-44 |
| → Services | A-2 |

# Overview of technical specifications

| | |
|---|---|
| **Protective field height (depending on type)** | 150 mm ... 1800 mm |
| **Scanning range (depending on type)** | 0 m ... 8 m / 0 m ... 19 m |
| **Resolution (depending on type)** | 14 mm / 20 mm / 30 mm / 40 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

# Product description

The C4000 Standard safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection:

- Alignment and diagnostics via 7-segment display
- Application diagnostic output for status information
- Configuration and diagnostics via RS-232 interface
- Emergency stop button or reset button directly at the extension connection
- Rapid commissioning due to preconfigured devices
- Configure quickly and straightforwardly using Clone Plug

# In-system added value

- Supports integration with multiple safety control solutions

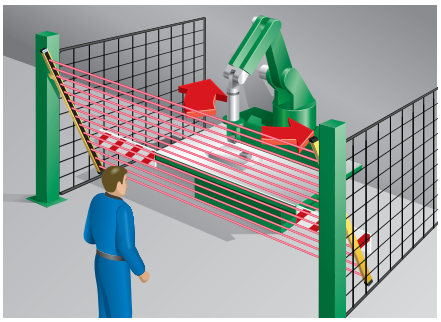
| Combination with | Restart interlock | External device monitoring | Bypass | PSDI/ PSDI window | Teach-in | Operating mode selection | Further information |
|---|---|---|---|---|---|---|---|
| **UE402** | – | – | ✔ | ✔ | ✔ | ✔ | E-45 |
| **UE48-2OS** | ✔ | ✔ | – | – | – | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | – | – | – | N-48 |
| **UE10-3OS** | Relay module | | | | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

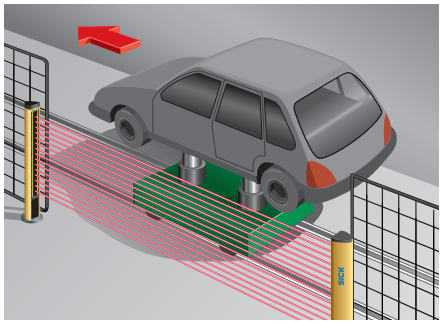
# Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Car and vehicle manufacture
- Shaping machine tools
- Plastic and rubber industry
- Electronics industry
- Robots
- Printing and paper industry
- Wood processing
- Palletiser



Hazardous point protection on an industrial robot



Hazardous point protection on an assembly line

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# Ordering information

## C4000 Standard without extension connection

➜ Ordering information C4000 Standard with extension connection, see page E-37

| | |
|---|---|
| **Housing dimensions** | 48 mm× 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass (with UE402), operating mode selection (with UE402) |
| **Consisting of** | Sender and receiver unit |
| **Usage** | Last system in cascade or stand-alone system |
| **Connections** | System connection: Hirschmann plug M26×11 + FE<br>Configuration and diagnostics interface: M8×4 |

E

### Resolution 14 mm, scanning range 0 m ... 8 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301CA010 | 1018591 | C40E-0301CA010 | 1018592 | C40P-0301CA010 | 7026328 |
| 450 | C40S-0401CA010 | 1018347 | C40E-0401CA010 | 1018348 | C40P-0401CA010 | 7026329 |
| 600 | C40S-0601CA010 | 1018593 | C40E-0601CA010 | 1018594 | C40P-0601CA010 | 7026330 |
| 750 | C40S-0701CA010 | 1018595 | C40E-0701CA010 | 1018596 | C40P-0701CA010 | 7026331 |
| 900 | C40S-0901CA010 | 1018597 | C40E-0901CA010 | 1018598 | C40P-0901CA010 | 7026332 |
| 1050 | C40S-1001CA010 | 1018599 | C40E-1001CA010 | 1018600 | C40P-1001CA010 | 7026333 |
| 1200 | C40S-1201CA010 | 1018601 | C40E-1201CA010 | 1018602 | C40P-1201CA010 | 7026334 |
| 1350 | C40S-1301CA010 | 1018603 | C40E-1301CA010 | 1018604 | C40P-1301CA010 | 7026335 |
| 1500 | C40S-1501CA010 | 1018605 | C40E-1501CA010 | 1018606 | C40P-1501CA010 | 7026336 |
| 1650 | C40S-1601CA010 | 1018607 | C40E-1601CA010 | 1018608 | C40P-1601CA010 | 7027029 |
| 1800 | C40S-1801CA010 | 1018609 | C40E-1801CA010 | 1018610 | C40P-1801CA010 | 7026337 |

### Resolution 20 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0302CA010 | 1018613 | C40E-0302CA010 | 1018614 | C40P-0302CA010 | 7026338 |
| 450 | C40S-0402CA010 | 1018615 | C40E-0402CA010 | 1018616 | C40P-0402CA010 | 7026339 |
| 600 | C40S-0602CA010 | 1018617 | C40E-0602CA010 | 1018618 | C40P-0602CA010 | 7026340 |
| 750 | C40S-0702CA010 | 1018619 | C40E-0702CA010 | 1018620 | C40P-0702CA010 | 7026341 |
| 900 | C40S-0902CA010 | 1018621 | C40E-0902CA010 | 1018622 | C40P-0902CA010 | 7026342 |
| 1050 | C40S-1002CA010 | 1018623 | C40E-1002CA010 | 1018624 | C40P-1002CA010 | 7026343 |
| 1200 | C40S-1202CA010 | 1018625 | C40E-1202CA010 | 1018626 | C40P-1202CA010 | 7026344 |
| 1350 | C40S-1302CA010 | 1018627 | C40E-1302CA010 | 1018628 | C40P-1302CA010 | 7026345 |
| 1500 | C40S-1502CA010 | 1018629 | C40E-1502CA010 | 1018630 | C40P-1502CA010 | 7026346 |
| 1650 | C40S-1602CA010 | 1018631 | C40E-1602CA010 | 1018632 | C40P-1602CA010 | 7027030 |
| 1800 | C40S-1802CA010 | 1018633 | C40E-1802CA010 | 1018634 | C40P-1802CA010 | 7026347 |


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**Resolution 30 mm, scanning range 0 m ... 19 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303CA010 | 1018635 | C40E-0303CA010 | 1018636 | C40P-0303CA010 | 7026348 |
| 450 | C40S-0403CA010 | 1018637 | C40E-0403CA010 | 1018638 | C40P-0403CA010 | 7026349 |
| 600 | C40S-0603CA010 | 1018639 | C40E-0603CA010 | 1018640 | C40P-0603CA010 | 7026350 |
| 750 | C40S-0703CA010 | 1018641 | C40E-0703CA010 | 1018642 | C40P-0703CA010 | 7026351 |
| 900 | C40S-0903CA010 | 1018643 | C40E-0903CA010 | 1018644 | C40P-0903CA010 | 7026352 |
| 1050 | C40S-1003CA010 | 1018645 | C40E-1003CA010 | 1018646 | C40P-1003CA010 | 7026353 |
| 1200 | C40S-1203CA010 | 1018647 | C40E-1203CA010 | 1018648 | C40P-1203CA010 | 7026354 |
| 1350 | C40S-1303CA010 | 1018649 | C40E-1303CA010 | 1018650 | C40P-1303CA010 | 7026355 |
| 1500 | C40S-1503CA010 | 1018651 | C40E-1503CA010 | 1018652 | C40P-1503CA010 | 7026356 |
| 1650 | C40S-1603CA010 | 1018653 | C40E-1603CA010 | 1018654 | C40P-1603CA010 | 7027031 |
| 1800 | C40S-1803CA010 | 1018655 | C40E-1803CA010 | 1018656 | C40P-1803CA010 | 7026357 |

E

**Resolution 40 mm, scanning range 0 m ... 19 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0304CA010 | 1018657 | C40E-0304CA010 | 1018658 | C40P-0304CA010 | 7026358 |
| 450 | C40S-0404CA010 | 1018659 | C40E-0404CA010 | 1018660 | C40P-0404CA010 | 7026359 |
| 600 | C40S-0604CA010 | 1018661 | C40E-0604CA010 | 1018662 | C40P-0604CA010 | 7026360 |
| 750 | C40S-0704CA010 | 1018663 | C40E-0704CA010 | 1018664 | C40P-0704CA010 | 7026361 |
| 900 | C40S-0904CA010 | 1018665 | C40E-0904CA010 | 1018666 | C40P-0904CA010 | 7026362 |
| 1050 | C40S-1004CA010 | 1018667 | C40E-1004CA010 | 1018668 | C40P-1004CA010 | 7026363 |
| 1200 | C40S-1204CA010 | 1018669 | C40E-1204CA010 | 1018670 | C40P-1204CA010 | 7026364 |
| 1350 | C40S-1304CA010 | 1018671 | C40E-1304CA010 | 1018672 | C40P-1304CA010 | 7026365 |
| 1500 | C40S-1504CA010 | 1018673 | C40E-1504CA010 | 1018674 | C40P-1504CA010 | 7026366 |
| 1650 | C40S-1604CA010 | 1018675 | C40E-1604CA010 | 1018676 | C40P-1604CA010 | 7027032 |
| 1800 | C40S-1804CA010 | 1018677 | C40E-1804CA010 | 1018678 | C40P-1804CA010 | 7026367 |

## C4000 Standard with angled system connection, without extension connection

| | |
|---|---|
| **Housing dimensions** | 48 mm× 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass (with UE402), operating mode selection (with UE402) |
| **Consisting of** | Sender and receiver unit |
| **Usage** | Last system in cascade or stand-alone system |
| **Connections** | System connection: Hirschmann plug M26×11 + FE<br>Configuration and diagnostics interface: M8×4 |

| Resolution (mm) | Scanning range (m) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 14 | 0 ... 8 | 300 | C40S-0301CA020 | 1022267 | C40E-0301CA020 | 1022268 |
| | | 450 | C40S-0401CA020 | 1026737 | C40E-0401CA020 | 1026738 |
| 30 | 0 ... 19 | 300 | C40S-0303CA020 | 1026733 | C40E-0303CA020 | 1026734 |
| | | 450 | C40S-0403CA020 | 1026735 | C40E-0403CA020 | 1026736 |


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## C4000 Standard with extension connection M26 × 11 + FE

➜ Ordering information C4000 Standard without extension connection, see page E-35

| | |
|---|---|
| **Housing dimensions** | 48 mm × 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass or emergency stop, operating mode selection (with UE402) |
| **Consisting of** | Sender and receiver unit |
| **Usage** | First system in cascade, middle system in cascade |
| **Connections** | System connection: Hirschmann plug M26 × 11 + FE<br>Extension connection: Hirschmann socket M26 × 11 + FE<br>Configuration and diagnostics interface: M8 × 4 |

E

### Resolution 14 mm, scanning range 0 m ... 8 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301DA010 | 1018690 | C40E-0301DA010 | 1018691 | C40P-0301DA010 | 7026408 |
| 450 | C40S-0401DA010 | 1018349 | C40E-0401DA010 | 1018350 | C40P-0401DA010 | 7026409 |
| 600 | C40S-0601DA010 | 1018692 | C40E-0601DA010 | 1018693 | C40P-0601DA010 | 7026410 |
| 750 | C40S-0701DA010 | 1018694 | C40E-0701DA010 | 1018695 | C40P-0701DA010 | 7026411 |
| 900 | C40S-0901DA010 | 1018696 | C40E-0901DA010 | 1018697 | C40P-0901DA010 | 7026412 |
| 1050 | C40S-1001DA010 | 1018698 | C40E-1001DA010 | 1018699 | C40P-1001DA010 | 7026413 |
| 1200 | C40S-1201DA010 | 1018700 | C40E-1201DA010 | 1018701 | C40P-1201DA010 | 7026414 |
| 1350 | C40S-1301DA010 | 1018702 | C40E-1301DA010 | 1018703 | C40P-1301DA010 | 7026415 |
| 1500 | C40S-1501DA010 | 1018704 | C40E-1501DA010 | 1018705 | C40P-1501DA010 | 7026416 |
| 1650 | C40S-1601DA010 | 1018706 | C40E-1601DA010 | 1018707 | C40P-1601DA010 | 7027037 |
| 1800 | C40S-1801DA010 | 1018708 | C40E-1801DA010 | 1018709 | C40P-1801DA010 | 7026417 |

### Resolution 20 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0302DA010 | 1018710 | C40E-0302DA010 | 1018711 | C40P-0302DA010 | 7026418 |
| 450 | C40S-0402DA010 | 1018712 | C40E-0402DA010 | 1018713 | C40P-0402DA010 | 7026419 |
| 600 | C40S-0602DA010 | 1018714 | C40E-0602DA010 | 1018715 | C40P-0602DA010 | 7026420 |
| 750 | C40S-0702DA010 | 1018716 | C40E-0702DA010 | 1018717 | C40P-0702DA010 | 7026421 |
| 900 | C40S-0902DA010 | 1018718 | C40E-0902DA010 | 1018719 | C40P-0902DA010 | 7026422 |
| 1050 | C40S-1002DA010 | 1018720 | C40E-1002DA010 | 1018721 | C40P-1002DA010 | 7026423 |
| 1200 | C40S-1202DA010 | 1018722 | C40E-1202DA010 | 1018723 | C40P-1202DA010 | 7026424 |
| 1350 | C40S-1302DA010 | 1018724 | C40E-1302DA010 | 1018725 | C40P-1302DA010 | 7026425 |
| 1500 | C40S-1502DA010 | 1018726 | C40E-1502DA010 | 1018727 | C40P-1502DA010 | 7026426 |
| 1650 | C40S-1602DA010 | 1018728 | C40E-1602DA010 | 1018729 | C40P-1602DA010 | 7027038 |
| 1800 | C40S-1802DA010 | 1018730 | C40E-1802DA010 | 1018731 | C40P-1802DA010 | 7026427 |


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### Resolution 30 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303DA010 | 1018733 | C40E-0303DA010 | 1018734 | C40P-0303DA010 | 7026428 |
| 450 | C40S-0403DA010 | 1018735 | C40E-0403DA010 | 1018736 | C40P-0403DA010 | 7026429 |
| 600 | C40S-0603DA010 | 1018737 | C40E-0603DA010 | 1018738 | C40P-0603DA010 | 7026430 |
| 750 | C40S-0703DA010 | 1018739 | C40E-0703DA010 | 1018740 | C40P-0703DA010 | 7026431 |
| 900 | C40S-0903DA010 | 1018741 | C40E-0903DA010 | 1018742 | C40P-0903DA010 | 7026432 |
| 1050 | C40S-1003DA010 | 1018743 | C40E-1003DA010 | 1018744 | C40P-1003DA010 | 7026433 |
| 1200 | C40S-1203DA010 | 1018745 | C40E-1203DA010 | 1018746 | C40P-1203DA010 | 7026434 |
| 1350 | C40S-1303DA010 | 1018747 | C40E-1303DA010 | 1018748 | C40P-1303DA010 | 7026435 |
| 1500 | C40S-1503DA010 | 1018749 | C40E-1503DA010 | 1018750 | C40P-1503DA010 | 7026436 |
| 1650 | C40S-1603DA010 | 1018751 | C40E-1603DA010 | 1018752 | C40P-1603DA010 | 7027039 |
| 1800 | C40S-1803DA010 | 1018753 | C40E-1803DA010 | 1018754 | C40P-1803DA010 | 7026437 |

E

### Resolution 40 mm, scanning range 0 m ... 19 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0304DA010 | 1018755 | C40E-0304DA010 | 1018756 | C40P-0304DA010 | 7026438 |
| 450 | C40S-0404DA010 | 1018757 | C40E-0404DA010 | 1018758 | C40P-0404DA010 | 7026439 |
| 600 | C40S-0604DA010 | 1018759 | C40E-0604DA010 | 1018760 | C40P-0604DA010 | 7026440 |
| 750 | C40S-0704DA010 | 1018762 | C40E-0704DA010 | 1018763 | C40P-0704DA010 | 7026441 |
| 900 | C40S-0904DA010 | 1018765 | C40E-0904DA010 | 1018766 | C40P-0904DA010 | 7026442 |
| 1050 | C40S-1004DA010 | 1018767 | C40E-1004DA010 | 1018768 | C40P-1004DA010 | 7026443 |
| 1200 | C40S-1204DA010 | 1018769 | C40E-1204DA010 | 1018770 | C40P-1204DA010 | 7026444 |
| 1350 | C40S-1304DA010 | 1018771 | C40E-1304DA010 | 1018772 | C40P-1304DA010 | 7026445 |
| 1500 | C40S-1504DA010 | 1018773 | C40E-1504DA010 | 1018774 | C40P-1504DA010 | 7026446 |
| 1650 | C40S-1604DA010 | 1018775 | C40E-1604DA010 | 1018776 | C40P-1604DA010 | 7027040 |
| 1800 | C40S-1804DA010 | 1018777 | C40E-1804DA010 | 1018778 | C40P-1804DA010 | 7026447 |


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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## C4000 Standard

### General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 6 m / 0 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 14 mm ... 40 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

| | |
|---|---|
| **Output signal switching devices (OSSDs)** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Response time (depending on type)** | 9 ms ... 56 ms (stand-alone system, without beam coding, without blanking) |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 3.5 V |
| **Switching current max.** | 500 mA |
| **Power consumption** | ≤3 A |

### Sender unit

| | |
|---|---|
| **Power consumption** | ≤2 A |

### General operating data

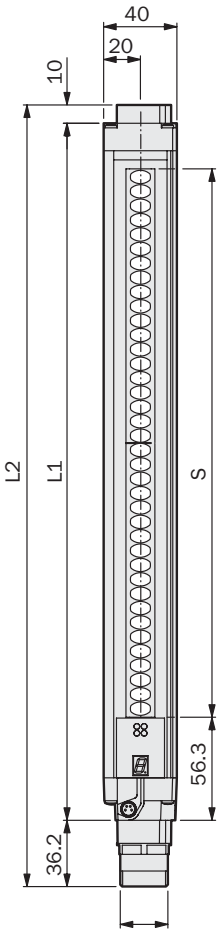
| | |
|---|---|
| **Connection type system connection** | Hirschmann plug M26 × 11 + FE |
| **Connection type extension connection** | Hirschmann socket M26 × 11 + FE |
| **Connection type configuration connection** | M8 × 4 |
| **Connecting cable length** | Max. 50 m |
| **Connecting cable wire cross-section** | 0.75 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm × 40 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Weight (depending on type)** | 0.82 kg ... 3.71 kg |

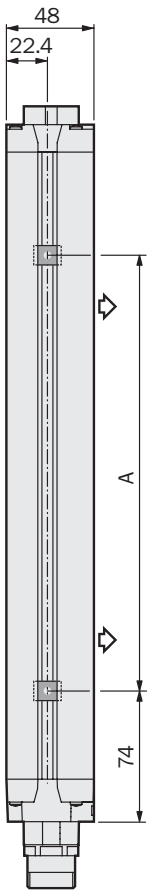
E


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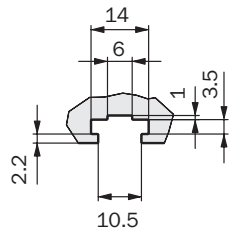
# Dimensional drawings

## C4000 Standard without extension connection

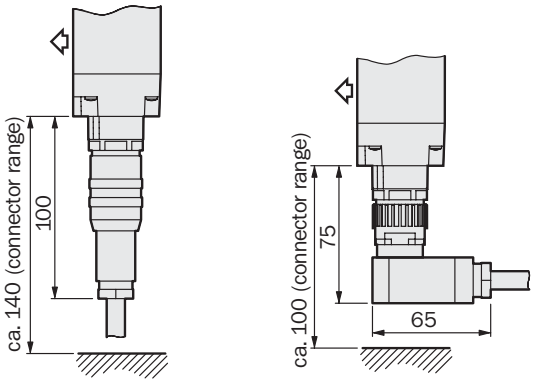



DIN 43651 plug
(M26 x 11 + FE)




Sliding nut groove for side mounting




Cable sockets M26 × 11 + FE with crimp contacts

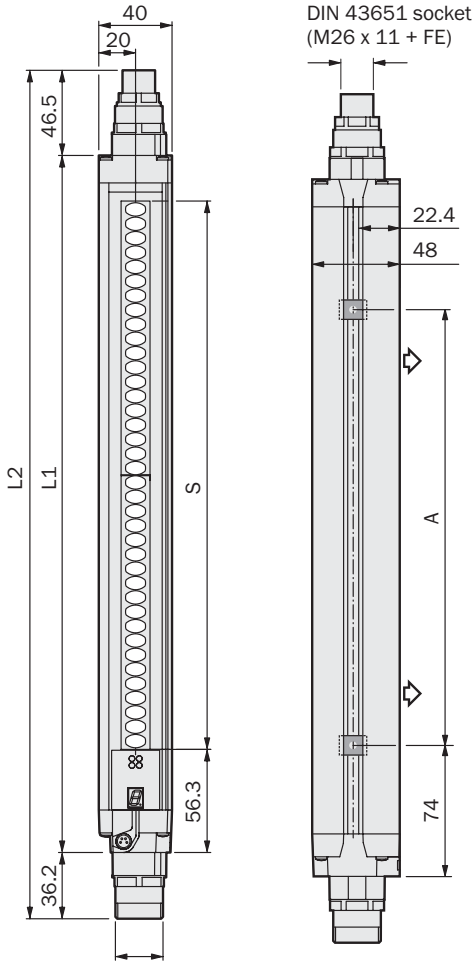
Dimensions in mm

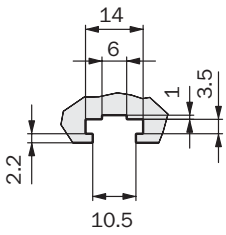
| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **300** | 381 | 427 | 224 |
| **450** | 532 | 578 | 374 |
| **600** | 682 | 728 | 524 |
| **750** | 833 | 879 | 674 |
| **900** | 984 | 1030 | 824 |
| **1050** | 1134 | 1180 | 974 |
| **1200** | 1283 | 1329 | 1124 |
| **1350** | 1435 | 1481 | 1274 |
| **1500** | 1586 | 1632 | 1424 |
| **1650** | 1736 | 1782 | 1574 |
| **1800** | 1887 | 1933 | 1724 |

Dimensions in mm

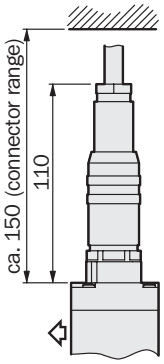

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## C4000 Standard with extension connection M26 × 11 + FE

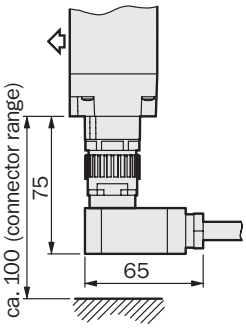


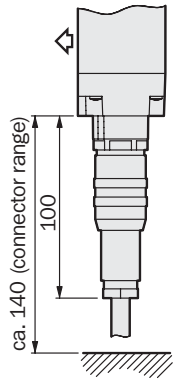




Sliding nut groove for side mounting




Cable plug M26 × 11 + FE with crimp contacts




Cable sockets M26 × 11 + FE with crimp contacts

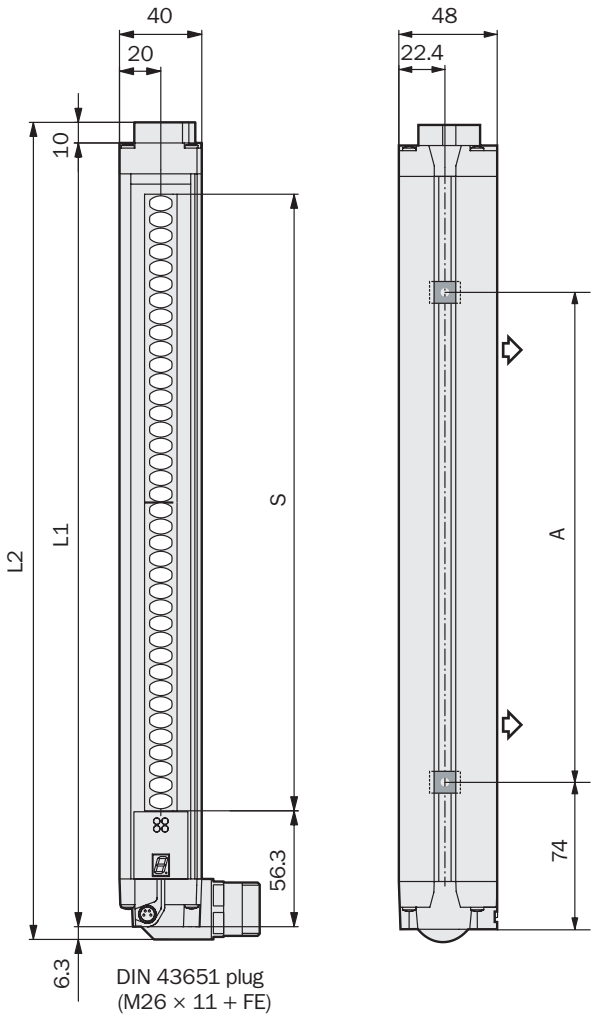
Dimensions in mm

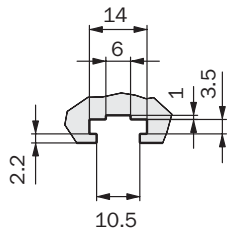
| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **300** | 381 | 464 | 224 |
| **450** | 532 | 614 | 374 |
| **600** | 682 | 765 | 524 |
| **750** | 833 | 915 | 674 |
| **900** | 984 | 1066 | 824 |
| **1050** | 1134 | 1216 | 974 |
| **1200** | 1283 | 1366 | 1124 |
| **1350** | 1435 | 1517 | 1274 |
| **1500** | 1586 | 1669 | 1424 |
| **1650** | 1736 | 1818 | 1574 |
| **1800** | 1887 | 1969 | 1724 |

Dimensions in mm

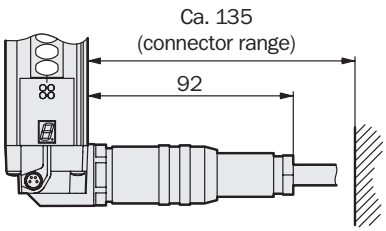

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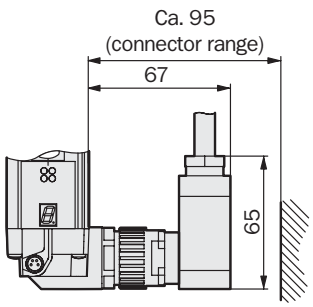
## C4000 Standard with angled system connection, without extension connection




Sliding nut groove for side mounting




Cable sockets M26×11 + FE with crimp contacts

Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **300** | 381 | 397 | 224 |
| **450** | 532 | 548 | 374 |

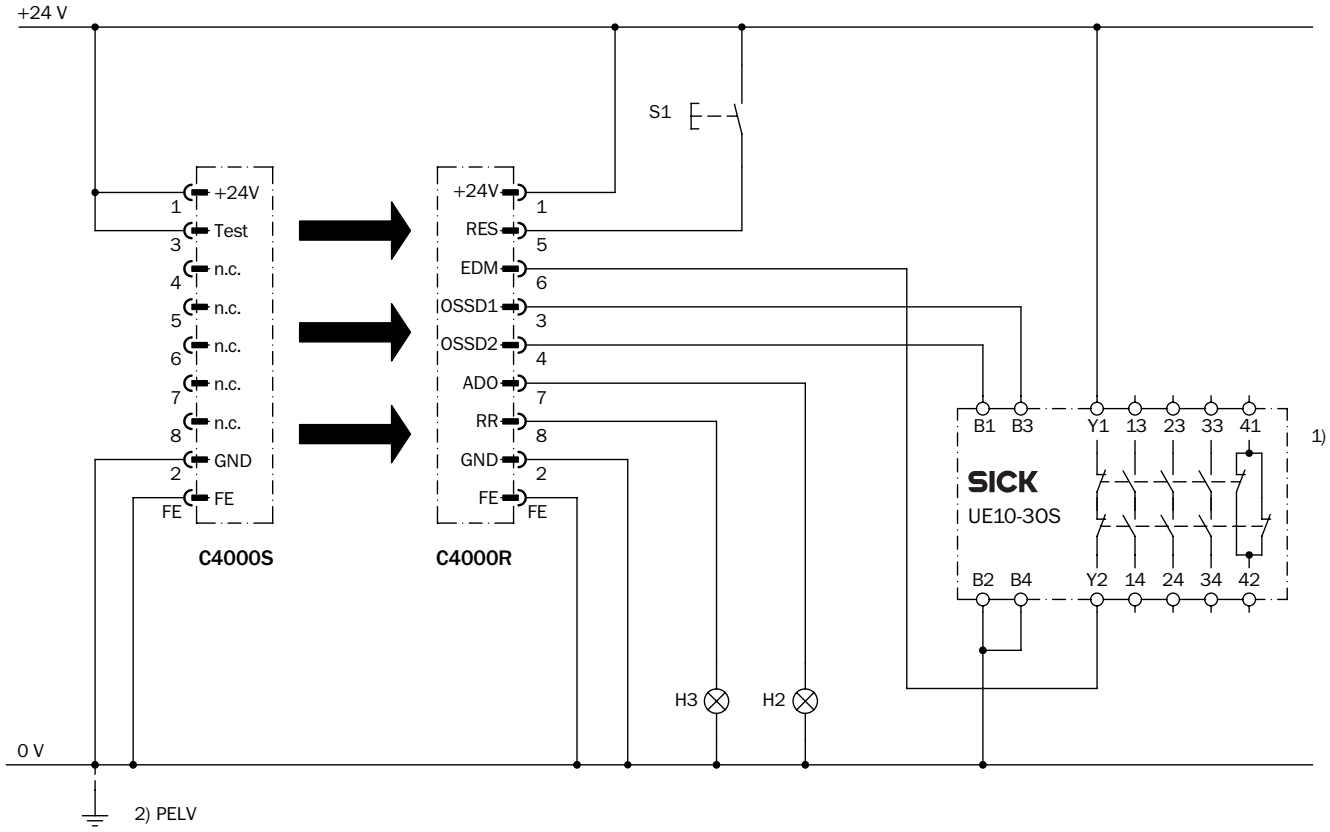
Dimensions in mm


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# Connection diagrams

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## C4000 Standard on UE10-3OS safety relay




**Task**

Connection of a C4000 Standard safety light curtain to UE10-3OS. Operating mode with restart interlock and external device monitoring.

**Function**

When the light path is clear and the UE10-3OS is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 are flashing. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-3OS is switched on. On the interruption of one of the light beams, the UE10-3OS is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-3OS will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable. Lamp H2 is illuminated if there is contamination (adjustable parameter).

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4.

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

→ Dimensional drawings for mounting systems, see page E-47

### Mounting systems

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Cable sockets

| Connection type | Connector technology | Direction of the cable outlet | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Crimp contacts | Straight | 6020757 |
| | | Angled | 6020758 |

### Cable plugs

| Connection type | Connector technology | Direction of the cable outlet on the plug | Part number |
|---|---|---|---|
| Hirschmann cable plug M26×11 + FE | Crimp contacts | Straight | 6021191 |
| | | Angled | 6021192 |


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### Connecting cables

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |

### Connection cables cascade

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Plug connection, M26×11 + FE | Plug straight/socket straight | 0.25 m | 2022278 |
| | | 0.5 m | 2021838 |
| | | 1 m | 2022279 |
| | | 1.5 m | 2022280 |
| | | 2 m | 2022281 |
| | | 2.5 m | 2022282 |
| | | 3 m | 2022283 |
| | Plug straight, socket angled | 0.25 m | 2022284 |
| | | 0.5 m | 2022285 |
| | | 1 m | 2022286 |
| | | 1.5 m | 2022287 |
| | | 2 m | 2022288 |
| | | 2.5 m | 2022289 |
| | | 3 m | 2022290 |

### Connection cables emergency stop, reset button, door switch

| Connector technology | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Stripped | Plug straight | 2.5 m | 2026869 |
| | | 10 m | 2026870 |

### Cables without plug/socket

| Comment | Part number |
|---|---|
| Self assembly cable (suitable for EFI communication) | 6021437 |

### Connection cables configuration

| Comment | Cable length | Part number |
|---|---|---|
| For connecting the configuration interface to the serial interface on the PC | 2 m | 6021195 |
| | 8 m | 2027649 |

### Interfaces

| Designation | Enclosure rating | Description | Type | Part number |
|---|---|---|---|---|
| Safety interface | IP 20 | Expands C4000 Standard/Advanced with the functions PSDI mode, bypass, operating mode selection | UE402 | 1023577 |

Continued on next page


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### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns

→ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2022412 |
| 450 | 2022413 |
| 600 | 2022414 |
| 750 | 2022415 |
| 900 | 2022416 |
| 1050 | 2022417 |
| 1200 | 2022418 |
| 1350 | 2022419 |
| 1500 | 2022420 |
| 1650 | 2022421 |
| 1800 | 2022422 |

### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |


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### Sliding nuts for deflector mirrors

| Suitable for | Packing unit | Part number |
|---|---|---|
| PNS75 and PNS125 | 6 | 2030600 |

### Explosion protection

| Designation | Comment | Part number |
|---|---|---|
| ATEX package | Can be used in zone 2/22, 3G 3D | 2029961 |

### Laser alignment aid

| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 | – | – | 4032461 |

### Configuration software

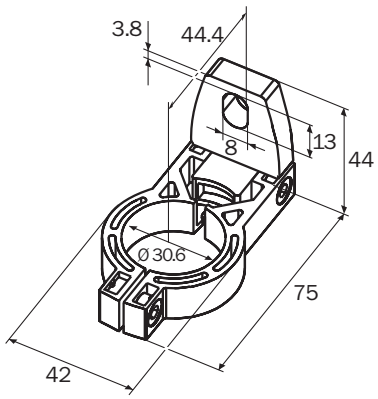
| Designation | Comment | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages | 2032314 |

### Configuration tools

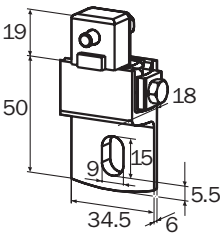
| Designation | Comment | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced | 1029665 |
| Host-Guest Plug for C4000 | For C4000 Standard / Advanced | 1029717 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host-Guest Plug | 5318293 |

## Dimensional drawings mounting systems

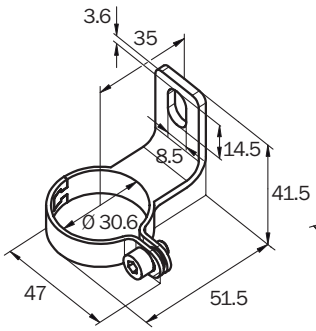
Dimensions in mm



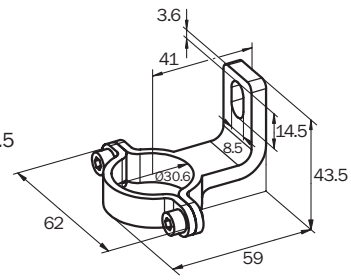

Swivel mount, mounting kit 2




Side bracket, mounting kit 6



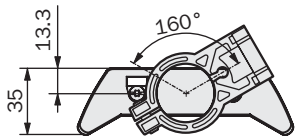

Stainless steel bracket



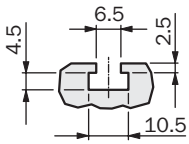

Reinforced stainless steel bracket


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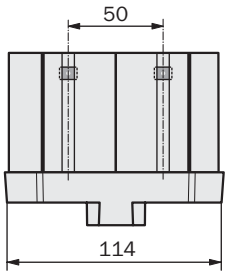
## Dimensional drawings deflector mirror PNS75

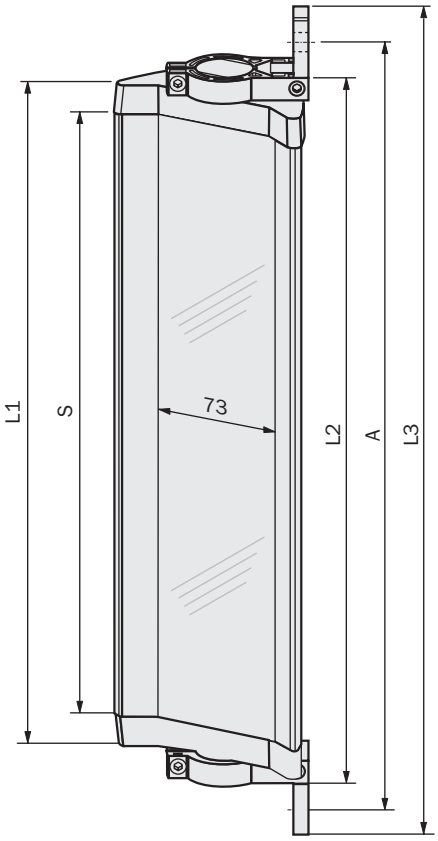



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



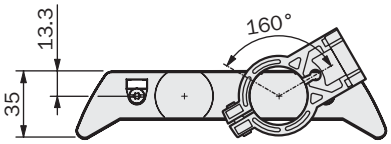

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

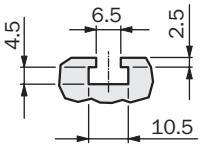
Dimensions in mm


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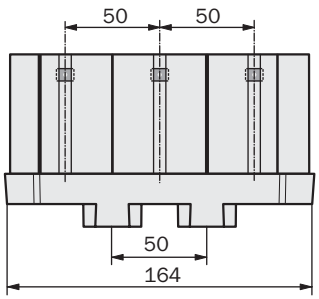
## Dimensional drawings deflector mirror PNS125

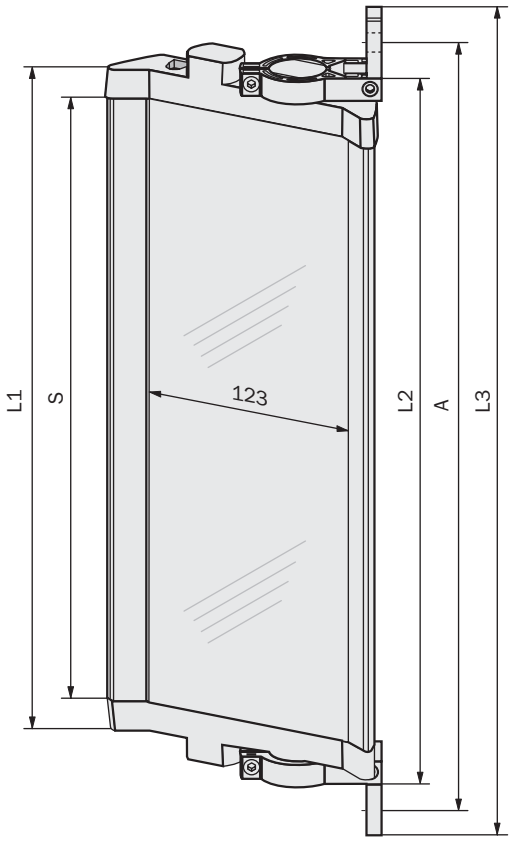



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



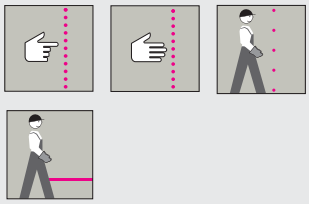

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

Dimensions in mm

E


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- Small, compact design
- External device monitoring (EDM)
- Restart interlock (RES)

E

## Overview of technical specifications

| | |
|---|---|
| **Protective field height (depending on type)** | 150 mm ... 1200 mm |
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The C4000 Micro safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection.

- Simplified machine integration in small spaces due to small, compact design
- Space-saving cable entry due to M12 connections

## In-system added value

- Supports integration with multiple safety control solutions

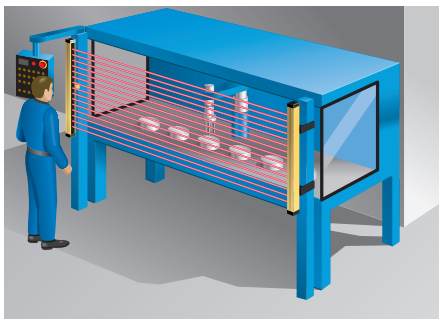
| Combination with | Restart interlock | External device monitoring | Further information |
|---|---|---|---|
| **UE48-20S** | ✔ | ✔ | N-42 |
| **UE48-30S** | ✔ | ✔ | N-48 |
| **UE10-3OS** | Relay module | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Electronics industry
- Packaging machines
- Food, tobacco and beverage industry
- Handling machines
- Special machine-tool manufacture



Hazardous point protection on a handling machine


| Further information | Page |
|---|---|
| → Technical specifications | E-52 |
| → Dimensional drawings | E-53 |
| → Connection diagrams | E-54 |
| → Accessories | E-55 |
| → Services | A-2 |




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# Ordering information

## C4000 Micro

| | |
|---|---|
| **Housing cross-section** | 33.5 mm × 28.5 mm |
| **Functions** | Restart interlock, external device monitoring |
| **Consisting of** | Sender and receiver unit, operating instructions on CD-ROM |
| **Usage** | Stand-alone system |
| **Connections** | System connection: M12 × 7 + FE |

### Resolution 14 mm, scanning range 0 m ... 2.5 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 150 | C41S-0101AA300 | 1024054 | C41E-0101AG300 | 1024055 | C41P-0101AG300 | 7028891 |
| 300 | C41S-0301AA300 | 1023458 | C41E-0301AG300 | 1023459 | C41P-0301AG300 | 7027685 |
| 450 | C41S-0401AA300 | 1023460 | C41E-0401AG300 | 1023461 | C41P-0401AG300 | 7027686 |
| 600 | C41S-0601AA300 | 1023462 | C41E-0601AG300 | 1023463 | C41P-0601AG300 | 7027687 |
| 750 | C41S-0701AA300 | 1023464 | C41E-0701AG300 | 1023465 | C41P-0701AG300 | 7027688 |
| 900 | C41S-0901AA300 | 1023466 | C41E-0901AG300 | 1023467 | C41P-0901AG300 | 7027689 |
| 1050 | C41S-1001AA300 | 1023468 | C41E-1001AG300 | 1023469 | C41P-1001AG300 | 7027690 |
| 1200 | C41S-1201AA300 | 1023470 | C41E-1201AG300 | 1023471 | C41P-1201AG300 | 7027691 |

### Resolution 14 mm, scanning range 1 m ... 5 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 150 | C41S-0101AA300 | 1024054 | C41E-0101BG300 | 1024037 | C41P-0101BG300 | 7028892 |
| 300 | C41S-0301AA300 | 1023458 | C41E-0301BG300 | 1023486 | C41P-0301BG300 | 7027692 |
| 450 | C41S-0401AA300 | 1023460 | C41E-0401BG300 | 1023487 | C41P-0401BG300 | 7027693 |
| 600 | C41S-0601AA300 | 1023462 | C41E-0601BG300 | 1023488 | C41P-0601BG300 | 7027694 |
| 750 | C41S-0701AA300 | 1023464 | C41E-0701BG300 | 1023489 | C41P-0701BG300 | 7027695 |
| 900 | C41S-0901AA300 | 1023466 | C41E-0901BG300 | 1023490 | C41P-0901BG300 | 7027696 |
| 1050 | C41S-1001AA300 | 1023468 | C41E-1001BG300 | 1023491 | C41P-1001BG300 | 7027697 |
| 1200 | C41S-1201AA300 | 1023470 | C41E-1201BG300 | 1023492 | C41P-1201BG300 | 7027698 |

### Resolution 30 mm, scanning range 0 m ... 6 m

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 150 | C41S-0103AA300 | 1023563 | C41E-0103AG300 | 1023860 | C41P-0103AG300 | 7028893 |
| 300 | C41S-0303AA300 | 1023472 | C41E-0303AG300 | 1023473 | C41P-0303AG300 | 7027699 |
| 450 | C41S-0403AA300 | 1023474 | C41E-0403AG300 | 1023475 | C41P-0403AG300 | 7027700 |
| 600 | C41S-0603AA300 | 1023476 | C41E-0603AG300 | 1023477 | C41P-0603AG300 | 7027701 |
| 750 | C41S-0703AA300 | 1023478 | C41E-0703AG300 | 1023479 | C41P-0703AG300 | 7027702 |
| 900 | C41S-0903AA300 | 1023480 | C41E-0903AG300 | 1023481 | C41P-0903AG300 | 7027703 |
| 1050 | C41S-1003AA300 | 1023482 | C41E-1003AG300 | 1023483 | C41P-1003AG300 | 7027704 |
| 1200 | C41S-1203AA300 | 1023484 | C41E-1203AG300 | 1023485 | C41P-1203AG300 | 7027705 |




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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Protective field height (depending on type)** | 150 mm ... 1200 mm |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 (IEC 61496) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

## Receiver unit

| | | |
|---|---|---|
| **Output signal switching devices (OSSDs)** | | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Switching voltage** | **$HIGH_{min}$**<br>**$LOW_{max}$** | $V_S$ – 2.25 V<br>3.5 V |
| **Switching current max.** | | 500 mA |
| **Power consumption** | | ≤1.45 A |

## Sender unit

| | |
|---|---|
| **Power consumption** | ≤0.35 A |

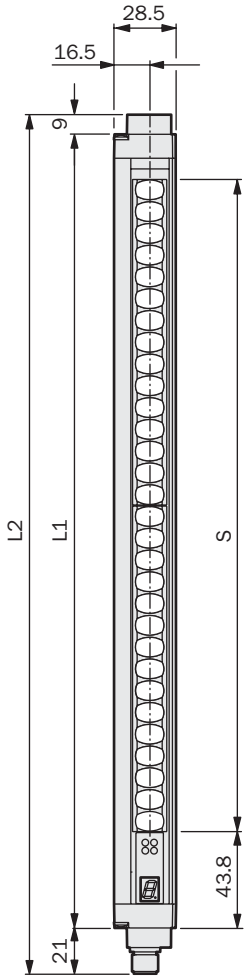
## General operating data

| | |
|---|---|
| **Connection type system connection** | M12 × 7 + FE |
| **Connecting cable length** | Max. 15 m |
| **Connecting cable wire cross-section** | 0.25 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 33.5 mm × 28.5 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Weight (depending on type)** | 0.37 kg ... 1.25 kg |

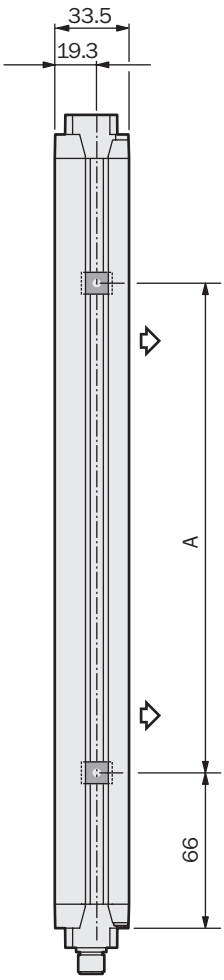

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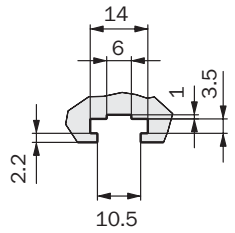
# Dimensional drawings

## C4000 Micro

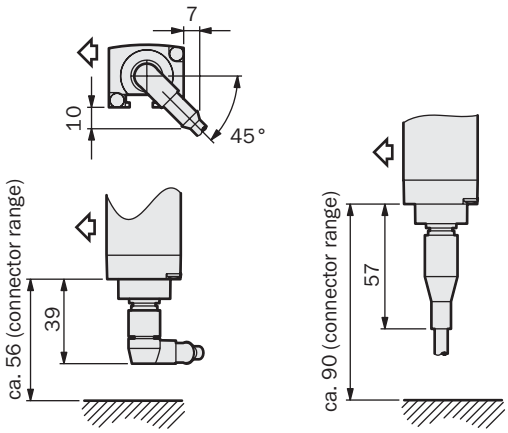



Plug M12 x 7 + FE




Sliding nut groove for side mounting




Cable sockets M12×7 + FE

Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **150** | 276 | 246 | – |
| **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 |

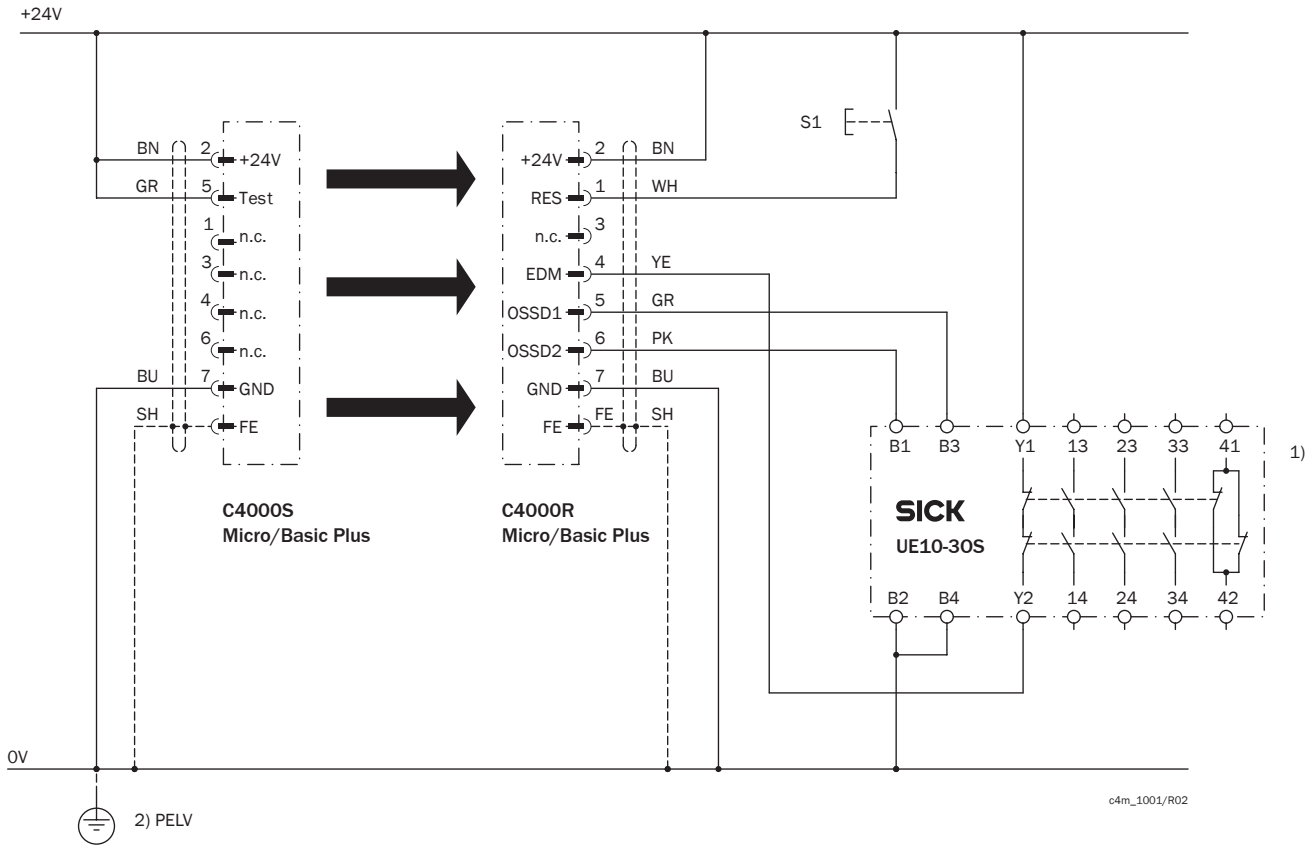
Dimensions in mm


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# Connection diagrams

→ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## C4000 Micro on UE10-3OS safety relay




**Task**

Integration of a C4000 Micro/Basic Plus safety light curtain on UE10-3OS.

Operating mode with restart interlock and external device monitoring.

**Function**

When the light path is clear and the UE10-3OS is de-energised and functioning correctly, the yellow LED on the receiver flashes. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-3OS is switched on. On the interruption of one of the light beams, the UE10-3OS is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-3OS will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

**Comments**

1) Output current circuits. These contacts are to be connected to the controller such that, with the output current circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1/6.4

Take note of the operating instructions of the integrated devices.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

### Mounting systems

→ Dimensional drawings for mounting systems, see page E-63

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 1 | Pivoting, swivel mount | 4 | For all protective field heights | 2019649 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 10 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021645 |
| Stainless steel bracket | Pivoting | 4 | Small housing profile | 2030288 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Connecting cables

| Connection type | Connector technology | Maximum connection wire cross-section | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|---|---|
| Cable socket M12×7 + FE | Stripped | 0.25 $mm^2$ | Straight | 2.5 m | 6020537 |
| | | | | 5 m | 6020354 |
| | | | | 7.5 m | 6020353 |
| | | | | 10 m | 6020352 |
| | | | | 15 m | 6020872 |
| | | | Angled | 5 m | 6021342 |
| | | | | 15 m | 6021343 |

### Cable sockets

| Connection type | Connector technology | Direction of the cable outlet | Connection wire cross-section | Part number |
|---|---|---|---|---|
| M12×7 + FE | Screw contacts | Straight | Max. 0.75 $mm^2$ | 6028422 |

Continued on next page


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### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns

➜ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2022405 |
| 450 | 2022406 |
| 600 | 2022407 |
| 750 | 2022408 |
| 900 | 2022409 |
| 1050 | 2022410 |
| 1200 | 2022411 |

### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |

### Sliding nuts for deflector mirrors

| Suitable for | Packing unit | Part number |
|---|---|---|
| PNS75 and PNS125 | 6 | 2030600 |

### Laser alignment aid

| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 Micro | – | – | 4032462 |

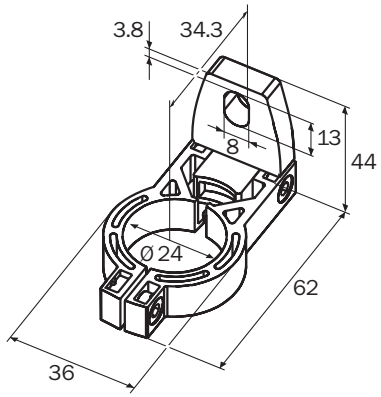
### Documentation

| Designation | Comment | Part number |
|---|---|---|
| Operating instructions C4000 Micro / Basic Plus/ Basic / Eco on CD-ROM | Included in the delivery | 2026783 |

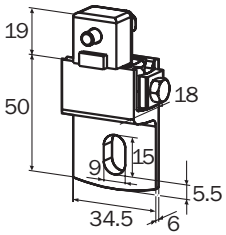

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## Dimensional drawings mounting systems

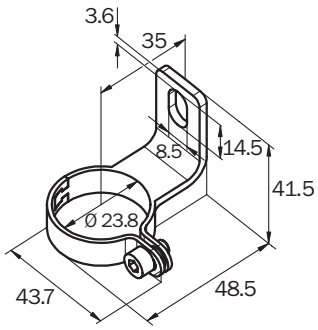
Dimensions in mm




Swivel mount, mounting kit 1



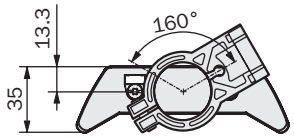

Side bracket, mounting kit 6



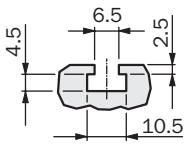

Stainless steel bracket

E

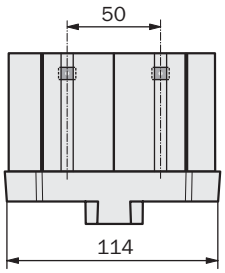
## Dimensional drawings deflector mirror PNS75

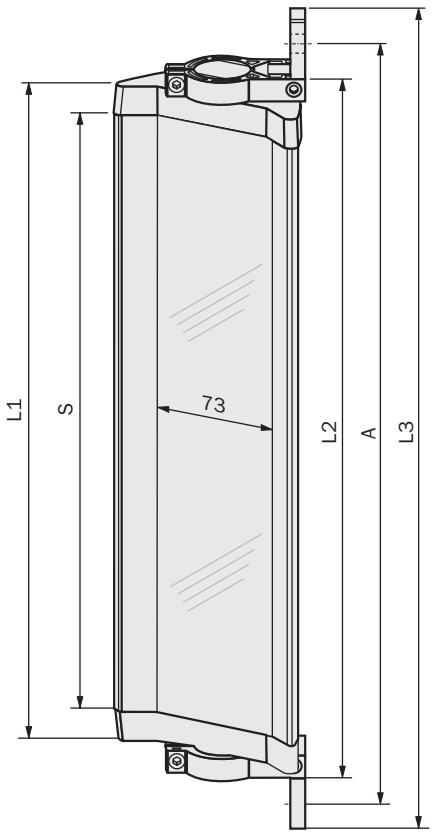



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



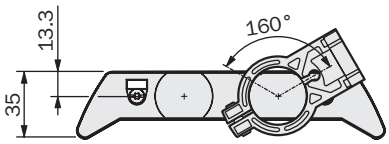

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

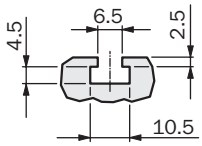
Dimensions in mm


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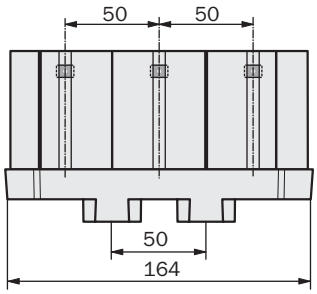
## Dimensional drawings deflector mirror PNS125

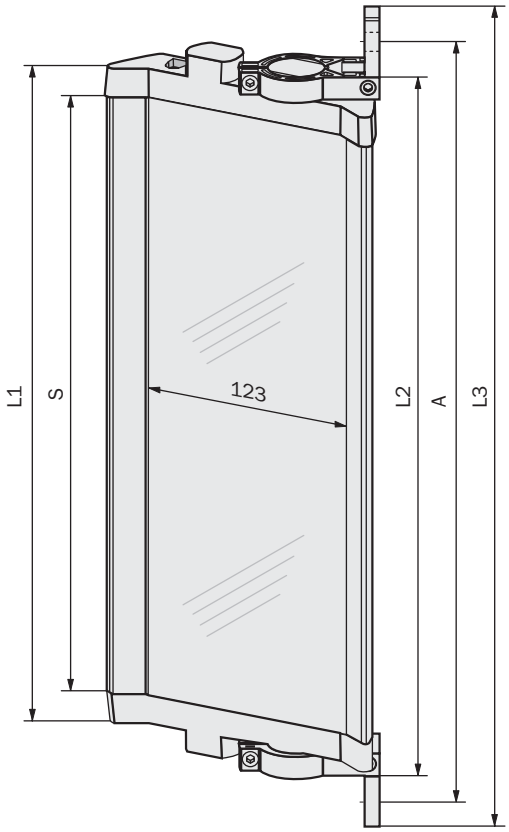



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting




Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

Dimensions in mm


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## Overview of technical specifications

| | |
|---|---|
| **Resistant materials** | V4A, PMMA, PA, PVC |
| **Enclosure rating** | IP 66, IP 67 |
| **Protective field height (depending on type)** | 150 mm ... 1200 mm |
| **Scanning range (depending on type)** | 0 m ... 1.8 m / 1 m ... 4 m / 0 m ... 4.5 m |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 (IEC 61496-1),<br>Type 2 (IEC 61496-2) |

## Product description

The IP 67 Housing in conjunction with the C4000 Micro safety light curtain achieves the enclosure rating IP 67. A high level of resistance against the usual cleaning agents is achieved by using suitable materials (V4A, PMMA, PA, PVC).

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

## In-system added value

- Supports integration with multiple safety control solutions

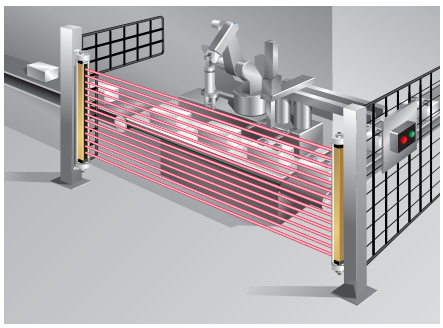
| Combination with | Restart interlock | External device monitoring | Further information |
|---|---|---|---|
| **UE48-2OS** | ✔ | ✔ | N-42 |
| **UE48-3OS** | ✔ | ✔ | N-48 |
| **UE10-3OS** | – | – | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

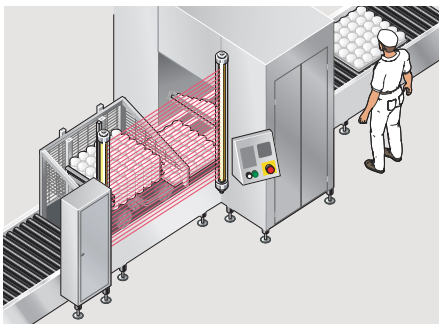
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

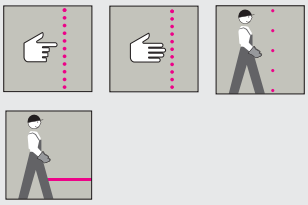
- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Hazardous point protection on a processing centre in the hygiene area



Hazardous point protection on a cheese-making machine





- High durability
- Compact design
- On site diagnostics
- External device monitoring (EDM)
- Restart interlock (RES)

| Further information | Page |
|---|---|
| → Ordering information | E-60 |
| → Technical specifications | E-61 |
| → Dimensional drawing | E-62 |
| → Accessories | E-63 |
| → Services | A-2 |

E



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# Ordering information

## IP 67 Housing with integrated sender or receiver unit C4000 Micro, including 15 m PVC cable

**Resolution 14 mm, scanning range 0 m ... 1.8 m**

| Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|
| | Type | Part number | Type | Part number |
| 150 | C45S-0101AA220 | 1025720 | C45E-0101AG220 | 1025721 |
| 300 | C45S-0301AA220 | 1025722 | C45E-0301AG220 | 1025723 |
| 450 | C45S-0401AA220 | 1025727 | C45E-0401AG220 | 1025728 |
| 600 | C45S-0601AA220 | 1025732 | C45E-0601AG220 | 1025733 |
| 750 | C45S-0701AA220 | 1025737 | C45E-0701AG220 | 1025738 |
| 900 | C45S-0901AA220 | 1025742 | C45E-0901AG220 | 1025743 |
| 1050 | C45S-1001AA220 | 1025747 | C45E-1001AG220 | 1025748 |
| 1200 | C45S-1201AA220 | 1025753 | C45E-1201AG220 | 1025754 |

**Resolution 14 mm, scanning range 1 m ... 4 m**

| Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|
| | Type | Part number | Type | Part number |
| 150 | C45S-0101AA220 | 1025720 | C45E-0101BG220 | 1025719 |
| 300 | C45S-0301AA220 | 1025722 | C45E-0301BG220 | 1025726 |
| 450 | C45S-0401AA220 | 1025727 | C45E-0401BG220 | 1025731 |
| 600 | C45S-0601AA220 | 1025732 | C45E-0601BG220 | 1025736 |
| 750 | C45S-0701AA220 | 1025737 | C45E-0701BG220 | 1025741 |
| 900 | C45S-0901AA220 | 1025742 | C45E-0901BG220 | 1025746 |
| 1050 | C45S-1001AA220 | 1025747 | C45E-1001BG220 | 1025752 |
| 1200 | C45S-1201AA220 | 1025753 | C45E-1201BG220 | 1025757 |

**Resolution 30 mm, scanning range 0 m ... 4.5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|
| | Type | Part number | Type | Part number |
| 150 | C45S-0103AA220 | 1025717 | C45E-0103AG220 | 1025718 |
| 300 | C45S-0303AA220 | 1025724 | C45E-0303AG220 | 1025725 |
| 450 | C45S-0403AA220 | 1025729 | C45E-0403AG220 | 1025730 |
| 600 | C45S-0603AA220 | 1025734 | C45E-0603AG220 | 1025735 |
| 750 | C45S-0703AA220 | 1025739 | C45E-0703AG220 | 1025740 |
| 900 | C45S-0903AA220 | 1025744 | C45E-0903AG220 | 1025745 |
| 1050 | C45S-1003AA220 | 1025749 | C45E-1003AG220 | 1025750 |
| 1200 | C45S-1203AA220 | 1025755 | C45E-1203AG220 | 1025756 |





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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## C4000 Micro in IP 67 Housing

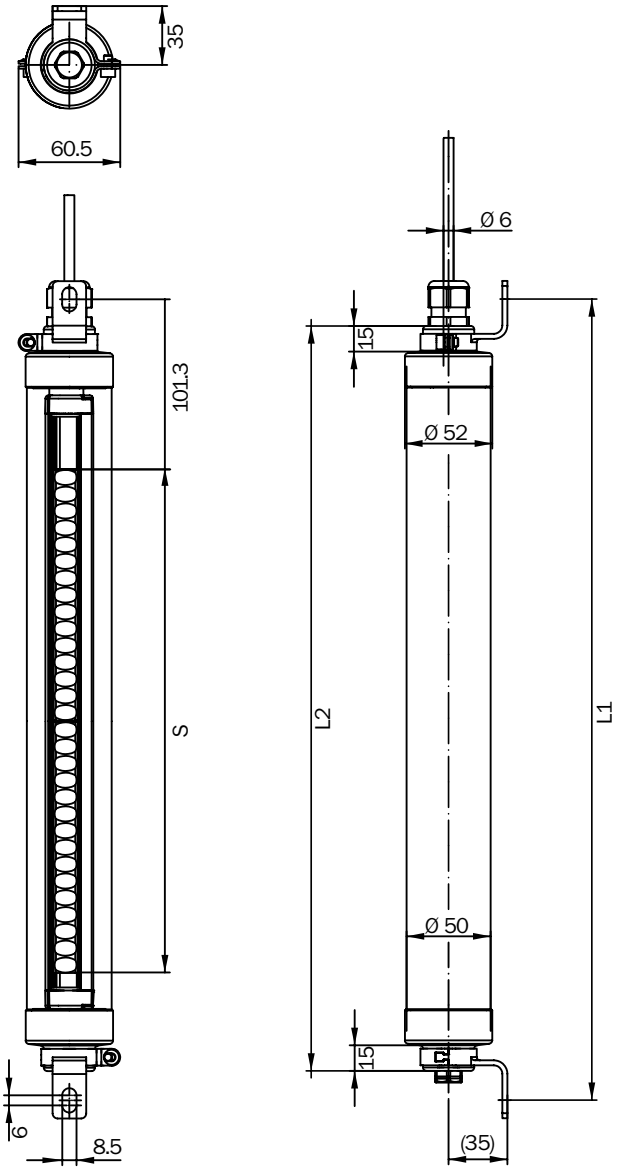
➜ C4000 specific data see C4000 Micro page E-52

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 1.8 m / 1 m ... 4 m / 0 m ... 4.5 m |
| **Protective field height (depending on type)** | 150 mm ... 1200 mm |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 (IEC 61496-1),<br>Type 2 (IEC 61496-2) |
| **Enclosure rating** | IP 66, IP 67 |
| **Materials** | |
| **End caps** | Stainless steel (V4A) |
| **Plastic tube** | PMMA |
| **Compensating element (membrane)** | PA 6 |
| **PG connector** | PA 6 |
| **Ambient operating temperature** | 0 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +70 °C |

E


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## Dimensional drawing




Dimensions in mm

Illustration with stainless steel bracket (not included in the delivery)

| Protective field height S | L 1 | L 2 |
|---|---|---|
| **150** | 357 | 324 |
| **300** | 476 | 443 |
| **450** | 626 | 593 |
| **600** | 777 | 744 |
| **750** | 927 | 894 |
| **900** | 1078 | 1045 |
| **1050** | 1228 | 1195 |
| **1200** | 1382 | 1349 |

Dimensions in mm


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

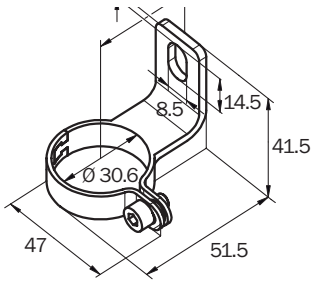
# Accessories

**Mounting systems**

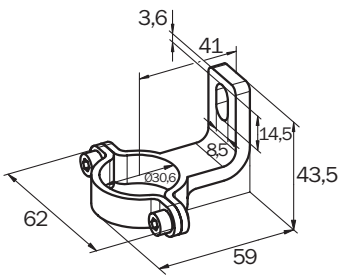
| Designation | Comment | Packing unit | Part number |
|---|---|---|---|
| Stainless steel bracket | Pivoting | 4 | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | 2026850 |
| Stainless steel support bracket | Pivoting | 2 | 2026849 |
| Mounting key | For M12 cable socket on device replacement | 1 | 4034690 |
| Venting membrane | – | 1 | 5309082 |

## Dimensional drawings mounting systems

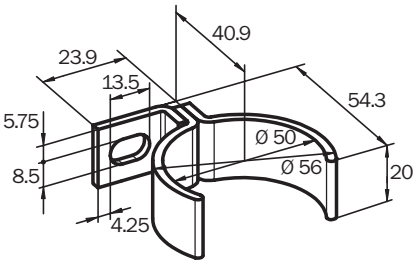
Dimensions in mm




Stainless steel bracket




Reinforced stainless steel bracket

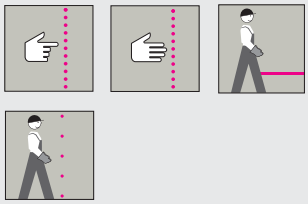



Stainless steel support bracket



Mounting key


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- 7-segment display + LED
- Restart interlock (RES)
- External device monitoring (EDM)
- Pre-assembled M12 cables

## Overview of technical specifications

| | |
|---|---|
| **Protective field height (depending on type)** | 150 mm ... 1200 mm / 300 mm ... 1800 mm |
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 according to IEC 61496, SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

Cost-effective and reliable protection of hazardous points and hazardous areas using the C4000 Basic Plus safety light curtain.

Pre-assembled "off-the-peg" M12×8 cables save money and machine integration is made easy by integrated functions such as restart interlock and external device monitoring. Alignment and diagnostics using the proven 7-segment display save more time.

- Cost and time saving in case of replacement: Sender and receiver can be replaced separately
- Security of investment due to high impact resistance and resistance of the front screen to scratches
- High system availability due to tested interaction between sensor and evaluation unit
- Space-saving and compact systems due to fast response times for low safety distances
- High availability even in harsh industrial conditions due to EMC immunity

## In-system added value

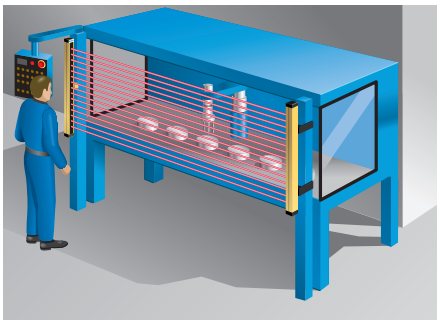
| Combination with | Restart interlock | External device monitoring | Further information |
|---|---|---|---|
| **UE48-2OS** | ✔ | ✔ | N-42 |
| **UE48-3OS** | ✔ | ✔ | N-48 |
| **UE10-3OS** | Relay module | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

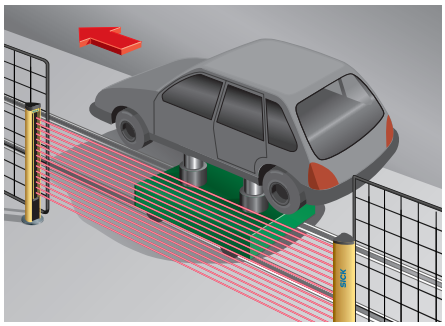
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Car and vehicle manufacture
- Machine tools
- Electronics industry
- Packaging machines
- Food, tobacco and beverage industry
- Handling machines
- Special machine-tool manufacture
- Environmental engineering



Hazardous point protection on a handling machine



Access protection on an assembly line


| Further information | Page |
|---|---|
| → Technical specifications | E-67 |
| → Dimensional drawings | E-68 |
| → Connection diagrams | E-69 |
| → Accessories | E-69 |
| → Services | A-2 |




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# Ordering information

## C4000 Basic Plus

| | |
|---|---|
| **Housing cross-section** | 40 mm × 48 mm |
| **Functions** | Restart interlock, external device monitoring |
| **Usage** | As a stand-alone system |
| **Connections** | System connection: M12 × 7 + FE (sender and receiver unit) |

**Resolution 14 mm, scanning range 0 m ... 2.5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301AA300 | 1027922 | C40E-0301AG300 | 1027944 | C40P-0301AG300 | 7122703 |
| 450 | C40S-0401AA300 | 1027923 | C40E-0401AG300 | 1027945 | C40P-0401AG300 | 7122704 |
| 600 | C40S-0601AA300 | 1027924 | C40E-0601AG300 | 1027946 | C40P-0601AG300 | 7122705 |
| 750 | C40S-0701AA300 | 1027925 | C40E-0701AG300 | 1027947 | C40P-0701AG300 | 7122706 |
| 900 | C40S-0901AA300 | 1027926 | C40E-0901AG300 | 1027948 | C40P-0901AG300 | 7122707 |
| 1050 | C40S-1001AA300 | 1027927 | C40E-1001AG300 | 1027949 | C40P-1001AG300 | 7122708 |
| 1200 | C40S-1201AA300 | 1027928 | C40E-1201AG300 | 1027950 | C40P-1201AG300 | 7122709 |
| 1350 | C40S-1301AA300 | 1027929 | C40E-1301AG300 | 1027951 | C40P-1301AG300 | 7122710 |
| 1500 | C40S-1501AA300 | 1027930 | C40E-1501AG300 | 1027952 | C40P-1501AG300 | 7122711 |
| 1650 | C40S-1601AA300 | 1027931 | C40E-1601AG300 | 1027953 | C40P-1601AG300 | 7122712 |
| 1800 | C40S-1801AA300 | 1027932 | C40E-1801AG300 | 1027954 | C40P-1801AG300 | 7122713 |

**Resolution 14 mm, scanning range 1 m ... 5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301AA300 | 1027922 | C40E-0301BG300 | 1027966 | C40P-0301BG300 | 7122714 |
| 450 | C40S-0401AA300 | 1027923 | C40E-0401BG300 | 1027967 | C40P-0401BG300 | 7122715 |
| 600 | C40S-0601AA300 | 1027924 | C40E-0601BG300 | 1027968 | C40P-0601BG300 | 7122716 |
| 750 | C40S-0701AA300 | 1027925 | C40E-0701BG300 | 1027969 | C40P-0701BG300 | 7122717 |
| 900 | C40S-0901AA300 | 1027926 | C40E-0901BG300 | 1027970 | C40P-0901BG300 | 7122718 |
| 1050 | C40S-1001AA300 | 1027927 | C40E-1001BG300 | 1027971 | C40P-1001BG300 | 7122719 |
| 1200 | C40S-1201AA300 | 1027928 | C40E-1201BG300 | 1027972 | C40P-1201BG300 | 7122720 |
| 1350 | C40S-1301AA300 | 1027929 | C40E-1301BG300 | 1027973 | C40P-1301BG300 | 7122721 |
| 1500 | C40S-1501AA300 | 1027930 | C40E-1501BG300 | 1027974 | C40P-1501BG300 | 7122722 |
| 1650 | C40S-1601AA300 | 1027931 | C40E-1601BG300 | 1027975 | C40P-1601BG300 | 7122723 |
| 1800 | C40S-1801AA300 | 1027932 | C40E-1801BG300 | 1027976 | C40P-1801BG300 | 7122724 |

Continued on next page




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**Resolution 30 mm, scanning range 0 m ... 6 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303AA300 | 1027933 | C40E-0303AG300 | 1027955 | C40P-0303AG300 | 7122725 |
| 450 | C40S-0403AA300 | 1027934 | C40E-0403AG300 | 1027956 | C40P-0403AG300 | 7122726 |
| 600 | C40S-0603AA300 | 1027935 | C40E-0603AG300 | 1027957 | C40P-0603AG300 | 7122727 |
| 750 | C40S-0703AA300 | 1027936 | C40E-0703AG300 | 1027958 | C40P-0703AG300 | 7122728 |
| 900 | C40S-0903AA300 | 1027937 | C40E-0903AG300 | 1027959 | C40P-0903AG300 | 7122729 |
| 1050 | C40S-1003AA300 | 1027938 | C40E-1003AG300 | 1027960 | C40P-1003AG300 | 7122730 |
| 1200 | C40S-1203AA300 | 1027939 | C40E-1203AG300 | 1027961 | C40P-1203AG300 | 7122731 |
| 1350 | C40S-1303AA300 | 1027940 | C40E-1303AG300 | 1027962 | C40P-1303AG300 | 7122732 |
| 1500 | C40S-1503AA300 | 1027941 | C40E-1503AG300 | 1027963 | C40P-1503AG300 | 7122733 |
| 1650 | C40S-1603AA300 | 1027942 | C40E-1603AG300 | 1027964 | C40P-1603AG300 | 7122734 |
| 1800 | C40S-1803AA300 | 1027943 | C40E-1803AG300 | 1027965 | C40P-1803AG300 | 7122735 |




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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 according to IEC 61496, SIL3 (EN 61508) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

E

## Receiver unit

| | | |
|---|---|---|
| **Output signal switching devices (OSSDs)** | | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Switching voltage** | **$HIGH_{min}$**<br>**$LOW_{max}$** | 24 V (15 V ... 28.8 V) DC<br>3.5 V |
| **Switching current max.** | | 500 mA |
| **Power consumption** | | ≤0.45 A (without OSSD) |

## Sender unit

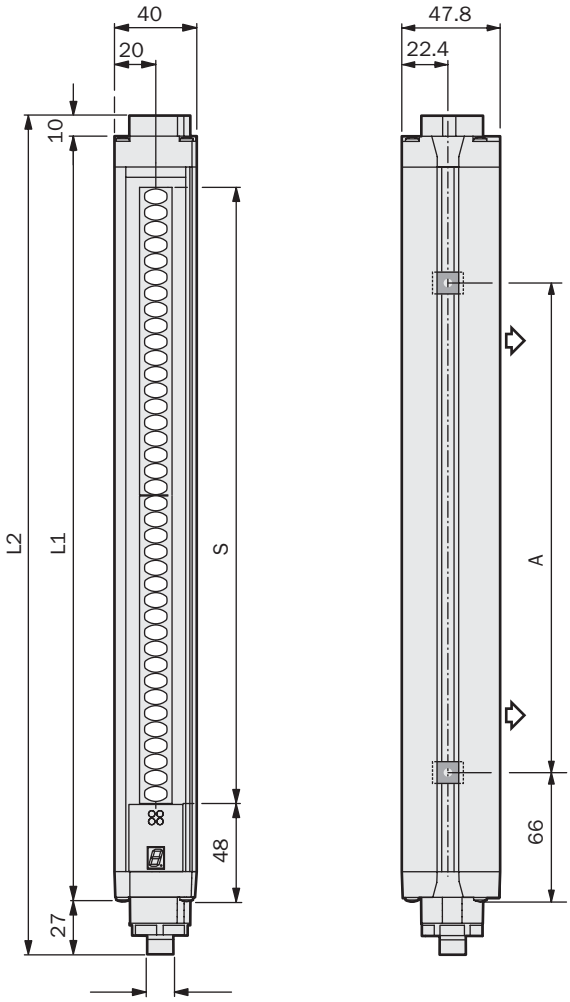
| | |
|---|---|
| **Power consumption** | ≤0.35 A |

## Operating data

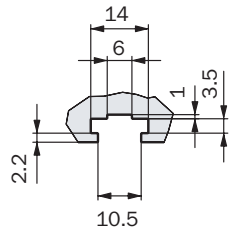
| | |
|---|---|
| **Connection type** | M12 × 7 + FE |
| **Cable length** | Max. 15 m |
| **Wire cross-section** | 0.25 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 40 mm × 48 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |


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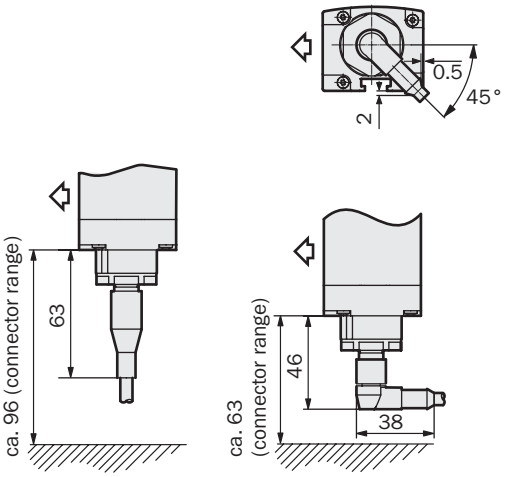
# Dimensional drawings




Plug M12 x 7 + FE




Sliding nut groove for side mounting




Cable sockets M12 x 7 + FE

Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **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 |

Dimensions in mm


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# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

### Mounting systems

➜ Dimensional drawings for mounting systems, see page E-72

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 3 | Pivoting, with anti-vibration mount | 4 | For all protective field heights | 2017752 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

Continued on next page


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### Connecting cables

| Connection type | Direction of the cable outlet | Connector technology | Cable length | Part number |
|---|---|---|---|---|
| Cable socket M12 × 7 + FE | Straight | Stripped | 2.5 m | 6020537 |
| | | | 5 m | 6020354 |
| | | | 10 m | 6020352 |
| | | | 15 m | 6020872 |
| | | | 7.5 m | 6020353 |
| | Angled | | 5 m | 6021342 |
| | | | 15 m | 6021343 |

### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Reset tool

| Designation | Comment | Part number |
|---|---|---|
| Reset tool | For deactivation of the integrated restart interlock | 6022103 |
| Adapter cable | – | 2026866 |

### Device columns

→ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2022412 |
| 450 | 2022413 |
| 600 | 2022414 |
| 750 | 2022415 |
| 900 | 2022416 |
| 1050 | 2022417 |
| 1200 | 2022418 |
| 1350 | 2022419 |
| 1500 | 2022420 |
| 1650 | 2022421 |
| 1800 | 2022422 |


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### Additional front screens Heavy Duty

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2026853 |
| 450 | 2026854 |
| 600 | 2026855 |
| 750 | 2026856 |
| 900 | 2026857 |
| 1050 | 2026858 |
| 1200 | 2026859 |
| 1350 | 2026860 |
| 1500 | 2026861 |
| 1650 | 2026862 |
| 1800 | 2026863 |

E

### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

### Sliding nuts for deflector mirrors

| Suitable for | Packing unit | Part number |
|---|---|---|
| PNS75 and PNS125 | 6 | 2030600 |

Continued on next page


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### Laser alignment aid

| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 Basic Plus | – | – | 4032461 |

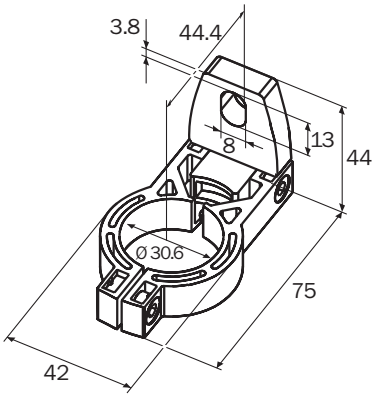
### Documentation

| Designation | Comment | Part number |
|---|---|---|
| Operating instructions C4000 Basic Plus, C4000 Basic, C4000 Eco, C4000 Micro on CD-ROM | Included in the delivery | 2026783 |

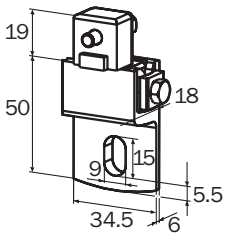
## Dimensional drawings mounting systems

E

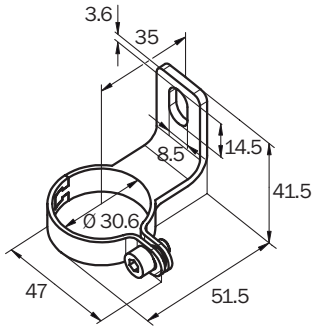
Dimensions in mm



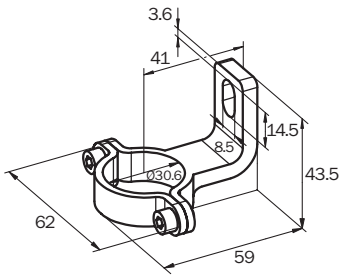

Swivel mount, mounting kit 2




Side bracket, mounting kit 6




Stainless steel bracket




Reinforced stainless steel bracket


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## Overview of technical specifications

| | |
|---|---|
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The C4000 Basic safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection. It is a robust device designed for use in simple applications. Alignment and diagnostics via 7-segment display.

## In-system added value

- Supports integration with multiple safety control solutions

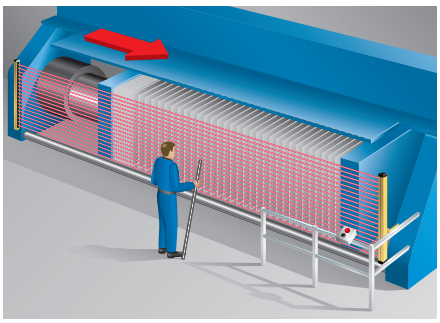
| Combination with | Restart interlock | External device monitoring | Further information |
|---|---|---|---|
| **UE48-2OS** | ✔ | ✔ | N-42 |
| **UE48-3OS** | ✔ | ✔ | N-48 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

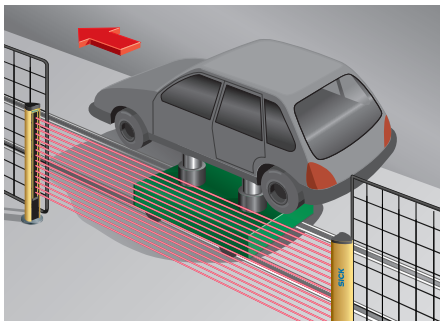
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

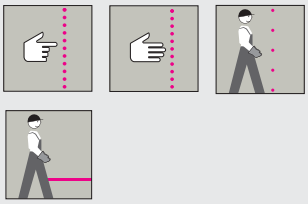
- Car and vehicle manufacture
- Machine tools
- Environmental engineering



Hazardous point protection on a diaphragm press



Access protection on an assembly line






- External device monitoring (EDM)

| Further information | Page |
|---|---|
| → Ordering information | E-74 |
| → Technical specifications | E-76 |
| → Dimensional drawings | E-77 |
| → Connection diagrams | E-78 |
| → Accessories | E-78 |
| → Services | A-2 |

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# Ordering information

## C4000 Basic

| | |
|---|---|
| **Housing cross-section** | 48 mm× 40 mm |
| **Functions** | External device monitoring |
| **Consisting of** | Sender and receiver unit |
| **Usage** | Stand-alone system |
| **Connections** | System connection: Hirschmann M26× 6 + FE |

**Resolution 14 mm, scanning range 0 m ... 2.5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301AA030 | 1022195 | C40E-0301AH030 | 1022196 | C40P-0301AH010 | 7027652 |
| 450 | C40S-0401AA030 | 1022198 | C40E-0401AH030 | 1022199 | C40P-0401AH010 | 7027653 |
| 600 | C40S-0601AA030 | 1022200 | C40E-0601AH030 | 1022201 | C40P-0601AH010 | 7027654 |
| 750 | C40S-0701AA030 | 1022202 | C40E-0701AH030 | 1022203 | C40P-0701AH010 | 7027655 |
| 900 | C40S-0901AA030 | 1022204 | C40E-0901AH030 | 1022205 | C40P-0901AH010 | 7027656 |
| 1050 | C40S-1001AA030 | 1022206 | C40E-1001AH030 | 1022207 | C40P-1001AH010 | 7027657 |
| 1200 | C40S-1201AA030 | 1022208 | C40E-1201AH030 | 1022209 | C40P-1201AH010 | 7027658 |
| 1350 | C40S-1301AA030 | 1022210 | C40E-1301AH030 | 1022211 | C40P-1301AH010 | 7027659 |
| 1500 | C40S-1501AA030 | 1022212 | C40E-1501AH030 | 1022213 | C40P-1501AH010 | 7027660 |
| 1650 | C40S-1601AA030 | 1022214 | C40E-1601AH030 | 1022215 | C40P-1601AH010 | 7027661 |
| 1800 | C40S-1801AA030 | 1022216 | C40E-1801AH030 | 1022217 | C40P-1801AH010 | 7027662 |

**Resolution 14 mm, scanning range 1 m ... 5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301AA030 | 1022195 | C40E-0301BH030 | 1022240 | C40P-0301BH010 | 7027663 |
| 450 | C40S-0401AA030 | 1022198 | C40E-0401BH030 | 1022241 | C40P-0401BH010 | 7027664 |
| 600 | C40S-0601AA030 | 1022200 | C40E-0601BH030 | 1022242 | C40P-0601BH010 | 7027665 |
| 750 | C40S-0701AA030 | 1022202 | C40E-0701BH030 | 1022243 | C40P-0701BH010 | 7027666 |
| 900 | C40S-0901AA030 | 1022204 | C40E-0901BH030 | 1022244 | C40P-0901BH010 | 7027667 |
| 1050 | C40S-1001AA030 | 1022206 | C40E-1001BH030 | 1022245 | C40P-1001BH010 | 7027668 |
| 1200 | C40S-1201AA030 | 1022208 | C40E-1201BH030 | 1022246 | C40P-1201BH010 | 7027669 |
| 1350 | C40S-1301AA030 | 1022210 | C40E-1301BH030 | 1022247 | C40P-1301BH010 | 7027670 |
| 1500 | C40S-1501AA030 | 1022212 | C40E-1501BH030 | 1022248 | C40P-1501BH010 | 7027671 |
| 1650 | C40S-1601AA030 | 1022214 | C40E-1601BH030 | 1022249 | C40P-1601BH010 | 7027672 |
| 1800 | C40S-1801AA030 | 1022216 | C40E-1801BH030 | 1022250 | C40P-1801BH010 | 7027673 |


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**Resolution 30 mm, scanning range 0 m ... 6 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303AA030 | 1022218 | C40E-0303AH030 | 1022219 | C40P-0303AH010 | 7027674 |
| 450 | C40S-0403AA030 | 1022220 | C40E-0403AH030 | 1022221 | C40P-0403AH010 | 7027675 |
| 600 | C40S-0603AA030 | 1022222 | C40E-0603AH030 | 1022223 | C40P-0603AH010 | 7027676 |
| 750 | C40S-0703AA030 | 1022224 | C40E-0703AH030 | 1022225 | C40P-0703AH010 | 7027677 |
| 900 | C40S-0903AA030 | 1022226 | C40E-0903AH030 | 1022227 | C40P-0903AH010 | 7027678 |
| 1050 | C40S-1003AA030 | 1022228 | C40E-1003AH030 | 1022229 | C40P-1003AH010 | 7027679 |
| 1200 | C40S-1203AA030 | 1022230 | C40E-1203AH030 | 1022231 | C40P-1203AH010 | 7027680 |
| 1350 | C40S-1303AA030 | 1022232 | C40E-1303AH030 | 1022233 | C40P-1303AH010 | 7027681 |
| 1500 | C40S-1503AA030 | 1022234 | C40E-1503AH030 | 1022235 | C40P-1503AH010 | 7027682 |
| 1650 | C40S-1603AA030 | 1022236 | C40E-1603AH030 | 1022237 | C40P-1603AH010 | 7027683 |
| 1800 | C40S-1803AA030 | 1022238 | C40E-1803AH030 | 1022239 | C40P-1803AH010 | 7027684 |




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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 (IEC 61496) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

## Receiver unit

| | | |
|---|---|---|
| **Output signal switching devices (OSSDs)** | | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Response time (depending on type)** | | 9 ms ... 26 ms |
| **Switching voltage** | | |
| | **$HIGH_{min}$** | $V_S$ – 2.25 V |
| | **$LOW_{max}$** | 3.5 V |
| **Switching current max.** | | 500 mA |
| **Power consumption** | | ≤1.45 A |

## Sender unit

| | |
|---|---|
| **Power consumption** | ≤0.35 A |

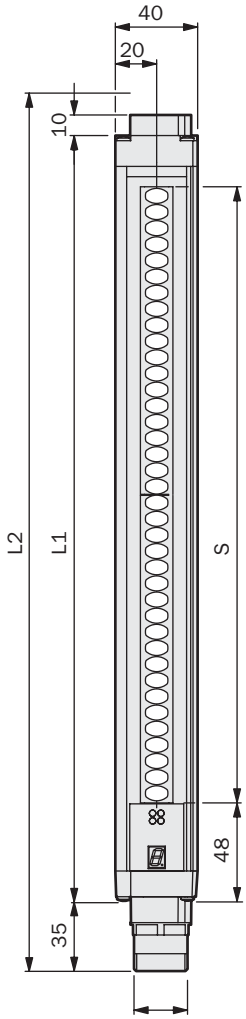
## General operating data

| | |
|---|---|
| **Connection type system connection** | Hirschmann plug M26× 6 + FE |
| **Connecting cable length** | Max. 50 m |
| **Connecting cable wire cross-section** | 0.75 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm× 40 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Weight (depending on type)** | 0.82 kg ... 3.71 kg |

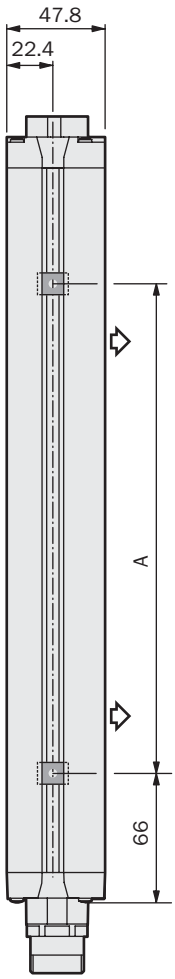

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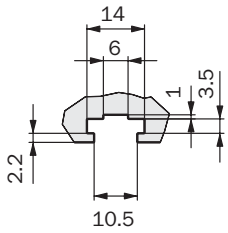
# Dimensional drawings

## C4000 Basic

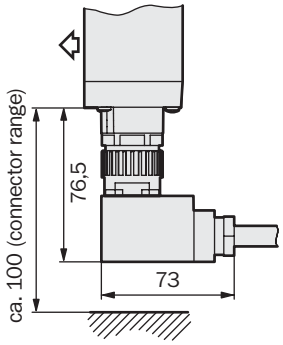



DIN 43651 plug
(M26 x 6 + FE)

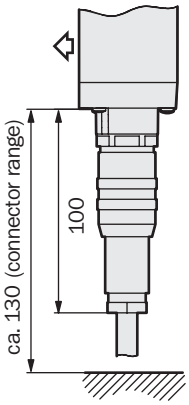



Sliding nut groove for side mounting




Angled cable socket
M26× 6 + FE with screw contacts




Straight cable socket
M26× 6 + FE with crimp contacts

Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **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 |

Dimensions in mm


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# Connection diagrams

→ You can find connection diagrams at www.sickusa.com/connectiondiagrams

# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

# Accessories

### Mounting systems

→ Dimensional drawings for mounting systems, see page E-80

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Cable sockets

| Connection type | Connector technology | Direction of the cable outlet on socket | Part number |
|---|---|---|---|
| Hirschmann cable socket M26× 6 + FE | Crimped | Straight | 6006612 |
| | Screwed | Angled | 6007363 |


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### Connecting cables

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26× 6 + FE | Straight | 2.5 m | 2023993 |
| | | 5 m | 2023994 |
| | | 7.5 m | 2023995 |
| | | 10 m | 2023996 |
| | | 15 m | 2023997 |
| | | 20 m | 2023998 |
| | | 30 m | 2023999 |

### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

E

### Device columns

➜ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2022412 |
| 450 | 2022413 |
| 600 | 2022414 |
| 750 | 2022415 |
| 900 | 2022416 |
| 1050 | 2022417 |
| 1200 | 2022418 |
| 1350 | 2022419 |
| 1500 | 2022420 |
| 1650 | 2022421 |
| 1800 | 2022422 |

### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |

Continued on next page


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### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

E

### Sliding nuts for deflector mirrors

| Suitable for | Packing unit | Part number |
|---|---|---|
| PNS75 and PNS125 | 6 | 2030600 |

### Laser alignment aid

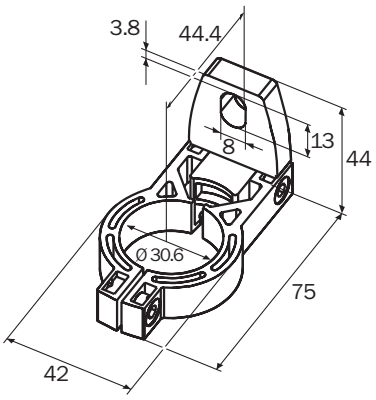
| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 | – | – | 4032461 |

### Documentation

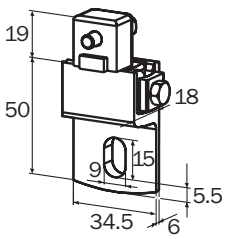
| Designation | Comment | Part number |
|---|---|---|
| Operating instructions C4000 Micro/Basic on CD-ROM | Included in the delivery | 2026783 |

## Dimensional drawings mounting systems

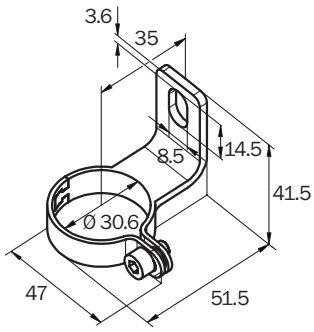
Dimensions in mm



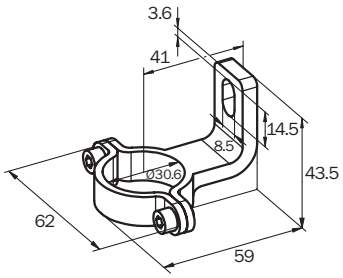

Swivel mount, mounting kit 2




Side bracket, mounting kit 6



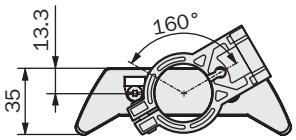

Stainless steel bracket



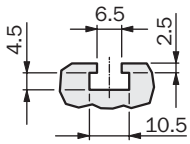

Reinforced stainless steel bracket


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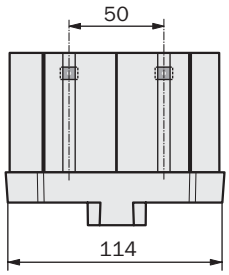
## Dimensional drawings deflector mirror PNS75

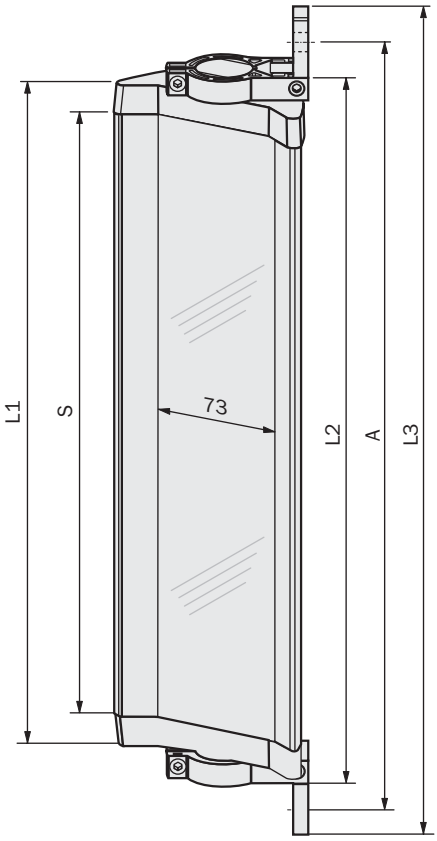



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



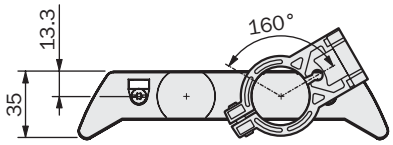

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

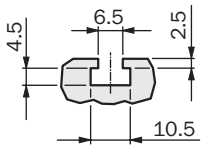
Dimensions in mm


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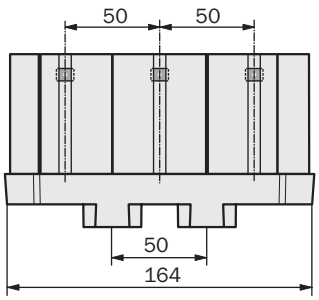
## Dimensional drawings deflector mirror PNS125

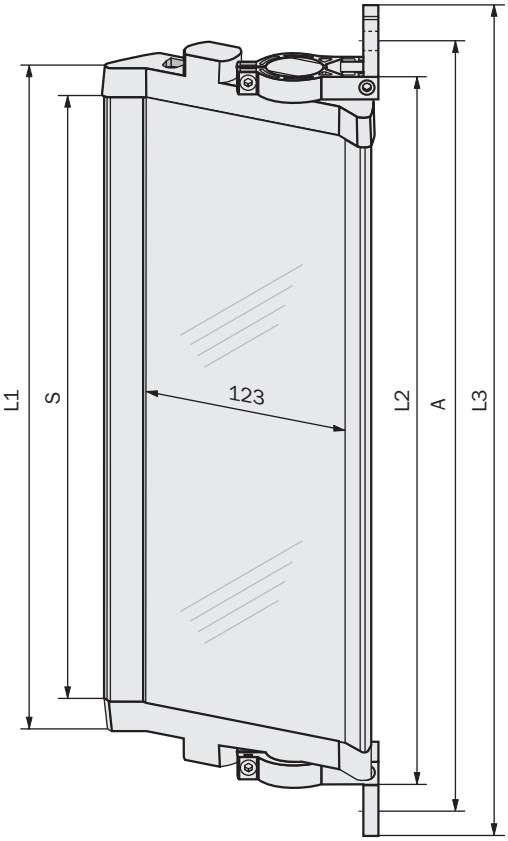



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting




Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

Dimensions in mm


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## Overview of technical specifications

| | |
|---|---|
| **Protective field height (depending on type)** | 150 mm ... 1200 mm / 300 mm ... 1800 mm |
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Type** | Type 4 according to IEC 61496, SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The C4000 Eco safety light curtain reliably protects hazardous points and hazardous areas. Pre-assembled cable M12× 5 and clever accessories such as the T-piece for only one cable back to the control cabinet save money.
Time-saving alignment and diagnostics using proven 7-segment display.

- Cost and time saving in case of replacement: Sender and receiver can be replaced separately
- Security of investment due to high impact resistance and resistance of the front screen to scratches
- High system availability due to tested interaction between sensor and evaluation unit
- Space-saving and compact systems due to fast response times for low safety distances
- High availability even in harsh industrial conditions due to EMC immunity

## In-system added value

- Supports integration with multiple safety control solutions

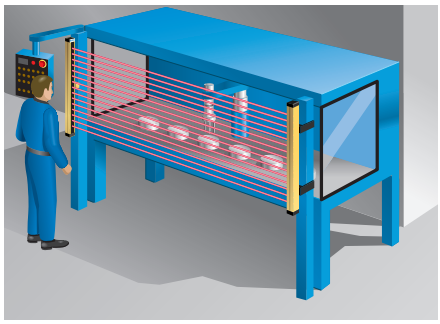
| Combination with | Restart interlock | External device monitoring | Further information |
|---|---|---|---|
| **UE48-2OS** | ✔ | ✔ | N-42 |
| **UE48-3OS** | ✔ | ✔ | N-48 |
| **UE10-3OS** | Relay module | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

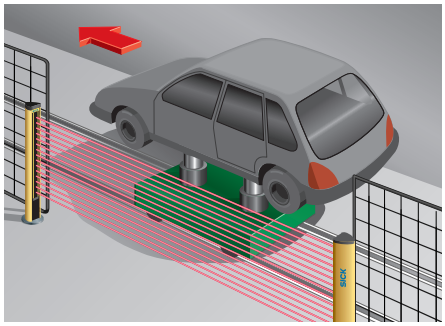
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

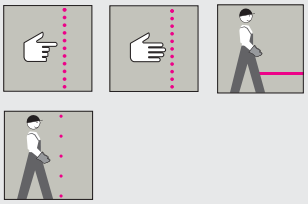
- Car and vehicle construction
- Machine tools
- Electronics industry
- Packaging machines
- Food, tobacco and beverage industry
- Handling machines
- Special machine-tool manufacture
- Environmental engineering



Hazardous point protection on a handling machine



Access protection on an assembly line






- 7-segment display + LED
- Restart interlock (RES)
- External device monitoring (EDM)
- Pre-assembled M12 cables

E

| Further information | Page |
|---|---|
| → Ordering information | E-84 |
| → Technical specifications | E-86 |
| → Dimensional drawings | E-87 |
| → Connection diagrams | E-88 |
| → Accessories | E-89 |
| → Services | A-2 |

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# Ordering information

## C4000 Eco

| | |
|---|---|
| **Housing cross-section** | 40 mm× 48 mm |
| **Functions** | Protective operation |
| **Usage** | As a stand-alone system |
| **Connections** | System connection: M12× 4 + FE (sender and receiver unit) |

**Resolution 14 mm, scanning range 0 m ... 2.5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301AA310 | 1027440 | C40E-0301AN310 | 1027441 | C40P-0301AN310 | 7122670 |
| 450 | C40S-0401AA310 | 1027442 | C40E-0401AN310 | 1027443 | C40P-0401AN310 | 7122671 |
| 600 | C40S-0601AA310 | 1027444 | C40E-0601AN310 | 1027445 | C40P-0601AN310 | 7122672 |
| 750 | C40S-0701AA310 | 1027446 | C40E-0701AN310 | 1027447 | C40P-0701AN310 | 7122673 |
| 900 | C40S-0901AA310 | 1027448 | C40E-0901AN310 | 1027449 | C40P-0901AN310 | 7122674 |
| 1050 | C40S-1001AA310 | 1027450 | C40E-1001AN310 | 1027451 | C40P-1001AN310 | 7122675 |
| 1200 | C40S-1201AA310 | 1027452 | C40E-1201AN310 | 1027453 | C40P-1201AN310 | 7122676 |
| 1350 | C40S-1301AA310 | 1027454 | C40E-1301AN310 | 1027455 | C40P-1301AN310 | 7122677 |
| 1500 | C40S-1501AA310 | 1027456 | C40E-1501AN310 | 1027457 | C40P-1501AN310 | 7122678 |
| 1650 | C40S-1601AA310 | 1027458 | C40E-1601AN310 | 1027459 | C40P-1601AN310 | 7122679 |
| 1800 | C40S-1801AA310 | 1027460 | C40E-1801AN310 | 1027463 | C40P-1801AN310 | 7122680 |

**Resolution 14 mm, scanning range 1 m ... 5 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0301AA310 | 1027440 | C40E-0301BN310 | 1027486 | C40P-0301BN310 | 7122681 |
| 450 | C40S-0401AA310 | 1027442 | C40E-0401BN310 | 1027487 | C40P-0401BN310 | 7122682 |
| 600 | C40S-0601AA310 | 1027444 | C40E-0601BN310 | 1027488 | C40P-0601BN310 | 7122683 |
| 750 | C40S-0701AA310 | 1027446 | C40E-0701BN310 | 1027489 | C40P-0701BN310 | 7122684 |
| 900 | C40S-0901AA310 | 1027448 | C40E-0901BN310 | 1027490 | C40P-0901BN310 | 7122685 |
| 1050 | C40S-1001AA310 | 1027450 | C40E-1001BN310 | 1027491 | C40P-1001BN310 | 7122686 |
| 1200 | C40S-1201AA310 | 1027452 | C40E-1201BN310 | 1027492 | C40P-1201BN310 | 7122687 |
| 1350 | C40S-1301AA310 | 1027454 | C40E-1301BN310 | 1027493 | C40P-1301BN310 | 7122688 |
| 1500 | C40S-1501AA310 | 1027456 | C40E-1501BN310 | 1027494 | C40P-1501BN310 | 7122689 |
| 1650 | C40S-1601AA310 | 1027458 | C40E-1601BN310 | 1027495 | C40P-1601BN310 | 7122690 |
| 1800 | C40S-1801AA310 | 1027460 | C40E-1801BN310 | 1027496 | C40P-1801BN310 | 7122691 |


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**Resolution 30 mm, scanning range 0 m ... 6 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 300 | C40S-0303AA310 | 1027464 | C40E-0303AN310 | 1027465 | C40P-0303AN310 | 7122692 |
| 450 | C40S-0403AA310 | 1027466 | C40E-0403AN310 | 1027467 | C40P-0403AN310 | 7122693 |
| 600 | C40S-0603AA310 | 1027468 | C40E-0603AN310 | 1027469 | C40P-0603AN310 | 7122694 |
| 750 | C40S-0703AA310 | 1027470 | C40E-0703AN310 | 1027471 | C40P-0703AN310 | 7122695 |
| 900 | C40S-0903AA310 | 1027472 | C40E-0903AN310 | 1027473 | C40P-0903AN310 | 7122696 |
| 1050 | C40S-1003AA310 | 1027474 | C40E-1003AN310 | 1027475 | C40P-1003AN310 | 7122697 |
| 1200 | C40S-1203AA310 | 1027476 | C40E-1203AN310 | 1027477 | C40P-1203AN310 | 7122698 |
| 1350 | C40S-1303AA310 | 1027478 | C40E-1303AN310 | 1027479 | C40P-1303AN310 | 7122699 |
| 1500 | C40S-1503AA310 | 1027480 | C40E-1503AN310 | 1027481 | C40P-1503AN310 | 7122700 |
| 1650 | C40S-1603AA310 | 1027482 | C40E-1603AN310 | 1027483 | C40P-1603AN310 | 7122701 |
| 1800 | C40S-1803AA310 | 1027484 | C40E-1803AN310 | 1027485 | C40P-1803AN310 | 7122702 |




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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 14 mm / 30 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 according to IEC 61496, SIL3 (EN 61508) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

E

## Receiver unit

| | |
|---|---|
| **Output signal switching devices (OSSDs)** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Switching voltage** | |
| **$HIGH_{min}$** | 24 V (15 V ... 28.8 V) DC |
| **$LOW_{max}$** | 3.5 V |
| **Switching current max.** | 500 mA |
| **Power consumption** | ≤0.45 A (without OSSD) |

## Sender unit

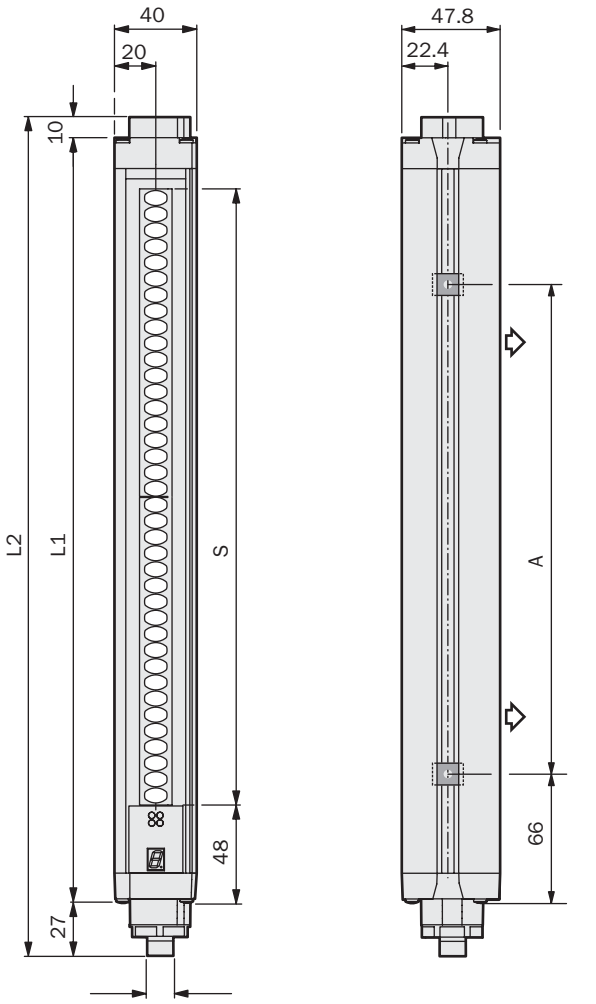
| | |
|---|---|
| **Power consumption** | ≤0.35 A |

## Operating data

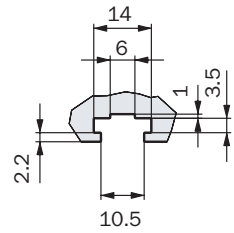
| | |
|---|---|
| **Connection type** | M12× 4 + FE |
| **Cable length** | 15 m |
| **Wire cross-section** | 0.25 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 40 mm× 48 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |


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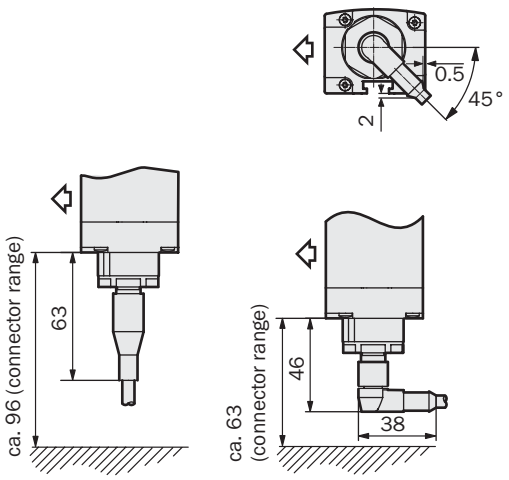
# Dimensional drawings




Plug M12 x 4 + FE




Sliding nut groove for side mounting




Cable sockets M12 x 4 + FE

Dimensions in mm

| Protective field height S | L1 | L2 | A |
|---|---|---|---|
| **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 |

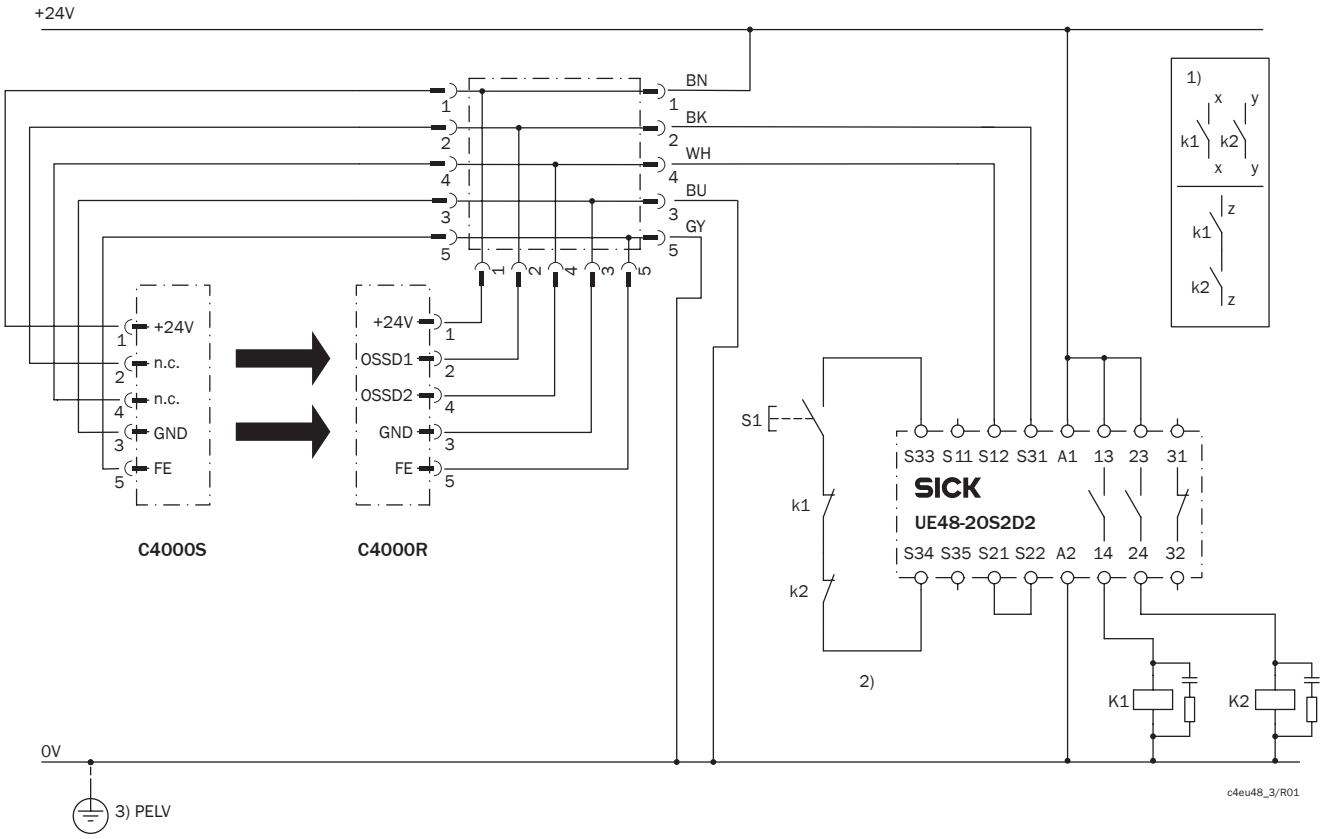
Dimensions in mm


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# Connection diagrams

→ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## C4000 Eco with T-piece on UE48-2OS safety relay




**Task**

Connection of a C4000 Eco safety light curtain with a T-piece to a UE48-2OS safety relay.

Operating mode: with restart interlock and external device monitoring.

**Function**

If the light path is clear, the OSSD1 and OSSD2 outputs are live. If K1 and K2 are de-energised and functioning correctly, the system is ready for switch on and waits for an input signal/ switch-on signal. The UE48-2OS is switched on by pressing and releasing the button S1. The outputs (contacts 13-14 and 23-24) energise the contactors K1 and K2. On interruption of one or several of the light beams, the UE48-2OS is de-energised by the OSSD1 and OSSD2 outputs. The contactors K1 and K2 are de-energised.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the contactors K1 or K2 will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the UE48-2OS will not re-enable the output current circuits.

**Comments**

1) Output current circuits. These contacts are to be connected to the controller such that, with the output current circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) The external device monitoring is only static.

3) PELV as required in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices.

This circuit can also be used for the UE48-3OS.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

### Mounting systems

➜ Dimensional drawings for mounting systems, see page E-91

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 3 | Pivoting, with anti-vibration mount | 4 | For all protective field heights | 2017752 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Connecting cables

| Connection type | Direction of the cable outlet | Connector technology | Cable length | Part number |
|---|---|---|---|---|
| Cable socket M12× 4 + FE | Straight | Stripped | 2 m | 6008899 |
| | | | 5 m | 6009868 |
| | | | 10 m | 6010544 |
| | | | 15 m | 6029215 |

Continued on next page


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### Connection cables for T-pieces

| Connection type | Direction of the cable outlet | Connector technology | Cable length | Comment | Part number |
|---|---|---|---|---|---|
| Cable socket M12× 4 + FE | Straight | Stripped | 0.6 m | For connection to T-piece | 6025930 |
| | | | 2 m | | 6025931 |

### T-piece

| Designation | Comment | Part number |
|---|---|---|
| T-piece | For connection to connection cable M12× 4 + FE | 6030664 |

### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns

➜ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2022412 |
| 450 | 2022413 |
| 600 | 2022414 |
| 750 | 2022415 |
| 900 | 2022416 |
| 1050 | 2022417 |
| 1200 | 2022418 |
| 1350 | 2022419 |
| 1500 | 2022420 |
| 1650 | 2022421 |
| 1800 | 2022422 |

### Additional front screens Heavy Duty

| Suitable for protective field height (mm) | Part number |
|---|---|
| 300 | 2026853 |
| 450 | 2026854 |
| 600 | 2026855 |
| 750 | 2026856 |
| 900 | 2026857 |
| 1050 | 2026858 |
| 1200 | 2026859 |
| 1350 | 2026860 |
| 1500 | 2026861 |
| 1650 | 2026862 |
| 1800 | 2026863 |


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### Deflector mirrors

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

E

### Laser alignment aid

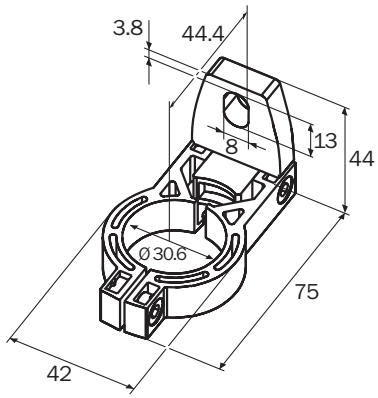
| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 Basic Plus | – | – | 4032461 |

### Documentation

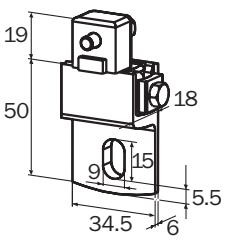
| Designation | Comment | Part number |
|---|---|---|
| Operating instructions C4000 Basic Plus, C4000 Basic, C4000 Eco, C4000 Micro on CD-ROM | Included in the delivery | 2026783 |

## Dimensional drawings mounting systems

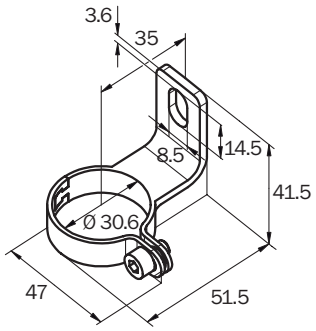
Dimensions in mm



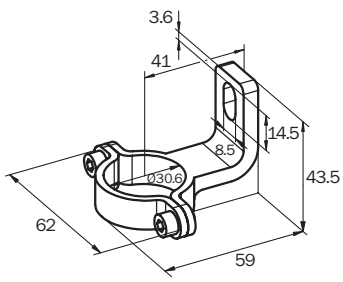
Swivel mount, mounting kit 2



Side bracket, mounting kit 6



Stainless steel bracket



Reinforced stainless steel bracket


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- Self-teach dynamic blanking
- External device monitoring (EDM)
- Restart interlock (RES)
- Configuration and diagnostics via PC
- Beam coding
- Multiple sampling to increase availability

E

## Overview of technical specifications

| | |
|---|---|
| **Protective field length (depending on type)** | 900 mm ... 1500 mm |
| **Scanning range** | 0.5 m ... 19 m |
| **Resolution** | 20 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The C4000 Entry/Exit safety light curtain is used wherever material is to be automatically transported into the dangerous area in a machine and, at the same time, access by people must be reliably excluded:

- Maximum safety due to continuously active light curtain — tampering is very difficult
- Cost-effective due to savings on additional sensor systems or other protection measures, e.g. muting sensors, muting lamp, hinged doors etc.
- Very high availability due to self-teach distance monitoring
- Reduced mounting effort due to compact pair of sensors
- Functions can be activated without additional control device

## In-system added value

- Supports integration with multiple safety control solutions

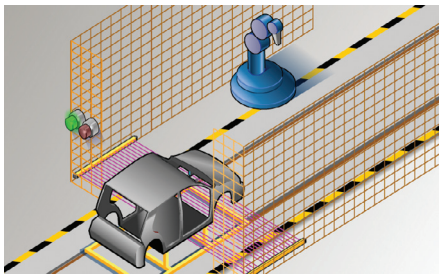
| Combination with | Restart interlock | External device monitoring | Bypass | Operating mode selection | Further information |
|---|---|---|---|---|---|
| **UE402** | – | – | ✔ | ✔ | E-97 |
| **UE48-2OS** | ✔ | ✔ | – | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | – | N-48 |
| **UE10-3OS** | Relay module | | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

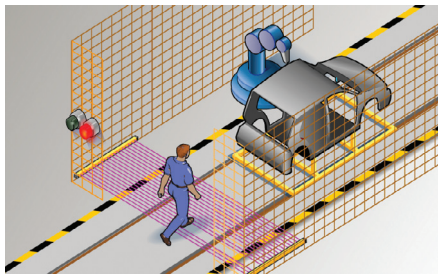
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Car and vehicle construction
- Storage and conveyor technology



Horizontal safety light curtain. No additional muting sensors required



Invalid objects or asynchronous movements result in shut down


| Further information | Page |
|---|---|
| → Technical specifications | E-94 |
| → Dimensional drawings | E-95 |
| → Accessories | E-96 |
| → Services | A-2 |




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# Ordering information

| | |
|---|---|
| **Housing cross-section** | 48 mm × 40 mm |
| **Function** | Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, operating mode switching (with UE402) |
| **Consisting of** | Sender and receiver unit |
| **Usage** | Stand-alone system |
| **Connections** | System connection: Hirschmann plug M26 × 11 + FE |

**Resolution 20 mm, scanning range 0.5 m ... 19 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 900 | C40S-0902CI010 | 1023968 | C40E-0902CI010 | 1023969 | C40P-0902CI010 | 7028512 |
| 1050 | C40S-1002CI010 | 1024044 | C40E-1002CI010 | 1024045 | C40P-1002CI010 | 7028513 |
| 1200 | C40S-1202CI010 | 1024046 | C40E-1202CI010 | 1024047 | C40P-1202CI010 | 7028514 |
| 1350 | C40S-1302CI010 | 1024048 | C40E-1302CI010 | 1024049 | C40P-1302CI010 | 7028515 |
| 1500 | C40S-1502CI010 | 1024050 | C40E-1502CI010 | 1024051 | C40P-1502CI010 | 7028516 |




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# Detailed technical specifications

→ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Scanning range** | 0.5 m ... 19 m |
| **Protective field length (depending on type)** | 900 mm ... 1500 mm |
| **Resolution** | 20 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 (IEC 61496), SIL (EN 61508) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

## Receiver unit

| | |
|---|---|
| **Output signal switching devices (OSSDs)** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Response time (depending on type)** | 15 ms ... 38 ms (without beam coding, multiple sampling 2 times) |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 3.5 V |
| **Switching current max.** | 500 mA |
| **Power consumption** | ≤1.8 A |

## Sender unit

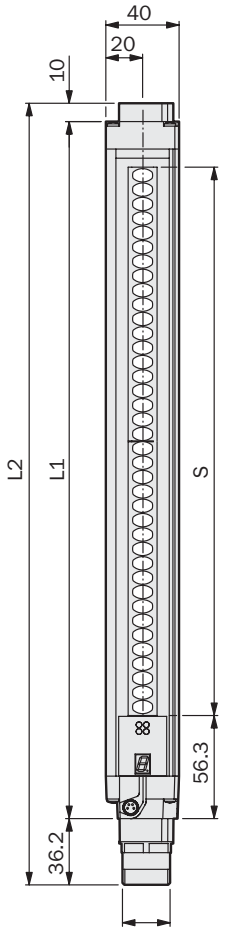
| | |
|---|---|
| **Power consumption** | ≤1 A |

## General operating data

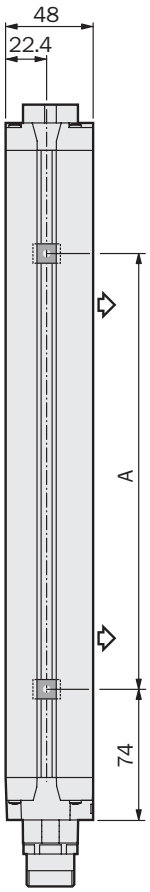
| | |
|---|---|
| **Connection type system connection** | Hirschmann plug M26×11 + FE |
| **Connection type configuration connection** | M8×4 |
| **Connecting cable length** | Max. 50 m |
| **Connecting cable wire cross-section** | 0.75 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm× 40 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Weight (depending on type)** | 1.96 kg ... 3.14 kg |

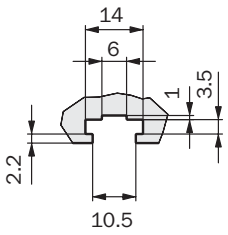

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# Dimensional drawings

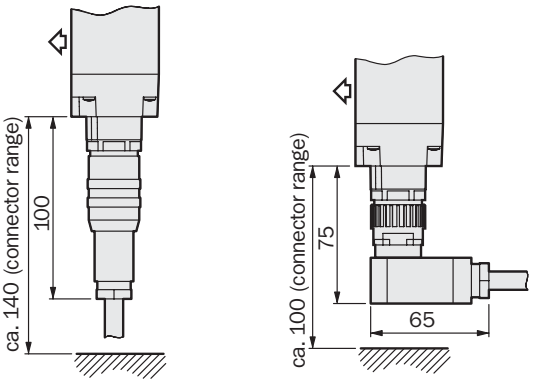



DIN 43651 plug
(M26 x 11 + FE)




Sliding nut groove for side mounting




Cable sockets M26 × 11 + FE with crimp contacts

Dimensions in mm

| S | L1 | L2 | A |
|---|---|---|---|
| **900** | 984 | 1030 | 824 |
| **1050** | 1134 | 1180 | 974 |
| **1200** | 1283 | 1329 | 1124 |
| **1350** | 1435 | 1481 | 1274 |
| **1500** | 1586 | 1632 | 1424 |

Dimensions in mm


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

### Mounting systems

➜ Dimensional drawings for mounting systems, see page E-98

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Connecting cables

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |


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### Plug connection

| Connection type | Connector technology | Direction of the cable outlet | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Crimp contacts | Straight | 6020757 |
| | | Angled | 6020758 |
| Hirschmann-cable plug M26×11 + FE | | Straight | 6021191 |
| | | Angled | 6021192 |

### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Interfaces

| Designation | Enclosure rating | Description | Type | Part number |
|---|---|---|---|---|
| Safety relay | IP 20 | Expands C4000 Entry/Exit with the functions bypass, operating mode selection | UE402 | 1023577 |

### Device columns

➜ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for protective field length (mm) | Part number |
|---|---|
| 900 | 2022416 |
| 1050 | 2022417 |
| 1200 | 2022418 |
| 1350 | 2022419 |
| 1500 | 2022420 |

### Explosion protection

| Designation | Comment | Part number |
|---|---|---|
| ATEX package | Can be used in zone 2/22, 3G 3D | 2029961 |

### Laser alignment aid

| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 | – | – | 4032461 |

Continued on next page


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### Configuration software

| Designation | Comment | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages | 2032314 |

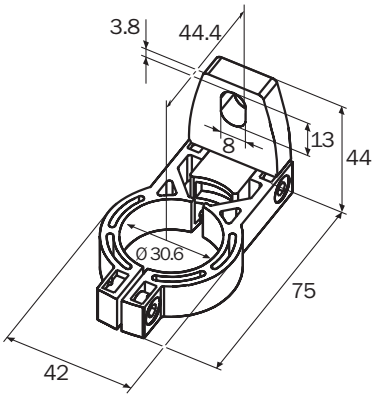
### Configuration tools

| Designation | Comment | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced | 1029665 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host-Guest Plug | 5318293 |

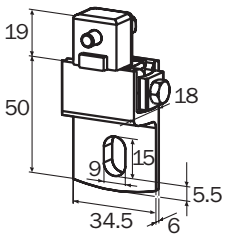
E

## Dimensional drawings mounting systems

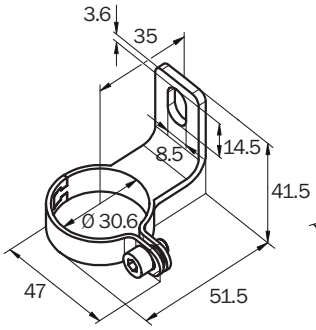
Dimensions in mm



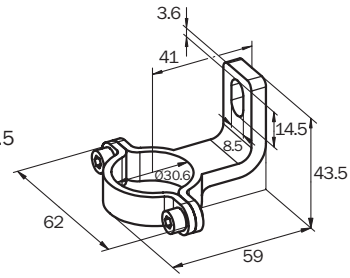

Swivel mount, mounting kit 2




Side bracket, mounting kit 6




Stainless steel bracket




Reinforced stainless steel bracket


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## Overview of technical specifications

| | |
|---|---|
| **Protective field length (depending on type)** | 750 mm ... 1800 mm |
| **Scanning range** | 0.5 m ... 19 m |
| **Resolution (depending on type)** | 40 mm / 30 mm |
| **Type** | Type 4 according to IEC 61496, SIL3 (EN 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The C4000 Palletizer safety light curtain is the innovative muting alternative for access protection during automatic material transport.

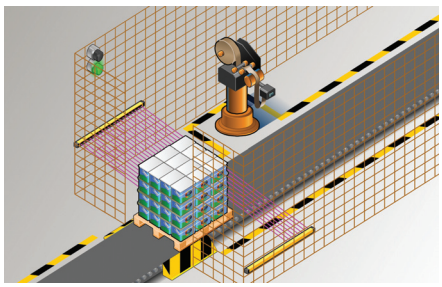
- Economical to procure: only one sensor pair means costs savings during planning, design, mounting, wiring and service
- Quickly placed in operation, euro pallets, mesh crates, etc. are recognised without programming
- Very high availability due to self-teach recognition of patterns on loading with different pallets
- Safer: provides protection in areas in which there is no object, unlike conventional muting solutions. The entire access area is protected if the belt is stopped
- Recognition of different package sizes: Packages with varying dimensions are sorted out
- Small installation area: direction detection enables very short light curtains to be used on outlet areas
- Quality control integrated: C4000 detects the pallet contours

| | C4000 Palletizer Standard | C4000 Palletizer Advanced |
|---|---|---|
| **Detected objects** | Packages on the pallet (min. size 500 mm) | Pallets, mesh crates or packages (max. size 240 mm) |
| **Pattern recognition** | Using size and enclosed shape of a package | Using size and number of objects (min. 2) and monitoring the distance between them |
| **Teach-in** | Via reset button | Automatic, within the parameters that can be configured |
| **Object tolerance** | Configurable | Fixed |
| **Resolution** | 40 mm | 30 mm |

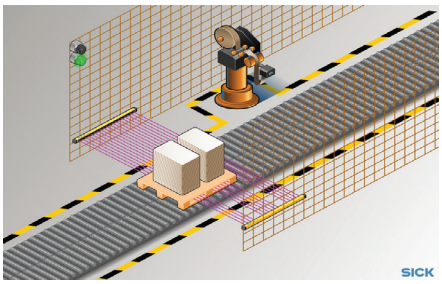
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Storage and conveyor technology



Sensor differentiates between product and worker




Sensor differentiates between pallet and worker





- Self-teach dynamic blanking
- Direction detection
- Belt signal
- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding

E

| Further information | Page |
|---|---|
| → Ordering information | E-100 |
| → Technical specifications | E-101 |
| → Dimensional drawings | E-102 |
| → Connection diagrams | E-102 |
| → Accessories | E-103 |
| → Services | A-2 |

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# Ordering information

## C4000 Palletizer Standard

| | |
|---|---|
| **Housing cross-section** | 48 mm× 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, bypass, operating mode switching (with UE402), belt signal, direction detection |
| **Usage** | Stand-alone system |
| **Connections** | System connection: Hirschmann plug M26×11 + FE<br>Configuration connection: M8×4 |

E

**Resolution 40 mm, scanning range 0.5 m ... 19 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 750 | C40S-0704CP010 | 1027124 | C40E-0704CP010 | 1027125 | C40P-0704CP010 | 7122321 |
| 900 | C40S-0904CP010 | 1027126 | C40E-0904CP010 | 1027127 | C40P-0904CP010 | 7122322 |
| 1050 | C40S-1004CP010 | 1027128 | C40E-1004CP010 | 1027129 | C40P-1004CP010 | 7122323 |
| 1200 | C40S-1204CP010 | 1027130 | C40E-1204CP010 | 1027131 | C40P-1204CP010 | 7122324 |
| 1350 | C40S-1304CP010 | 1027132 | C40E-1304CP010 | 1027133 | C40P-1304CP010 | 7122325 |
| 1500 | C40S-1504CP010 | 1027134 | C40E-1504CP010 | 1027135 | C40P-1504CP010 | 7122326 |
| 1650 | C40S-1604CP010 | 1027136 | C40E-1604CP010 | 1027137 | C40P-1604CP010 | 7122327 |
| 1800 | C40S-1804CP010 | 1027138 | C40E-1804CP010 | 1027139 | C40P-1804CP010 | 7122328 |

## C4000 Palletizer Advanced

| | |
|---|---|
| **Housing cross-section** | 48 mm× 40 mm |
| **Functions** | Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, bypass, operating mode switching (with UE402), belt signal, direction detection |
| **Usage** | Stand-alone system |
| **Connections** | System connection: Hirschmann plug M26×11 + FE<br>Configuration connection: M8×4 |

**Resolution 30 mm, scanning range 0.5 m ... 19 m**

| Protective field height (mm) | Sender unit | | Receiver unit | | Pair | |
|---|---|---|---|---|---|---|
| | Type | Part number | Type | Part number | Type | Part number |
| 750 | C40S-0703CP010 | 1027100 | C40E-0703CK010 | 1027101 | C40P-0703CK010 | 7122313 |
| 900 | C40S-0903CP010 | 1027102 | C40E-0903CK010 | 1027103 | C40P-0903CK010 | 7122314 |
| 1050 | C40S-1003CP010 | 1027104 | C40E-1003CK010 | 1027105 | C40P-1003CK010 | 7122315 |
| 1200 | C40S-1203CP010 | 1027106 | C40E-1203CK010 | 1027107 | C40P-1203CK010 | 7122316 |
| 1350 | C40S-1303CP010 | 1027108 | C40E-1303CK010 | 1027109 | C40P-1303CK010 | 7122317 |
| 1500 | C40S-1503CP010 | 1027110 | C40E-1503CK010 | 1027111 | C40P-1503CK010 | 7122318 |
| 1650 | C40S-1603CP010 | 1027112 | C40E-1603CK010 | 1027113 | C40P-1603CK010 | 7122319 |
| 1800 | C40S-1803CP010 | 1027114 | C40E-1803CK010 | 1027115 | C40P-1803CK010 | 7122320 |


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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Scanning range** | 0.5 m ... 19 m |
| **Protective field length (depending on type)** | 750 mm ... 1800 mm |
| **Resolution (depending on type)** | 40 mm / 30 mm |
| **Protection class** | III |
| **Enclosure rating** | IP 65 |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC [1] |
| **Type** | Type 4 according to IEC 61496, SIL3 (EN 61508) |
| **Synchronisation** | Optical, without separate synchronisation |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

## Receiver unit

| | |
|---|---|
| **Output signal switching devices (OSSDs)** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Switching voltage LOW** | 3.5 V |
| **Switching current max.** | 500 mA |
| **Power consumption** | ≤1.8 A |

## Sender unit

| | |
|---|---|
| **Power consumption** | ≤1 A |

## Operating data

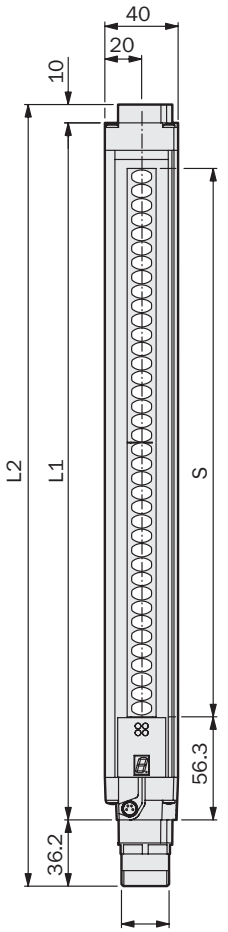
| | |
|---|---|
| **Connection type** | Hirschmann plug M26×11 + FE |
| **Connection type configuration connection** | M8×4 |
| **Cable length** | Max. 50 m |
| **Wire cross-section** | 0.75 mm² |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Air humidity from ... to** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm× 40 mm |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |

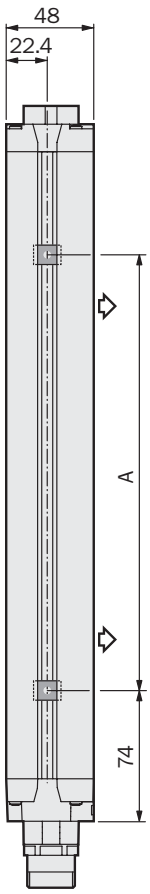




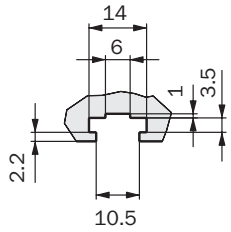
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# Dimensional drawings

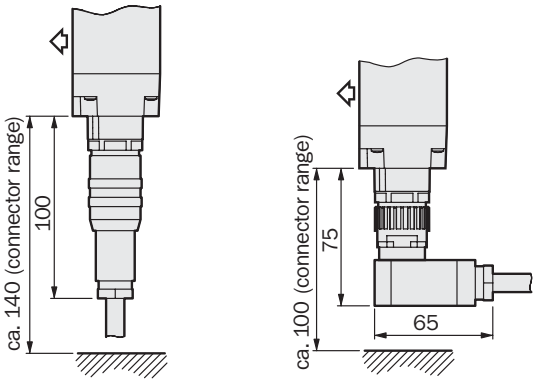



DIN 43651 plug
(M26 x 11 + FE)




Sliding nut groove for side mounting




Cable sockets M26×11 + FE with crimp contacts

Dimensions in mm

| Protective field length S | L1 | L2 | A |
|---|---|---|---|
| 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 |

Dimensions in mm

# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

### Mounting systems

➜ Dimensional drawings for mounting systems, see page E-105

| Designation | Type of fastening | Packing unit | Comment | Part number |
|---|---|---|---|---|
| Mounting kit 2 | Pivoting, swivel mount | 4 | For all protective field heights | 2019659 |
| Mounting kit 6 | Pivoting, side bracket | 4 | For all protective field heights | 2019506 |
| Mounting kit 11 | Replacement bracket | 4 | Suitable as replacement of FGS | 2021646 |
| Stainless steel bracket | Pivoting | 4 | For all protective field heights | 2023708 |
| Reinforced stainless steel bracket | Pivoting | 4 | For all protective field heights | 2026850 |

### Sliding nuts

| Designation | Packing unit | Comment | Part number |
|---|---|---|---|
| Sliding nuts | 4 | Included in the delivery | 2017550 |

### Connecting cables

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |
| | | 50 m | 2033548 |

Continued on next page


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### Plug connection

| Connection type | Connector technology | Direction of the cable outlet | Part number |
|---|---|---|---|
| Hirschmann cable socket M26×11 + FE | Crimp contacts | Straight | 6020757 |
| | | Angled | 6020758 |
| Hirschmann-cable plug M26×11 + FE | | Straight | 6021191 |
| | | Angled | 6021192 |

### Connection cables configuration

| Comment | Cable length | Part number |
|---|---|---|
| For connecting the configuration interface to the serial interface on the PC | 2 m | 6021195 |
| | 8 m | 2027649 |

E

### Interfaces

| Designation | Enclosure rating | Description | Type | Part number |
|---|---|---|---|---|
| Safety relay | IP 20 | Expands C4000 Palletizer with the functions emergency stop, operating mode selection | UE402 | 1023577 |

### Power supplies

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Additional front screens

| Designation | Suitable for protective field length (mm) | Part number |
|---|---|---|
| Additional front screen (weld spark guard) | 750 | 2022415 |
| | 900 | 2022416 |
| | 1050 | 2022417 |
| | 1200 | 2022418 |
| | 1350 | 2022419 |
| | 1500 | 2022420 |
| | 1650 | 2022421 |
| | 1800 | 2022422 |
| Additional front screen Heavy Duty (weld spark guard) with bracket | 750 | 2026856 |
| | 900 | 2026857 |
| | 1050 | 2026858 |
| | 1200 | 2026859 |
| | 1350 | 2026860 |
| | 1500 | 2026861 |
| | 1650 | 2026862 |
| | 1800 | 2026863 |

### Explosion protection

| Designation | Comment | Part number |
|---|---|---|
| ATEX package | Can be used in zone 2/22, 3G 3D | 2029961 |


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### Laser alignment aid

| Designation | Maximum scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | 60 m | Red light | 1015741 |
| AR60 adapter for C4000 | – | – | 4032461 |

### Configuration software

| Designation | Comment | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages | 2032314 |

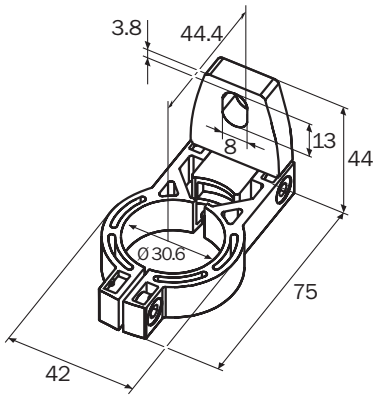
### Configuration tools

| Designation | Comment | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced | 1029665 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host-Guest Plug | 5318293 |

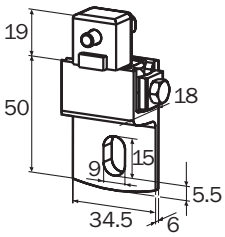
E

## Dimensional drawings mounting systems

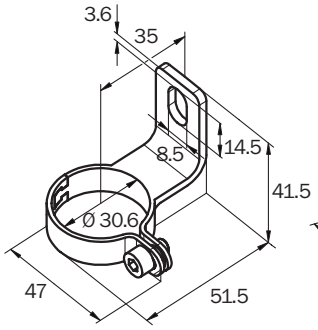
Dimensions in mm



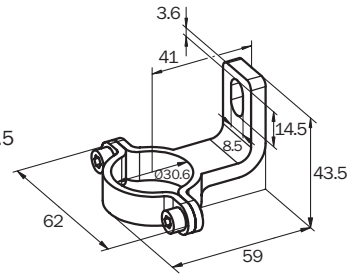

Swivel mount, mounting kit 2




Side bracket, mounting kit 6




Stainless steel bracket




Reinforced stainless steel bracket


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- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding

| Further information | Page |
|---|---|
| → Technical specifications | E-109 |
| → Dimensional drawings | E-110 |
| → Connection diagrams | E-112 |
| → Accessories | E-113 |
| → Dimensional drawings accessories | E-116 |
| → Services | A-2 |

# Overview of technical specifications

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 6 m / 2.5 m ... 19 m |
| **Protective field height (depending on type)** | 150 mm ... 1800 mm |
| **Resolution (depending on type)** | 20 mm / 30 mm / 40 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

# Product description

With its high signal reserve, the C2000 Standard safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considerations by precisely coordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

# In-system added value

- Combination with safe control solutions from SICK

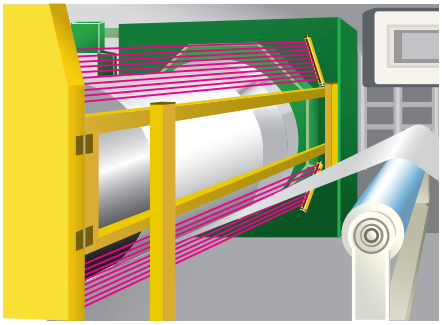
| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

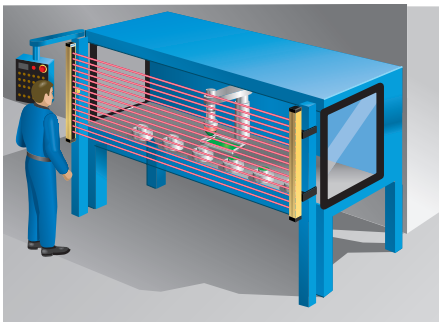
# Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Textile industry: C2000 Standard on a warping machine



Printing industry: C2000 Standard on a pad printing machine

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# Ordering information

C2000 Standard
- With external device monitoring (EDM)
- For usage as a stand-alone system
- Consisting of sender and receiver unit

→ Accessories, see page E-113

## Scanning range 0 ... 6 m

| Resolution (mm) | Housing cross-section (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 20 | 34 x 29 | 150 | C20S-015102A11 | 1016563 | C20E-015302A11 | 1016564 |
| | | 300 | C20S-030102A11 | 1016448 | C20E-030302A11 | 1016449 |
| | | 450 | C20S-045102A11 | 1016573 | C20E-045302A11 | 1016459 |
| | | 600 | C20S-060102A11 | 1016574 | C20E-060302A11 | 1016575 |
| | | 750 | C20S-075102A11 | 1016579 | C20E-075302A11 | 1016580 |
| | | 900 | C20S-090102A11 | 1016584 | C20E-090302A11 | 1016585 |
| | | 1050 | C20S-105102A11 | 1016589 | C20E-105302A11 | 1016590 |
| | | 1200 | C20S-120102A11 | 1016464 | C20E-120302A11 | 1016465 |
| 30 | 34 x 29 | 150 | C20S-015103A11 | 1016475 | C20E-015303A11 | 1016476 |
| | | 300 | C20S-030103A11 | 1016568 | C20E-030303A11 | 1016569 |
| | | 450 | C20S-045103A11 | 1016454 | C20E-045303A11 | 1016455 |
| | | 600 | C20S-060103A11 | 1016477 | C20E-060303A11 | 1016478 |
| | | 750 | C20S-075103A11 | 1016479 | C20E-075303A11 | 1016480 |
| | | 900 | C20S-090103A11 | 1016481 | C20E-090303A11 | 1016482 |
| | | 1050 | C20S-105103A11 | 1016483 | C20E-105303A11 | 1016484 |
| | | 1200 | C20S-120103A11 | 1016594 | C20E-120303A11 | 1016595 |
| | 48 x 40 | 1350 | C20S-135103A12 | 1016600 | C20E-135303A12 | 1016601 |
| | | 1500 | C20S-150103A12 | 1016605 | C20E-150303A12 | 1016606 |
| | | 1650 | C20S-165103A12 | 1016610 | C20E-165303A12 | 1016611 |
| | | 1800 | C20S-180103A12 | 1016615 | C20E-180303A12 | 1016616 |
| 40 | 34 x 29 | 150 | C20S-015104A11 | 1016565 | C20E-015304A11 | 1016566 |
| | | 300 | C20S-030104A11 | 1016570 | C20E-030304A11 | 1016571 |
| | | 450 | C20S-045104A11 | 1016456 | C20E-045304A11 | 1016457 |
| | | 600 | C20S-060104A11 | 1016576 | C20E-060304A11 | 1016577 |
| | | 750 | C20S-075104A11 | 1016581 | C20E-075304A11 | 1016582 |
| | | 900 | C20S-090104A11 | 1016586 | C20E-090304A11 | 1016587 |
| | | 1050 | C20S-105104A11 | 1016591 | C20E-105304A11 | 1016592 |
| | | 1200 | C20S-120104A11 | 1016596 | C20E-120304A11 | 1016597 |
| | 48 x 40 | 1350 | C20S-135104A12 | 1016603 | C20E-135304A12 | 1016604 |
| | | 1500 | C20S-150104A12 | 1016608 | C20E-150304A12 | 1016609 |
| | | 1650 | C20S-165104A12 | 1016613 | C20E-165304A12 | 1016614 |
| | | 1800 | C20S-180104A12 | 1016618 | C20E-180304A12 | 1016619 |

Continued on next page





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## Scanning range 2.5 ... 19 m

| Resolution (mm) | Housing cross-section (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 20 | 34 x 29 | 150 | C20S-015202A11 | 1016631 | C20E-015302A11 | 1016564 |
| | | 300 | C20S-030202A11 | 1016632 | C20E-030302A11 | 1016449 |
| | | 450 | C20S-045202A11 | 1016458 | C20E-045302A11 | 1016459 |
| | | 600 | C20S-060202A11 | 1016633 | C20E-060302A11 | 1016575 |
| | | 750 | C20S-075202A11 | 1016634 | C20E-075302A11 | 1016580 |
| | | 900 | C20S-090202A11 | 1016635 | C20E-090302A11 | 1016585 |
| | | 1050 | C20S-105202A11 | 1016636 | C20E-105302A11 | 1016590 |
| | | 1200 | C20S-120202A11 | 1016466 | C20E-120302A11 | 1016465 |
| 30 | 34 x 29 | 150 | C20S-015203A11 | 1016567 | C20E-015303A11 | 1016476 |
| | | 300 | C20S-030203A11 | 1016572 | C20E-030303A11 | 1016569 |
| | | 450 | C20S-045203A11 | 1016460 | C20E-045303A11 | 1016455 |
| | | 600 | C20S-060203A11 | 1016578 | C20E-060303A11 | 1016478 |
| | | 750 | C20S-075203A11 | 1016583 | C20E-075303A11 | 1016480 |
| | | 900 | C20S-090203A11 | 1016588 | C20E-090303A11 | 1016482 |
| | | 1050 | C20S-105203A11 | 1016593 | C20E-105303A11 | 1016484 |
| | | 1200 | C20S-120203A11 | 1016599 | C20E-120303A11 | 1016595 |
| | 48 x 40 | 1350 | C20S-135203A12 | 1016602 | C20E-135303A12 | 1016601 |
| | | 1500 | C20S-150203A12 | 1016607 | C20E-150303A12 | 1016606 |
| | | 1650 | C20S-165203A12 | 1016612 | C20E-165303A12 | 1016611 |
| | | 1800 | C20S-180203A12 | 1016617 | C20E-180303A12 | 1016616 |
| 40 | 34 x 29 | 150 | C20S-015204A11 | 1016637 | C20E-015304A11 | 1016566 |
| | | 300 | C20S-030204A11 | 1016638 | C20E-030304A11 | 1016571 |
| | | 450 | C20S-045204A11 | 1016462 | C20E-045304A11 | 1016457 |
| | | 600 | C20S-060204A11 | 1016639 | C20E-060304A11 | 1016577 |
| | | 750 | C20S-075204A11 | 1016640 | C20E-075304A11 | 1016582 |
| | | 900 | C20S-090204A11 | 1016641 | C20E-090304A11 | 1016587 |
| | | 1050 | C20S-105204A11 | 1016642 | C20E-105304A11 | 1016592 |
| | | 1200 | C20S-120204A11 | 1016643 | C20E-120304A11 | 1016597 |
| | 48 x 40 | 1350 | C20S-135204A12 | 1016644 | C20E-135304A12 | 1016604 |
| | | 1500 | C20S-150204A12 | 1016646 | C20E-150304A12 | 1016609 |
| | | 1650 | C20S-165204A12 | 1016647 | C20E-165304A12 | 1016614 |
| | | 1800 | C20S-180204A12 | 1016648 | C20E-180304A12 | 1016619 |


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# Detailed technical specifications

➜ You can find further data in the operating instructions. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 6 m / 2.5 m ... 19 m |
| **Protective field height (depending on type)** | 150 mm ... 1800 mm |
| **Resolution (depending on type)** | 20 mm / 30 mm / 40 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

## Sender unit

| | |
|---|---|
| **Power consumption** | Max. 6.2 W |

## Receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors (short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 7 ms ... 34 ms |
| **Switching voltage**<br>**$HIGH_{min}$**<br>**$LOW_{max}$** | <br>$V_S$ – 2.25 V<br>1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 8 W |

## Operating data

| | |
|---|---|
| **Connection type** | M12 plug, 8-pin |
| **Connection cable wire cross-section** | Max. 0.25 $mm^2$ |
| **Connection cable length** | Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section (depending on type)**<br>**for protective field heights of 150 mm to 1200 mm**<br>**for protective field heights of 1350 mm to 1800 mm** | <br>34 mm x 29 mm<br>48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight (depending on type)** | 0.27 kg ... 3.88 kg |

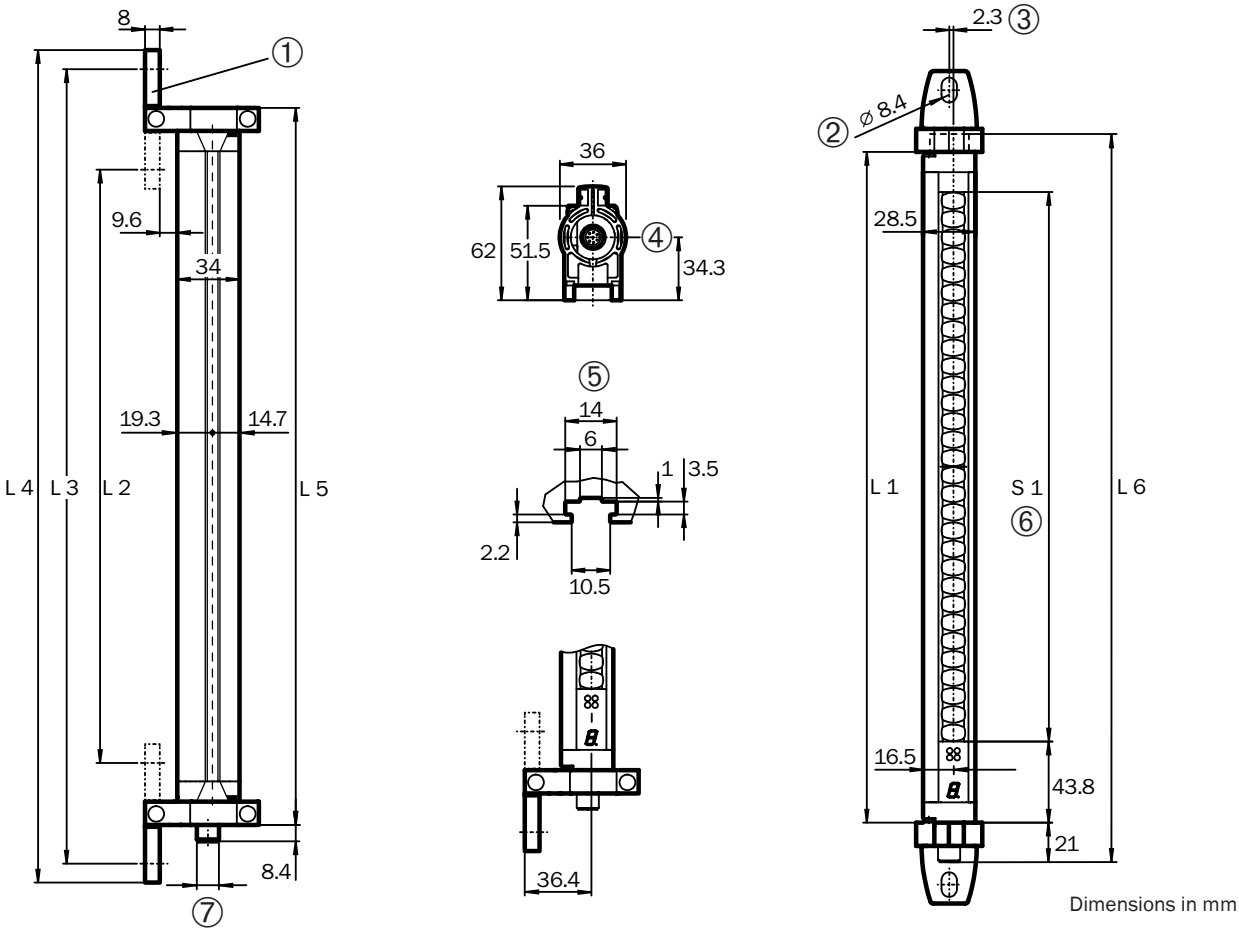
E


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# Dimensional drawings

→ You can find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature

## Protective field heights 150 mm ... 1200 mm




Dimensions in mm

Sender unit with swivel mount, small housing profile (receiver unit mirror image)
① Mounting clamp
② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
③ Centre of light beam offset
④ Adjustment
⑤ Sliding nut groove for side mounting
⑥ Protective field height
⑦ Plug M12 x 1

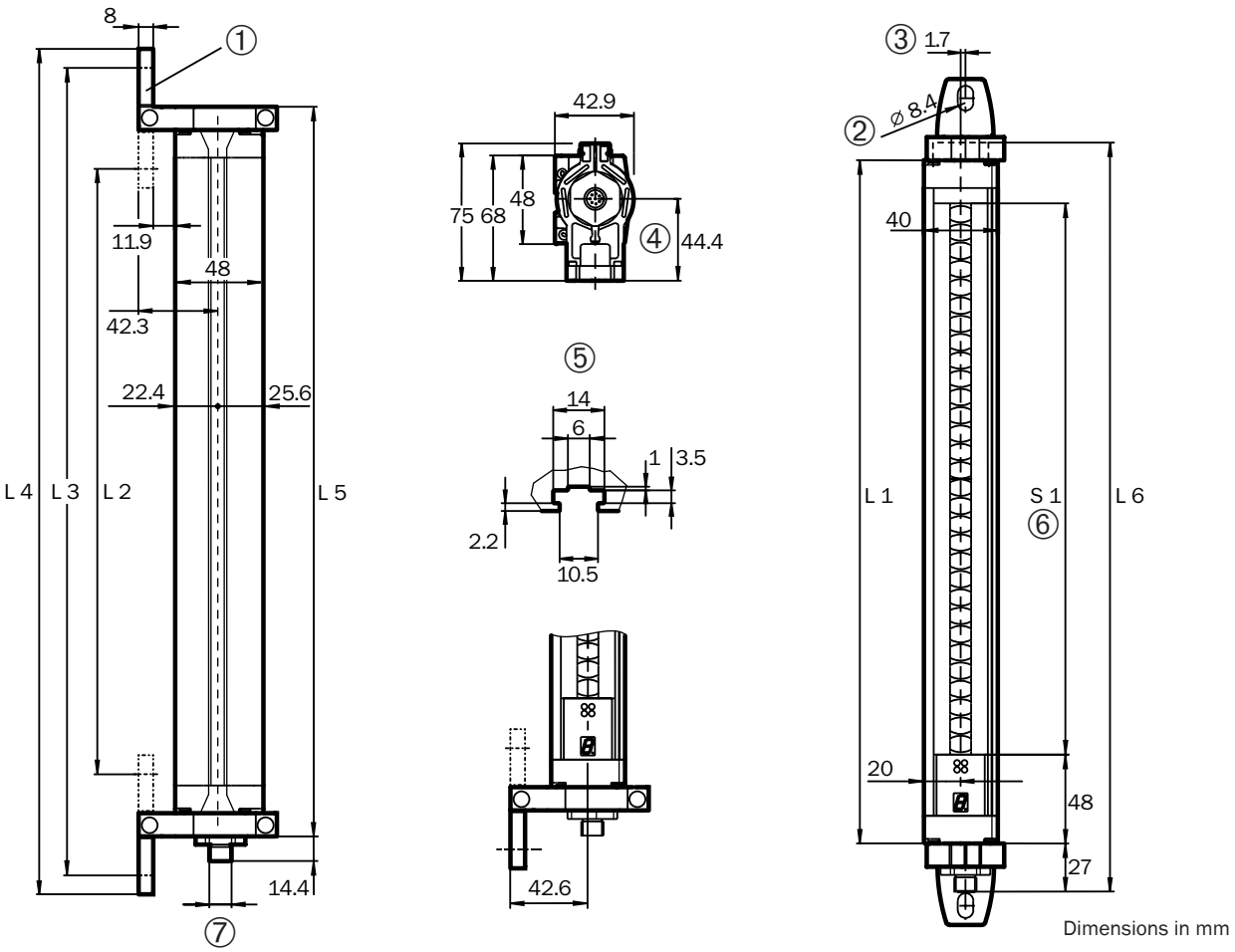
| S 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|
| **150** | 246 | 204 | 313 | 334 | 271 | 276 |
| **300** | 364 | 322 | 432 | 452 | 390 | 394 |
| **450** | 515 | 473 | 582 | 603 | 540 | 545 |
| **600** | 666 | 623 | 733 | 754 | 691 | 696 |
| **750** | 816 | 774 | 884 | 904 | 841 | 846 |
| **900** | 967 | 924 | 1034 | 1055 | 992 | 997 |
| **1050** | 1117 | 1075 | 1185 | 1205 | 1142 | 1147 |
| **1200** | 1266 | 1224 | 1334 | 1354 | 1292 | 1298 |

**S1** = protective field height

Dimensions in mm


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## Protective field heights 1350 mm ... 1800 mm




Dimensions in mm

Sender unit with swivel mount, large housing profile (receiver unit mirror image)

① Mounting clamp
② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
③ Centre of light beam offset
④ Adjustment
⑤ Sliding nut groove for side mounting
⑥ Protective field height
⑦ Plug M12 x 1

| S 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|
| **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 |

**S1** = protective field height

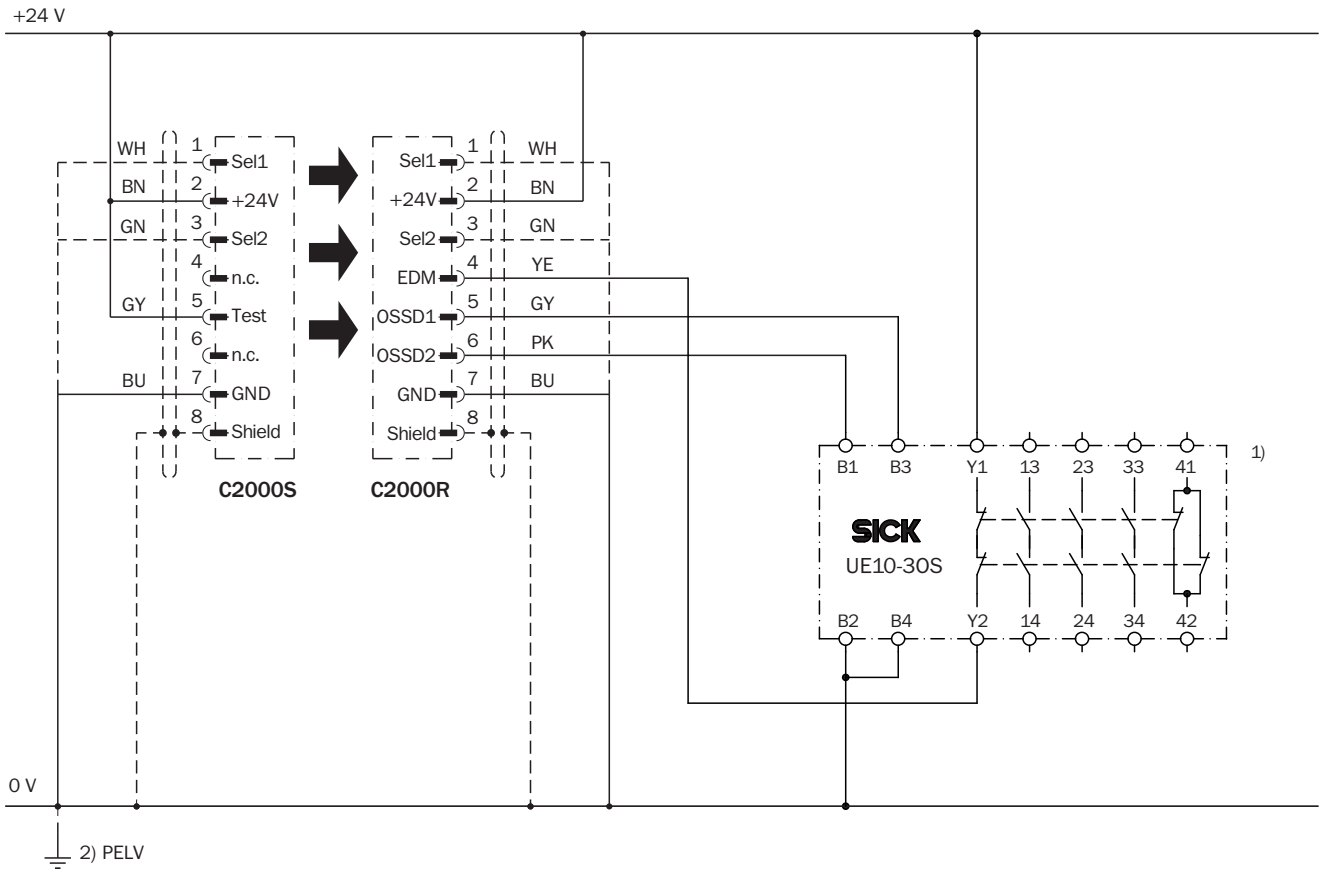
Dimensions in mm


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# Connection diagrams

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## C2000 Standard on UE10-3OS safety relay




**Task**

Interfacing a C2000 Standard safety light curtain to UE10-3OS. Operating mode without restart interlock with external device monitoring.

**Function**

The system is enabled when the light path is clear and the UE10-3OS is de-energised and functioning correctly. The OSSD1 and OSSD2 outputs are live, the UE10-3OS is switched on. On the interruption of one of the light beams, the UE10-3OS is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-3OS will be detected and will not result in the loss of the shutdown function.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

**Mounting accessories**

→ Dimensional drawings for mounting accessories, see page E-116

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 1 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount<br>▪ For protective field height 150 mm ... 1200 mm | 2019649 |
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount<br>▪ For protective field height 1350 mm ... 1800 mm | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ For protective field height 150 mm ... 1200 mm | 2030288 |
| | ▪ 4 pieces<br>▪ Pivoting<br>▪ For protective field height 1350 mm ... 1800 mm | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms<br>▪ For protective field height 1350 mm ... 1800 mm | 2026850 |

Continued on next page


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### Connector technology

| System connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns [1)]

→ Dimensional drawings device columns, see page F-86

| Designation | Description | Part number |
|---|---|---|
| Device column with front screen | ▪ For C2000 Standard (protective field height 150 mm ... 1050 mm)<br>▪ For C2000 Cascadable and RES/EDM (protective field height 150 mm ... 900 mm)<br>▪ 1200 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021333 |
| | ▪ For C2000 (protective field height 150 mm ... 1200 mm)<br>▪ 1500 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021242 |
| | ▪ For C2000 (protective field height 150 mm ... 1200 mm)<br>▪ 1700 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021337 |
| | ▪ For C2000 (protective field height 1350 mm ... 1500 mm)<br>▪ 1700 mm high<br>▪ Including mounting kit 2 (2 pieces) | 2021332 |

1) Warning, reduction of the scanning range!

### Additional front screens [1)]

| Designation | For protective field height (mm) | Part number |
|---|---|---|
| Additional front screen (weld spark guard) | 300 | 2022405 |
| | 450 | 2022406 |
| | 600 | 2022407 |
| | 750 | 2022408 |
| | 900 | 2022409 |
| | 1050 | 2022410 |
| | 1200 | 2022411 |

1) Warning, reduction of the scanning range!


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### Additional front screens Heavy Duty [1)]

| Designation | For protective field height (mm) | Part number |
|---|---|---|
| Additional front screen Heavy Duty (weld spark guard) with bracket | 1350 | 2026860 |
| | 1500 | 2026861 |
| | 1650 | 2026862 |
| | 1800 | 2026863 |

[1)] Warning, reduction of the scanning range!

### Deflector mirrors [1)] (incl. mounting kit 2)

→ Dimensional drawings deflector mirrors, see page E-117

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

[1)] Warning, reduction of the scanning range!

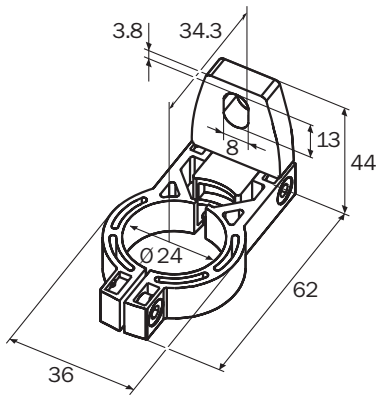
### Laser alignment aid

| Designation | Description | Type | Part number |
|---|---|---|---|
| Laser alignment aid | ▪ Does not require connection to power supply | AR60 | 1015741 |
| Adapter for AR60 | ▪ For large housing profile | – | 4032461 |
| | ▪ For small housing profile | – | 4032462 |

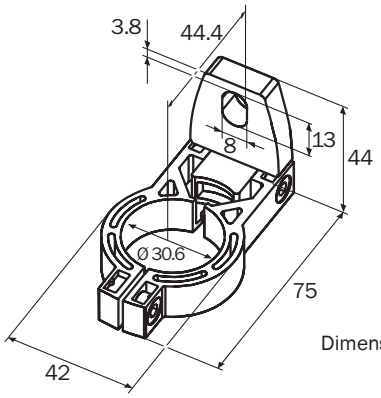



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## Dimensional drawings mounting accessories

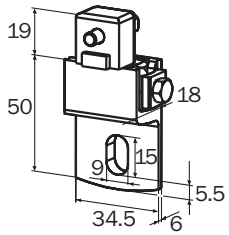



Swivel mount
Mounting kit 1
for protective field height 150 mm ... 1200 mm

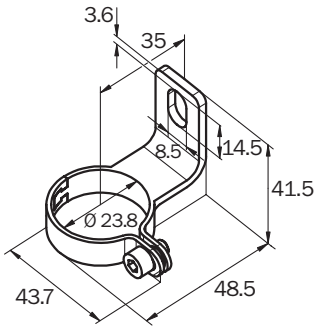



Swivel mount
Mounting kit 2
for protective field height 1350 mm ... 1800 mm

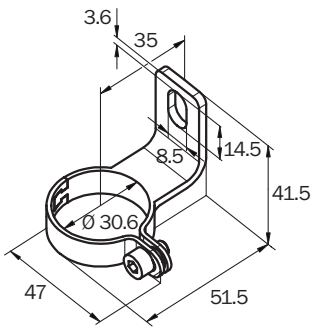
Dimensions in mm



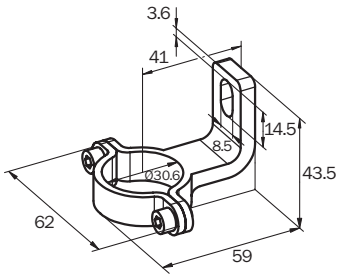

Side bracket
Mounting kit 6




Stainless steel bracket
for protective field height 150 mm ... 1200 mm



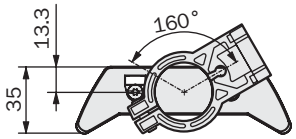

Stainless steel bracket
for protective field height 1350 mm ... 1800 mm



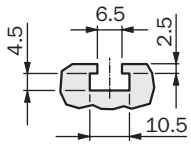

Reinforced stainless steel bracket for
protective field height 1350 mm ... 1800 mm


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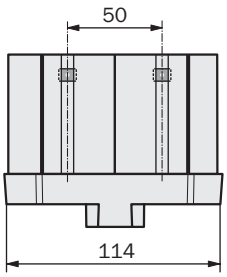
# Dimensional drawings deflector mirror PNS75

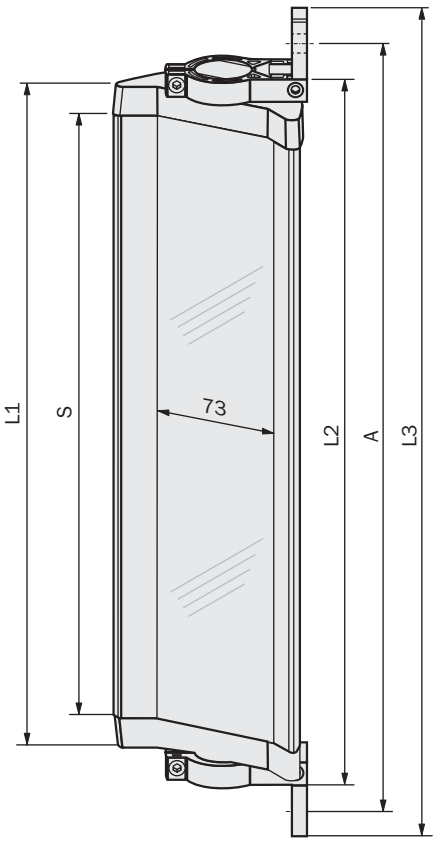



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting



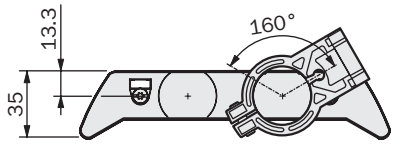

Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

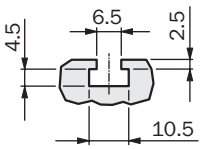
Dimensions in mm


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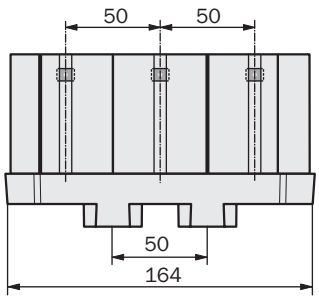
# Dimensional drawings deflector mirror PNS125

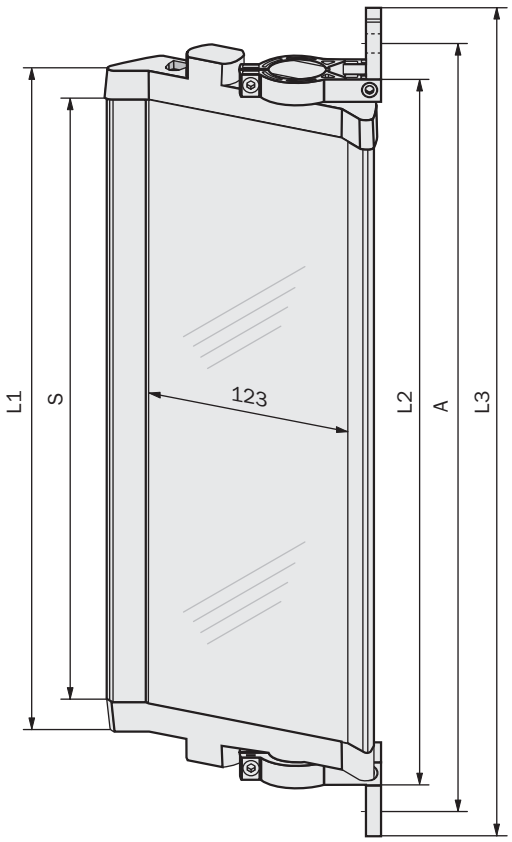



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting




Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

Dimensions in mm


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## Overview of technical specifications

| | |
|---|---|
| **Resistant materials** | Stainless steel (V4A), PMMA, PA, PVC |
| **Enclosure rating** | IP 67 |
| **Protective field width (depending on type)** | 0 m ... 4.5 m / 2.5 m ... 14.5 m |
| **Protective field height (depending on type)** | 150 mm ... 1200 mm |
| **Resolution (depending on type)** | 30 mm |
| **Type** | Type 2 according to EN 61496 |

## Product description

The IP 67 Housing in conjunction with the safety light curtain C2000 achieves the enclosure rating IP 67. A high level of resistance against the usual cleaning agents is achieved by using suitable materials (V4A, PMMA, PA, PVC).

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

## In-system added value

- Combination with safe control solutions from SICK

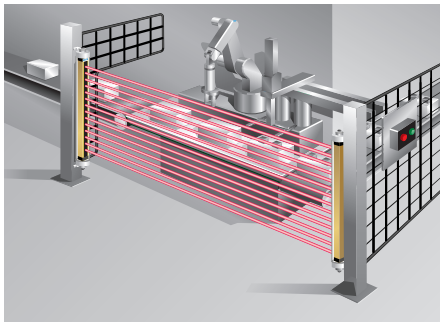
| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

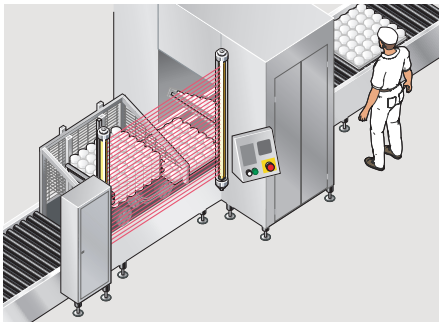
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Hazardous point protection on a processing centre in the hygiene area



Hazardous point protection on a cheese-making machine






- High durability
- Compact design
- External device monitoring (EDM)
- Self-testing
- On-site diagnostics
- Beam coding

CE


| Further information | Page |
|---|---|
| → Ordering information | E-120 |
| → Technical specifications | E-120 |
| → Dimensional drawings | E-121 |
| → Connection diagrams | E-122 |
| → Accessories | E-122 |
| → Dimensional drawings accessories | E-123 |
| → Services | A-2 |


E



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# Ordering information

IP 67 Housing with integrated sender or receiver unit C2000 Standard, including 15 m PVC cable

→ Accessories, see page E-122

## Scanning range 0 ... 4.5 m

| Resolution (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 30 | 150 | C25S-015103C11 | 1024184 | C25E-015303C11 | 1024185 |
| | 300 | C25S-030103C11 | 1024187 | C25E-030303C11 | 1024188 |
| | 450 | C25S-045103C11 | 1024190 | C25E-045303C11 | 1024191 |
| | 600 | C25S-060103C11 | 1024193 | C25E-060303C11 | 1024194 |
| | 750 | C25S-075103C11 | 1024196 | C25E-075303C11 | 1024197 |
| | 900 | C25S-090103C11 | 1024199 | C25E-090303C11 | 1024200 |
| | 1050 | C25S-105103C11 | 1024202 | C25E-105303C11 | 1024203 |
| | 1200 | C25S-120103C11 | 1024205 | C25E-120303C11 | 1024206 |

## Scanning range 2.5 ... 14.5 m

| Resolution (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 30 | 150 | C25S-015203C11 | 1024186 | C25E-015303C11 | 1024185 |
| | 300 | C25S-030203C11 | 1024189 | C25E-030303C11 | 1024188 |
| | 450 | C25S-045203C11 | 1024192 | C25E-045303C11 | 1024191 |
| | 600 | C25S-060203C11 | 1024195 | C25E-060303C11 | 1024194 |
| | 750 | C25S-075203C11 | 1024198 | C25E-075303C11 | 1024197 |
| | 900 | C25S-090203C11 | 1024201 | C25E-090303C11 | 1024200 |
| | 1050 | C25S-105203C11 | 1024204 | C25E-105303C11 | 1024203 |
| | 1200 | C25S-120203C11 | 1024207 | C25E-120303C11 | 1024206 |

# Detailed technical specifications

→ You can find further data in the operating instructions/technical description. Download at www.sickusa.com/literature

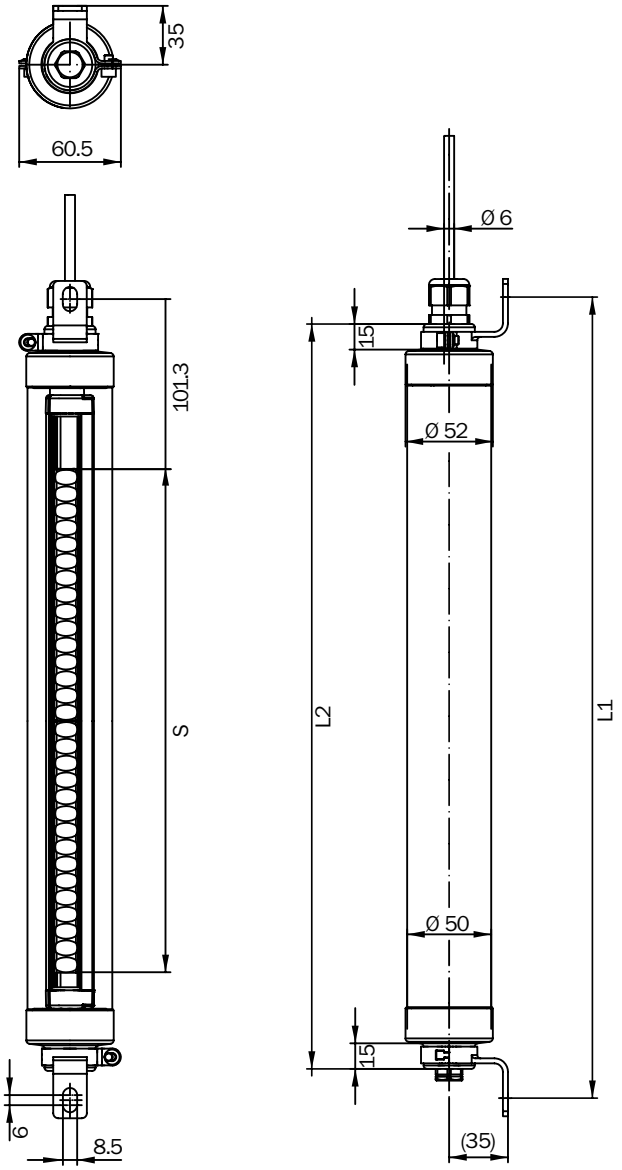
### C2000 Standard in IP 67 Housing

→ C2000 specific data see C2000 Standard page E-109

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 4.5 m / 2.5 m ... 14.5 m |
| **Protective field height (depending on type)** | 150 mm ... 1200 mm |
| **Resolution** | 30 mm |
| **Enclosure rating** | IP 66, IP 67 |
| **Type** | Type 2 according to EN 61496 |
| **Materials** | |
| **End caps** | Stainless steel (V4A) |
| **Plastic tube** | PMMA |
| **Compensating element (membrane)** | PA 6 |
| **PG connector** | PA 6 |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |


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## Dimensional drawings




Dimensions in mm

Illustration with stainless steel bracket (not supplied with delivery)

| Protective field height S | L 1 | L 2 |
|---|---|---|
| **150** | 357 | 324 |
| **300** | 476 | 443 |
| **450** | 626 | 593 |
| **600** | 777 | 744 |
| **750** | 927 | 894 |
| **900** | 1078 | 1045 |
| **1050** | 1228 | 1195 |
| **1200** | 1382 | 1349 |

Dimensions in mm


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## Connection diagrams

→ Connection diagram C2000 Standard on UE10-3OS safety relay, see page E-112
→ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Accessories

→ Dimensional drawings for mounting systems, see page E-123

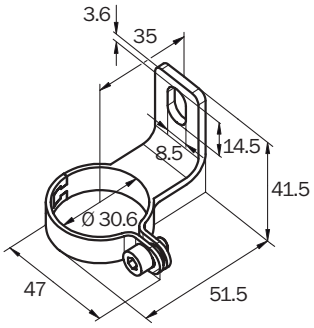
### Mounting accessories

| Designation | Description | Part number |
|---|---|---|
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16ms | 2026850 |
| Stainless steel support bracket | ▪ 2 pieces<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026849 |
| Mounting key | ▪ For M12 cable socket on device replacement | 4034690 |
| Venting membrane | – | 5309082 |

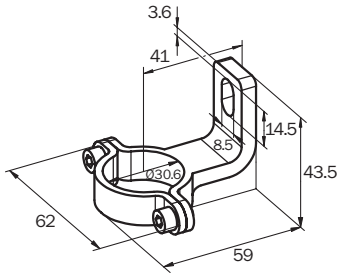

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## Dimensional drawings mounting accessories

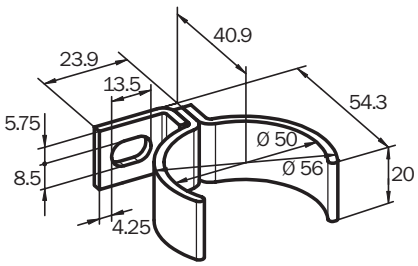
Dimensions in mm




Stainless steel bracket




Reinforced stainless steel bracket




Stainless steel support bracket



Mounting key

E


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- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding

E

## Overview of technical specifications

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 6 m / 2.5 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 20 mm / 30 mm / 40 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

With its high signal reserve, the C2000 RES/EDM safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considerations by precisely coordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector. Compared to traditional solutions the integrated restart interlock in the C2000 RES/EDM offers the advantages of shorter cable runs and quicker commissioning.

## In-system added value

- Combination with safe control solutions from SICK

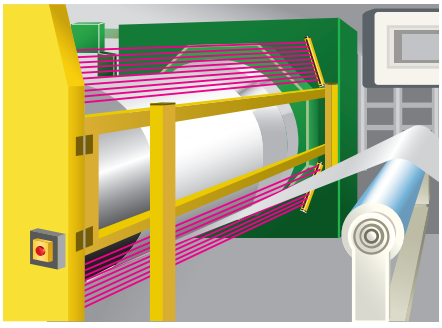
| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

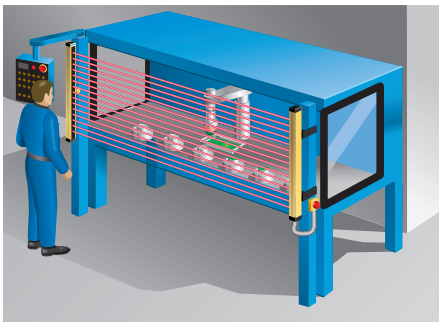
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



C2000 RES/EDM on a warping machine



C2000 RES/EDM on a pad printing machine

| Further information | Page |
|---|---|
| → Technical specifications | E-127 |
| → Dimensional drawings | E-128 |
| → Connection diagrams | E-130 |
| → Accessories | E-131 |
| → Dimensional drawings accessories | E-134 |
| → Services | A-2 |



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# Ordering information

C2000 RES/EDM
- With restart interlock (RES) and external device monitoring (EDM)
- For usage as a stand-alone system
- Consisting of sender and receiver unit

→ Accessories, see page E-131

## Scanning range 0 ... 6 m

| Resolution (mm) | Housing cross-section (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 20 | 34 x 29 | 300 | C20S-030102A11 | 1016448 | C20E-030302A21 | 1018073 |
| | | 450 | C20S-045102A11 | 1016573 | C20E-045302A21 | 1018079 |
| | | 600 | C20S-060102A11 | 1016574 | C20E-060302A21 | 1018056 |
| | | 750 | C20S-075102A11 | 1016579 | C20E-075302A21 | 1018096 |
| | | 900 | C20S-090102A11 | 1016584 | C20E-090302A21 | 1018105 |
| | | 1050 | C20S-105102A11 | 1016589 | C20E-105302A21 | 1018114 |
| | | 1200 | C20S-120102A11 | 1016464 | C20E-120302A21 | 1016970 |
| 30 | 34 x 29 | 300 | C20S-030103A11 | 1016568 | C20E-030303A21 | 1016974 |
| | | 450 | C20S-045103A11 | 1016454 | C20E-045303A21 | 1018081 |
| | | 600 | C20S-060103A11 | 1016477 | C20E-060303A21 | 1018089 |
| | | 750 | C20S-075103A11 | 1016479 | C20E-075303A21 | 1018098 |
| | | 900 | C20S-090103A11 | 1016481 | C20E-090303A21 | 1018107 |
| | | 1050 | C20S-105103A11 | 1016483 | C20E-105303A21 | 1018116 |
| | | 1200 | C20S-120103A11 | 1016594 | C20E-120303A21 | 1018124 |
| | 48 x 40 | 1350 | C20S-135103A12 | 1016600 | C20E-135303A22 | 1018058 |
| | | 1500 | C20S-150103A12 | 1016605 | C20E-150303A22 | 1018134 |
| | | 1650 | C20S-165103A12 | 1016610 | C20E-165303A22 | 1018140 |
| | | 1800 | C20S-180103A12 | 1016615 | C20E-180303A22 | 1018147 |
| 40 | 34 x 29 | 300 | C20S-030104A11 | 1016570 | C20E-030304A21 | 1016973 |
| | | 450 | C20S-045104A11 | 1016456 | C20E-045304A21 | 1018083 |
| | | 600 | C20S-060104A11 | 1016576 | C20E-060304A21 | 1018091 |
| | | 750 | C20S-075104A11 | 1016581 | C20E-075304A21 | 1018100 |
| | | 900 | C20S-090104A11 | 1016586 | C20E-090304A21 | 1018109 |
| | | 1050 | C20S-105104A11 | 1016591 | C20E-105304A21 | 1018118 |
| | | 1200 | C20S-120104A11 | 1016596 | C20E-120304A21 | 1018126 |
| | 48 x 40 | 1350 | C20S-135104A12 | 1016603 | C20E-135304A22 | 1018130 |
| | | 1500 | C20S-150104A12 | 1016608 | C20E-150304A22 | 1018136 |
| | | 1650 | C20S-165104A12 | 1016613 | C20E-165304A22 | 1018142 |
| | | 1800 | C20S-180104A12 | 1016618 | C20E-180304A22 | 1018149 |

Continued on next page




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## Scanning range 2.5 ... 19 m

| Resolution (mm) | Housing cross-section (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 20 | 34 x 29 | 300 | C20S-030202A11 | 1016632 | C20E-030302A21 | 1018073 |
| | | 450 | C20S-045202A11 | 1016458 | C20E-045302A21 | 1018079 |
| | | 600 | C20S-060202A11 | 1016633 | C20E-060302A21 | 1018056 |
| | | 750 | C20S-075202A11 | 1016634 | C20E-075302A21 | 1018096 |
| | | 900 | C20S-090202A11 | 1016635 | C20E-090302A21 | 1018105 |
| | | 1050 | C20S-105202A11 | 1016636 | C20E-105302A21 | 1018114 |
| | | 1200 | C20S-120202A11 | 1016466 | C20E-120302A21 | 1016970 |
| 30 | 34 x 29 | 300 | C20S-030203A11 | 1016572 | C20E-030303A21 | 1016974 |
| | | 450 | C20S-045203A11 | 1016460 | C20E-045303A21 | 1018081 |
| | | 600 | C20S-060203A11 | 1016578 | C20E-060303A21 | 1018089 |
| | | 750 | C20S-075203A11 | 1016583 | C20E-075303A21 | 1018098 |
| | | 900 | C20S-090203A11 | 1016588 | C20E-090303A21 | 1018107 |
| | | 1050 | C20S-105203A11 | 1016593 | C20E-105303A21 | 1018116 |
| | | 1200 | C20S-120203A11 | 1016599 | C20E-120303A21 | 1018124 |
| | 48 x 40 | 1350 | C20S-135203A12 | 1016602 | C20E-135303A22 | 1018058 |
| | | 1500 | C20S-150203A12 | 1016607 | C20E-150303A22 | 1018134 |
| | | 1650 | C20S-165203A12 | 1016612 | C20E-165303A22 | 1018140 |
| | | 1800 | C20S-180203A12 | 1016617 | C20E-180303A22 | 1018147 |
| 40 | 34 x 29 | 300 | C20S-030204A11 | 1016638 | C20E-030304A21 | 1016973 |
| | | 450 | C20S-045204A11 | 1016462 | C20E-045304A21 | 1018083 |
| | | 600 | C20S-060204A11 | 1016639 | C20E-060304A21 | 1018091 |
| | | 750 | C20S-075204A11 | 1016640 | C20E-075304A21 | 1018100 |
| | | 900 | C20S-090204A11 | 1016641 | C20E-090304A21 | 1018109 |
| | | 1050 | C20S-105204A11 | 1016642 | C20E-105304A21 | 1018118 |
| | | 1200 | C20S-120204A11 | 1016643 | C20E-120304A21 | 1018126 |
| | 48 x 40 | 1350 | C20S-135204A12 | 1016644 | C20E-135304A22 | 1018130 |
| | | 1500 | C20S-150204A12 | 1016646 | C20E-150304A22 | 1018136 |
| | | 1650 | C20S-165204A12 | 1016647 | C20E-165304A22 | 1018142 |
| | | 1800 | C20S-180204A12 | 1016648 | C20E-180304A22 | 1018149 |


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# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 6 m / 2.5 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 20 mm / 30 mm / 40 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

## Sender unit

| | |
|---|---|
| **Power consumption** | Max. 6.2 W |

## Receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors (short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 7 ms ... 34 ms |
| **Switching voltage**<br>**$HIGH_{min}$**<br>**$LOW_{max}$** | <br>$V_S$ – 2.25 V<br>1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 8 W |

## Operating data

| | |
|---|---|
| **Connection type** | M12 plug, 8-pin |
| **Connection cable wire cross-section** | Max. 0.25 $mm^2$ |
| **Connection cable length** | Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section (depending on type)**<br>**for protective field heights of 300 mm to 1200 mm**<br>**for protective field heights of 1350 mm to 1800 mm** | <br>34 mm x 29 mm<br>48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 m according to IEC 60068-2-29 |
| **Weight (depending on type)** | 0.27 kg ... 3.88 kg |

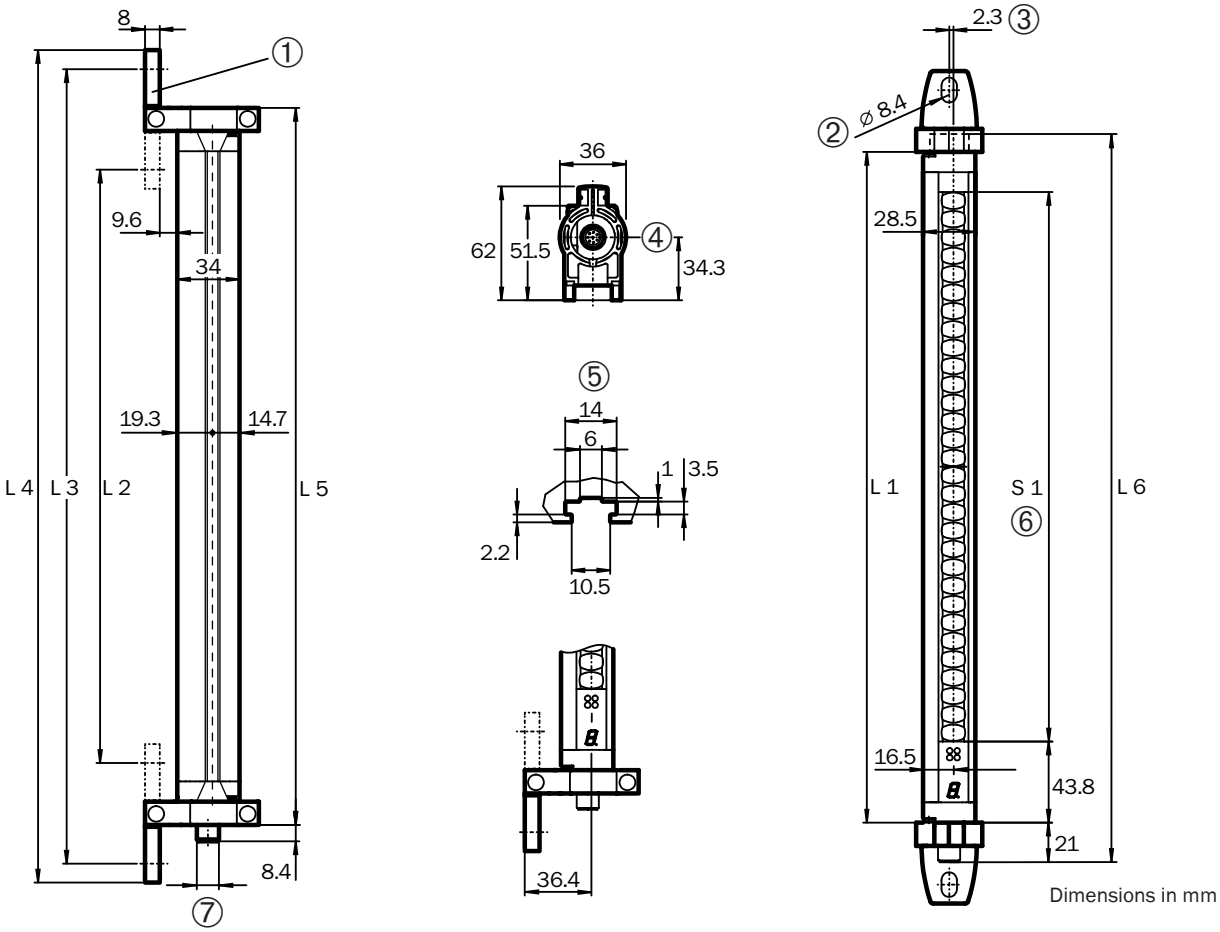
E


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# Dimensional drawings

→ You can find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature

## Protective field heights 300 mm ... 1200 mm




Dimensions in mm

Sender unit with swivel mount, small housing profile (receiver unit not mirror image. Dimensions as C2000 Cascadable, see page E-141)

① Mounting clamp
② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
③ Centre of light beam offset
④ Adjustment
⑤ Sliding nut groove for side mounting
⑥ Protective field height
⑦ Plug M12 x 1

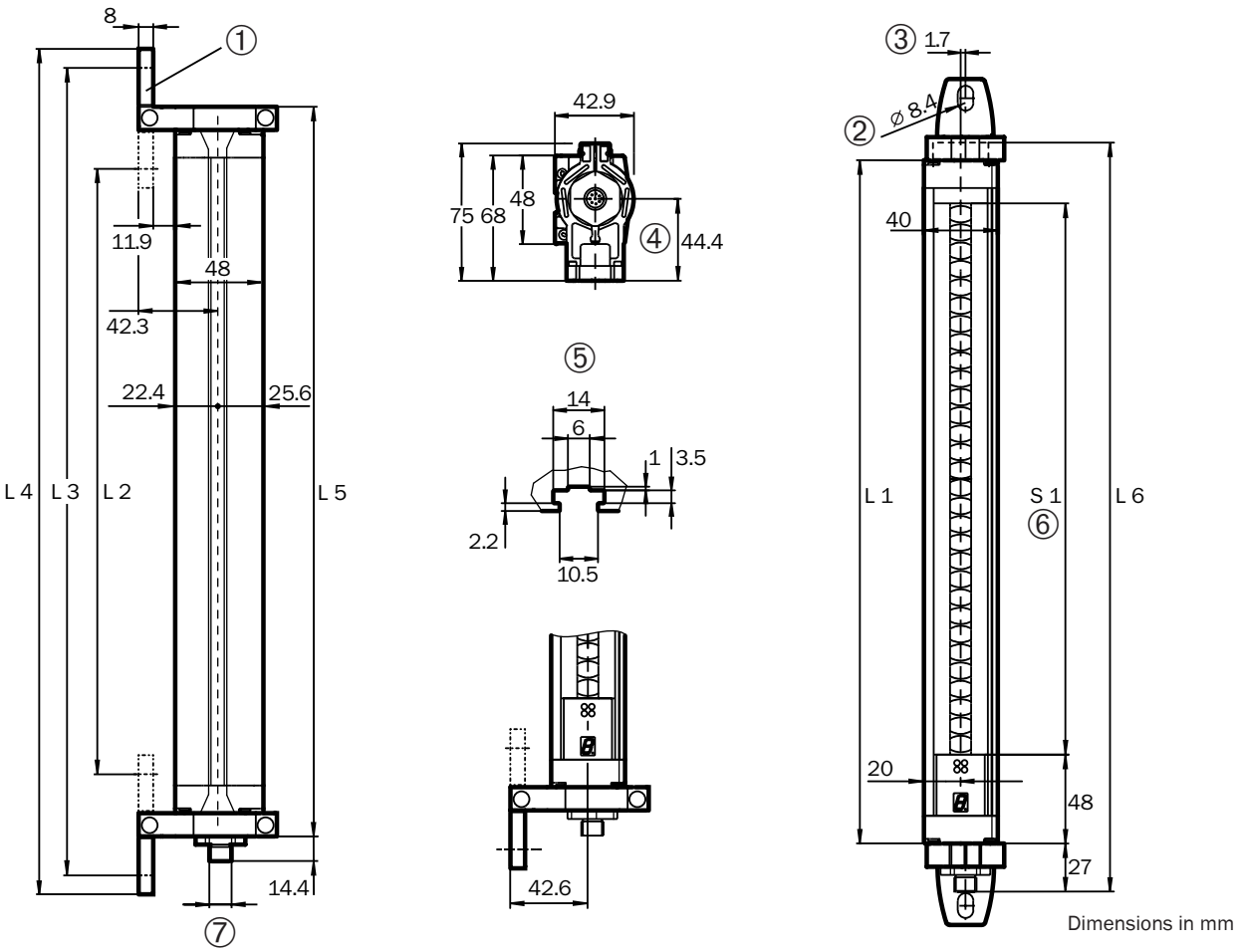
| S 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|
| **300** | 364 | 322 | 432 | 452 | 390 | 394 |
| **450** | 515 | 473 | 582 | 603 | 540 | 545 |
| **600** | 666 | 623 | 733 | 754 | 691 | 696 |
| **750** | 816 | 774 | 884 | 904 | 841 | 846 |
| **900** | 967 | 924 | 1034 | 1055 | 992 | 997 |
| **1050** | 1117 | 1075 | 1185 | 1205 | 1142 | 1147 |
| **1200** | 1266 | 1224 | 1334 | 1354 | 1292 | 1298 |

**S1** = protective field height

Dimensions in mm


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## Protective field heights 1350 mm ... 1800 mm




Dimensions in mm

Sender unit with swivel mount, large housing profile (receiver unit not mirror image, see C2000 Cascadable, page E-142)

① Mounting clamp
② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
③ Centre of light beam offset
④ Adjustment
⑤ Sliding nut groove for side mounting
⑥ Protective field height
⑦ Plug M12 x 1

| S 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|
| **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 |

**S1** = protective field height

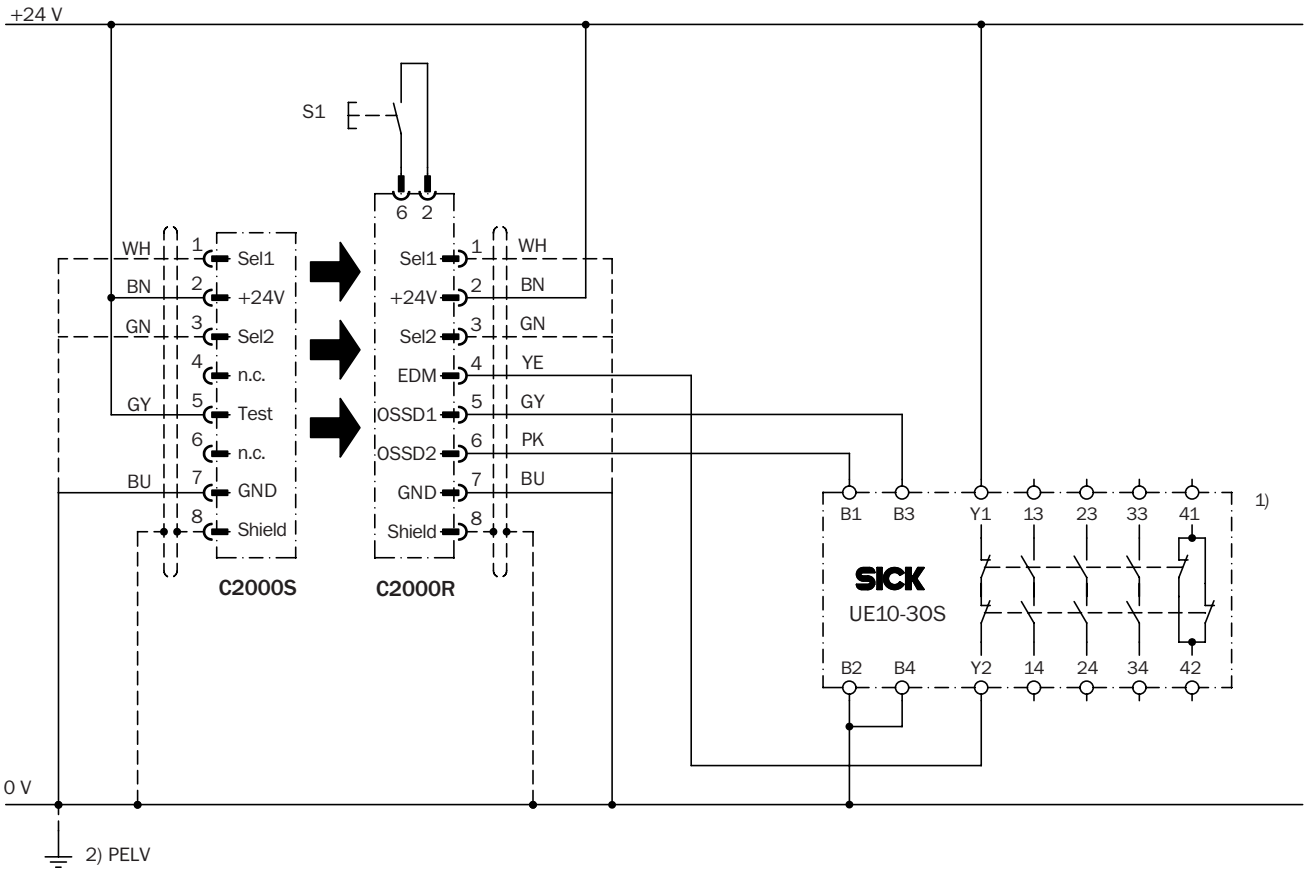
Dimensions in mm


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# Connection diagrams

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## C2000 RES/EDM on UE10-3OS safety relay




**Task**

Interfacing a C2000 RES/EDM safety light curtain to UE10-3OS. Operating mode with restart interlock and external device monitoring.

**Function**

The yellow LED on the receiver flashes when the light path is clear and the UE10-3OS is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-3OS is switched on. On the interruption of one of the light beams, the UE10-3OS is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-3OS will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

**Mounting accessories**

→ Dimensional drawings for mounting accessories, see page E-134

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 1 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount<br>▪ For protective field height 300 mm ... 1200 mm | 2019649 |
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount<br>▪ For protective field height 1350 mm ... 1800 mm | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ For protective field height 300 mm ... 1200 mm | 2030288 |
| | ▪ 4 pieces<br>▪ Pivoting<br>▪ For protective field height 1350 mm ... 1800 mm | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms<br>▪ For protective field height 1350 mm ... 1800 mm | 2026850 |

Continued on next page


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### Connector technology

| System connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |
| Extension connection | M12 cable plug | ▪ Straight<br>▪ For the connection of a control switch | 5.0 m | 6021204 |
| | | | 15.0 m | 6021205 |
| | | ▪ Angled<br>▪ For the connection of a control switch | 5.0 m | 6021830 |
| | | | 15.0 m | 6021831 |
| | Plug | ▪ Pre-assembled<br>▪ For deactivation of the integrated restart interlock<br>▪ M12 | – | 6021238 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns [1)]

➜ Dimensional drawings device columns, see page F-86

| Designation | Description | Part number |
|---|---|---|
| Device column with front screen | ▪ For C2000 Standard (protective field height 150 mm ... 1050 mm)<br>▪ For C2000 Cascadable and RES/EDM (protective field height 150 mm ... 900 mm)<br>▪ 1200 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021333 |
| | ▪ For C2000 (protective field height 150 mm ... 1200 mm)<br>▪ 1500 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021242 |
| | ▪ For C2000 (protective field height 150 mm ... 1200 mm)<br>▪ 1700 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021337 |
| | ▪ For C2000 (protective field height 1350 mm ... 1500 mm)<br>▪ 1700 mm high<br>▪ Including mounting kit 2 (2 pieces) | 2021332 |

[1)] Warning, reduction of the scanning range!


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### Additional front screens [1)]

| Designation | For protective field height (mm) | Part number |
|---|---|---|
| Additional front screen (weld spark guard) | 300 | 2022405 |
| | 450 | 2022406 |
| | 600 | 2022407 |
| | 750 | 2022408 |
| | 900 | 2022409 |
| | 1050 | 2022410 |
| | 1200 | 2022411 |

[1)] Warning, reduction of the scanning range!

### Additional front screens Heavy Duty [1)]

| Designation | For protective field height (mm) | Part number |
|---|---|---|
| Additional front screen Heavy Duty (weld spark guard) with bracket | 1350 | 2026860 |
| | 1500 | 2026861 |
| | 1650 | 2026862 |
| | 1800 | 2026863 |

[1)] Warning, reduction of the scanning range!

### Deflector mirrors [1)] (incl. mounting kit 2)

→ Dimensional drawings deflector mirrors, see page E-135

| Designation | For protective field height (mm) | Type | Part number |
|---|---|---|---|
| For overall protective field width 0 m ... 4 m | 300 | PNS75-034 | 1019414 |
| | 450 | PNS75-049 | 1019415 |
| | 600 | PNS75-064 | 1019416 |
| | 750 | PNS75-079 | 1019417 |
| | 900 | PNS75-094 | 1019418 |
| | 1050 | PNS75-109 | 1019419 |
| | 1200 | PNS75-124 | 1019420 |
| | 1350 | PNS75-139 | 1019421 |
| | 1500 | PNS75-154 | 1019422 |
| | 1650 | PNS75-169 | 1019423 |
| | 1800 | PNS75-184 | 1019424 |
| For overall protective field width 4 m ... 15 m | 300 | PNS125-034 | 1019425 |
| | 450 | PNS125-049 | 1019426 |
| | 600 | PNS125-064 | 1019427 |
| | 750 | PNS125-079 | 1019428 |
| | 900 | PNS125-094 | 1019429 |
| | 1050 | PNS125-109 | 1019430 |
| | 1200 | PNS125-124 | 1019431 |
| | 1350 | PNS125-139 | 1019432 |
| | 1500 | PNS125-154 | 1019433 |
| | 1650 | PNS125-169 | 1019434 |
| | 1800 | PNS125-184 | 1019435 |

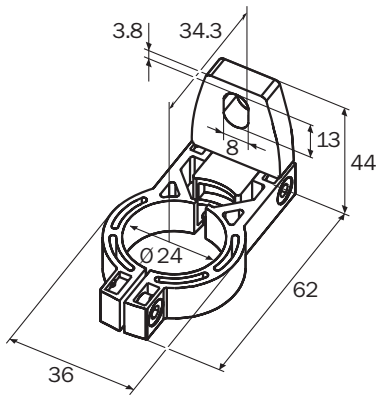
[1)] Warning, reduction of the scanning range!

### Laser alignment aid

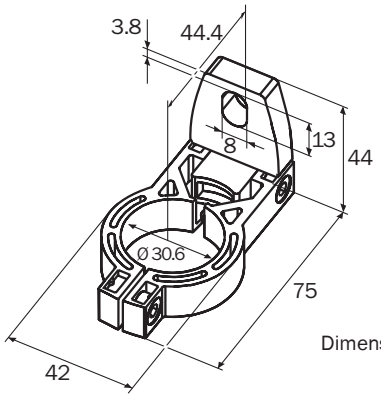
| Designation | Description | Type | Part number |
|---|---|---|---|
| Laser alignment aid | ▪ Does not require connection to power supply | AR60 | 1015741 |
| Adapter for AR60 | ▪ For large housing profile | – | 4032461 |
| | ▪ For small housing profile | – | 4032462 |


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## Dimensional drawings mounting accessories

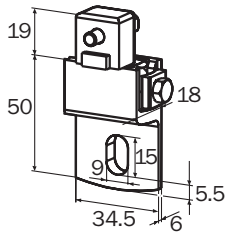



Swivel mount
Mounting kit 1
for protective field height 150 mm ... 1200 mm

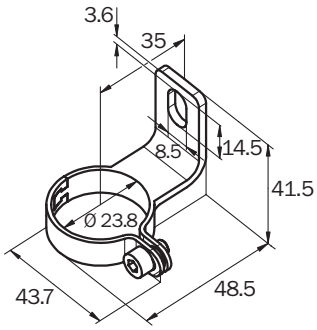



Swivel mount
Mounting kit 2
for protective field height 1350 mm ... 1800 mm

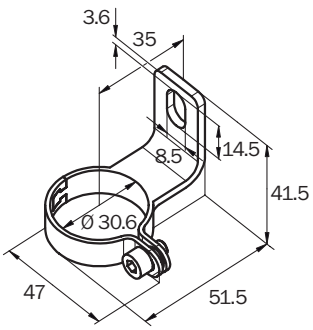
Dimensions in mm



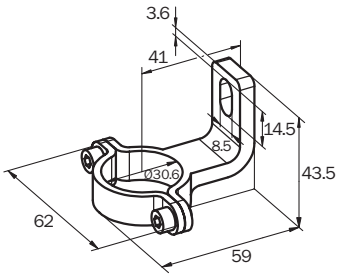

Side bracket
Mounting kit 6




Stainless steel bracket
for protective field height 150 mm ... 1200 mm



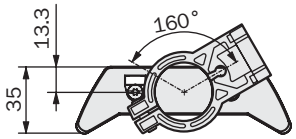

Stainless steel bracket
for protective field height 1350 mm ... 1800 mm



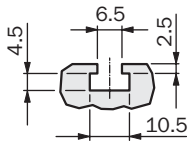

Reinforced stainless steel bracket for
protective field height 1350 mm ... 1800 mm


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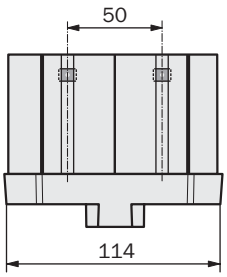
# Dimensional drawings deflector mirror PNS75

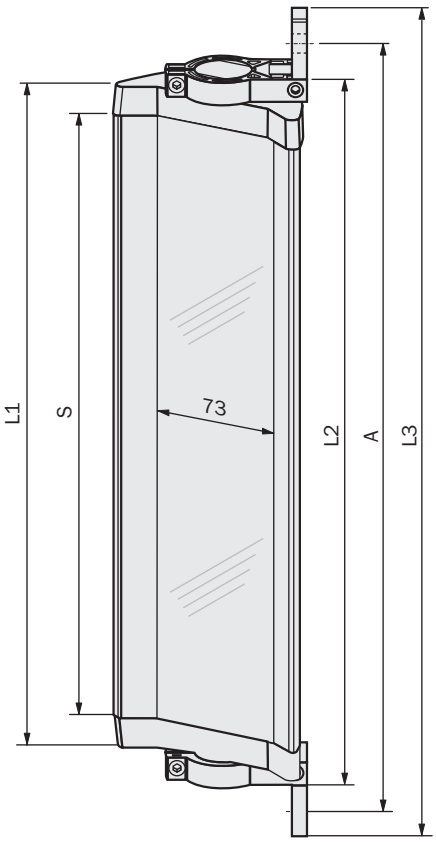



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting




Dimensions in mm

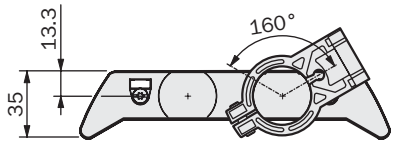
| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **340** | 372 | 396 | 460 | 440 |
| **490** | 522 | 546 | 610 | 590 |
| **640** | 672 | 696 | 760 | 740 |
| **790** | 822 | 846 | 910 | 890 |
| **940** | 972 | 996 | 1060 | 1040 |
| **1090** | 1122 | 1146 | 1210 | 1190 |
| **1240** | 1272 | 1296 | 1360 | 1340 |
| **1390** | 1422 | 1446 | 1510 | 1490 |
| **1540** | 1572 | 1596 | 1660 | 1640 |
| **1690** | 1722 | 1746 | 1810 | 1790 |
| **1840** | 1872 | 1896 | 1960 | 1940 |

Dimensions in mm

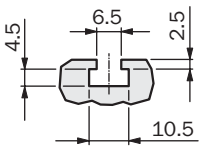
E


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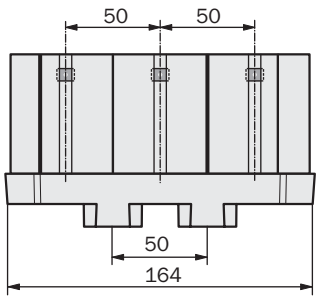
# Dimensional drawings deflector mirror PNS125

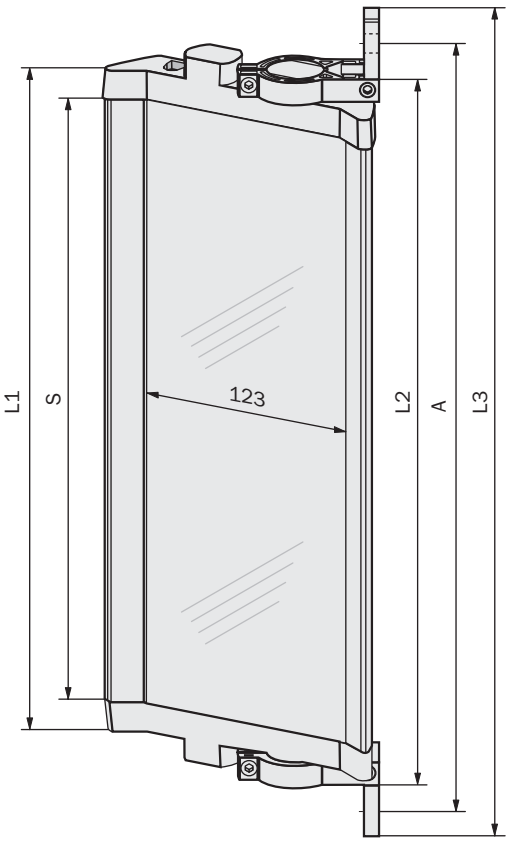



Mounting with
swivel mount bracket
(Part No. 2019659)




Sliding nut groove for
side mounting




Dimensions in mm

| Mirror height S | L1 | L2 | L3 | A |
|---|---|---|---|---|
| **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 |

Dimensions in mm


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## Overview of technical specifications

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 6 m / 2.5 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Number of beams in complete system** | Max. 180 beams |
| **Resolution (depending on type)** | 20 mm / 30 mm / 40 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

With its high signal reserve, the C2000 Cascadable safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considerations by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.
With the cascadable variants, safety light curtains can be flexibly adapted to the existing installation situation.

## In-system added value

- Combination with safe control solutions from SICK

| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications




C2000 Cascadable on a pad printing machine

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry






E

- Cascade
  - Max. 3 devices
  - Max. 3 m cable length
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding

| Further information | Page |
|---|---|
| → Ordering information | E-138 |
| → Technical specifications | E-140 |
| → Dimensional drawings | E-141 |
| → Connection diagrams | E-143 |
| → Accessories | E-144 |
| → Dimensional drawings accessories | E-146 |
| → Services | A-2 |


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# Ordering information

C2000 Cascadable
- With external device monitoring (EDM)
- For usage as cascaded device
- Consisting of sender and receiver unit

→ Accessories, see page E-144

## Scanning range 0 ... 6 m

| Resolution (mm) | Housing cross-section (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 20 | 34 x 29 | 300 | C20S-030102A21 | 1018072 | C20E-030302A21 | 1018073 |
| | | 450 | C20S-045102A21 | 1018078 | C20E-045302A21 | 1018079 |
| | | 600 | C20S-060102A21 | 1018055 | C20E-060302A21 | 1018056 |
| | | 750 | C20S-075102A21 | 1018095 | C20E-075302A21 | 1018096 |
| | | 900 | C20S-090102A21 | 1018104 | C20E-090302A21 | 1018105 |
| | | 1050 | C20S-105102A21 | 1018113 | C20E-105302A21 | 1018114 |
| | | 1200 | C20S-120102A21 | 1018122 | C20E-120302A21 | 1016970 |
| 30 | 34 x 29 | 300 | C20S-030103A21 | 1018074 | C20E-030303A21 | 1016974 |
| | | 450 | C20S-045103A21 | 1018080 | C20E-045303A21 | 1018081 |
| | | 600 | C20S-060103A21 | 1018087 | C20E-060303A21 | 1018089 |
| | | 750 | C20S-075103A21 | 1018097 | C20E-075303A21 | 1018098 |
| | | 900 | C20S-090103A21 | 1018106 | C20E-090303A21 | 1018107 |
| | | 1050 | C20S-105103A21 | 1018115 | C20E-105303A21 | 1018116 |
| | | 1200 | C20S-120103A21 | 1018123 | C20E-120303A21 | 1018124 |
| | 48 x 40 | 1350 | C20S-135103A22 | 1018057 | C20E-135303A22 | 1018058 |
| | | 1500 | C20S-150103A22 | 1018133 | C20E-150303A22 | 1018134 |
| | | 1650 | C20S-165103A22 | 1018139 | C20E-165303A22 | 1018140 |
| | | 1800 | C20S-180103A22 | 1018145 | C20E-180303A22 | 1018147 |
| 40 | 34 x 29 | 300 | C20S-030104A21 | 1016967 | C20E-030304A21 | 1016973 |
| | | 450 | C20S-045104A21 | 1018082 | C20E-045304A21 | 1018083 |
| | | 600 | C20S-060104A21 | 1018090 | C20E-060304A21 | 1018091 |
| | | 750 | C20S-075104A21 | 1018099 | C20E-075304A21 | 1018100 |
| | | 900 | C20S-090104A21 | 1018108 | C20E-090304A21 | 1018109 |
| | | 1050 | C20S-105104A21 | 1018117 | C20E-105304A21 | 1018118 |
| | | 1200 | C20S-120104A21 | 1018125 | C20E-120304A21 | 1018126 |
| | 48 x 40 | 1350 | C20S-135104A22 | 1018129 | C20E-135304A22 | 1018130 |
| | | 1500 | C20S-150104A22 | 1018135 | C20E-150304A22 | 1018136 |
| | | 1650 | C20S-165104A22 | 1018141 | C20E-165304A22 | 1018142 |
| | | 1800 | C20S-180104A22 | 1018148 | C20E-180304A22 | 1018149 |


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## Scanning range 2.5 ... 19 m

| Resolution (mm) | Housing cross-section (mm) | Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 20 | 34 x 29 | 300 | C20S-030202A21 | 1018075 | C20E-030302A21 | 1018073 |
| | | 450 | C20S-045202A21 | 1018084 | C20E-045302A21 | 1018079 |
| | | 600 | C20S-060202A21 | 1018092 | C20E-060302A21 | 1018056 |
| | | 750 | C20S-075202A21 | 1018101 | C20E-075302A21 | 1018096 |
| | | 900 | C20S-090202A21 | 1018110 | C20E-090302A21 | 1018105 |
| | | 1050 | C20S-105202A21 | 1018119 | C20E-105302A21 | 1018114 |
| | | 1200 | C20S-120202A21 | 1016964 | C20E-120302A21 | 1016970 |
| 30 | 34 x 29 | 300 | C20S-030203A21 | 1016968 | C20E-030303A21 | 1016974 |
| | | 450 | C20S-045203A21 | 1018085 | C20E-045303A21 | 1018081 |
| | | 600 | C20S-060203A21 | 1018093 | C20E-060303A21 | 1018089 |
| | | 750 | C20S-075203A21 | 1018102 | C20E-075303A21 | 1018098 |
| | | 900 | C20S-090203A21 | 1018111 | C20E-090303A21 | 1018107 |
| | | 1050 | C20S-105203A21 | 1018120 | C20E-105303A21 | 1018116 |
| | | 1200 | C20S-120203A21 | 1018127 | C20E-120303A21 | 1018124 |
| | 48 x 40 | 1350 | C20S-135203A22 | 1018131 | C20E-135303A22 | 1018058 |
| | | 1500 | C20S-150203A22 | 1018137 | C20E-150303A22 | 1018134 |
| | | 1650 | C20S-165203A22 | 1018143 | C20E-165303A22 | 1018140 |
| | | 1800 | C20S-180203A22 | 1018150 | C20E-180303A22 | 1018147 |
| 40 | 34 x 29 | 300 | C20S-030204A21 | 1018077 | C20E-030304A21 | 1016973 |
| | | 450 | C20S-045204A21 | 1018086 | C20E-045304A21 | 1018083 |
| | | 600 | C20S-060204A21 | 1018094 | C20E-060304A21 | 1018091 |
| | | 750 | C20S-075204A21 | 1018103 | C20E-075304A21 | 1018100 |
| | | 900 | C20S-090204A21 | 1018112 | C20E-090304A21 | 1018109 |
| | | 1050 | C20S-105204A21 | 1018121 | C20E-105304A21 | 1018118 |
| | | 1200 | C20S-120204A21 | 1018128 | C20E-120304A21 | 1018126 |
| | 48 x 40 | 1350 | C20S-135204A22 | 1018132 | C20E-135304A22 | 1018130 |
| | | 1500 | C20S-150204A22 | 1018138 | C20E-150304A22 | 1018136 |
| | | 1650 | C20S-165204A22 | 1018144 | C20E-165304A22 | 1018142 |
| | | 1800 | C20S-180204A22 | 1018151 | C20E-180304A22 | 1018149 |




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# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Protective field width (depending on type)** | 0 m ... 6 m / 2.5 m ... 19 m |
| **Protective field height (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 20 mm / 30 mm / 40 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

## Sender unit

| | |
|---|---|
| **Power consumption** | Max. 6.2 W |

## Receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors (short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 7 ms ... 34 ms |
| **Switching voltage**<br>**$HIGH_{min}$**<br>**$LOW_{max}$** | <br>$V_S$ – 2.25 V<br>1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 8 W |

## Operating data

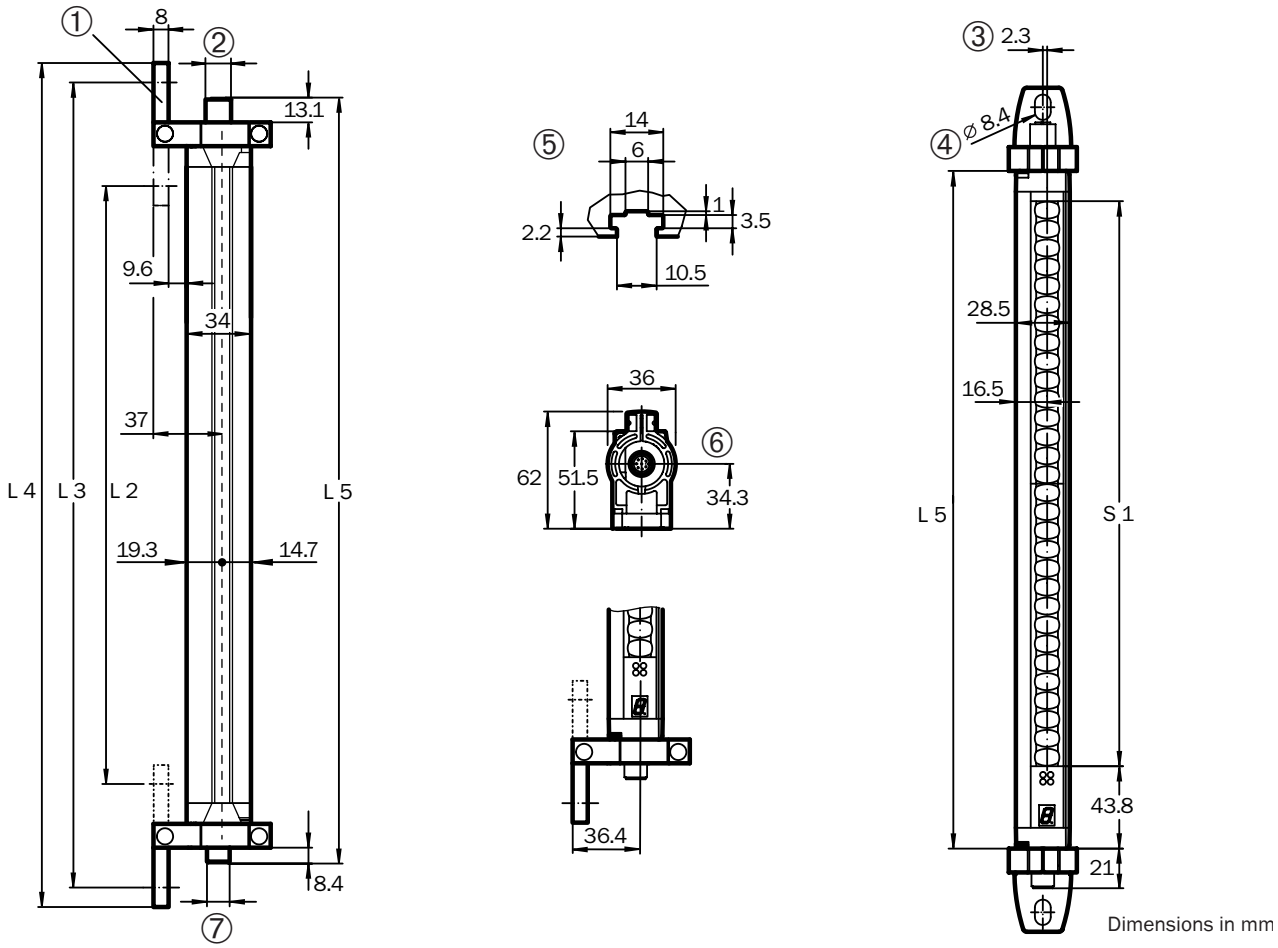
| | |
|---|---|
| **Connection type** | M12 plug, 8-pin |
| **Connection cable wire cross-section** | Max. 0.25 $mm^2$ |
| **Connection cable length** | Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section (depending on type)**<br>**for protective field heights of 300 mm to 1200 mm**<br>**for protective field heights of 1350 mm to 1800 mm** | <br>34 mm x 29 mm<br>48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight (depending on type)** | 0.27 kg ... 3.88 kg |


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# Dimensional drawings

➜ You can find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature

## Protective field heights 300 mm ... 1200 mm




Dimensions in mm

Sender unit with swivel mount, small housing profile (receiver unit mirror image)
① Mounting clamp
② Plug M12 x 1
③ Centre of light beam offset
④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
⑤ Sliding nut groove for side mounting
⑥ Adjustment
⑦ Plug M12 x 1

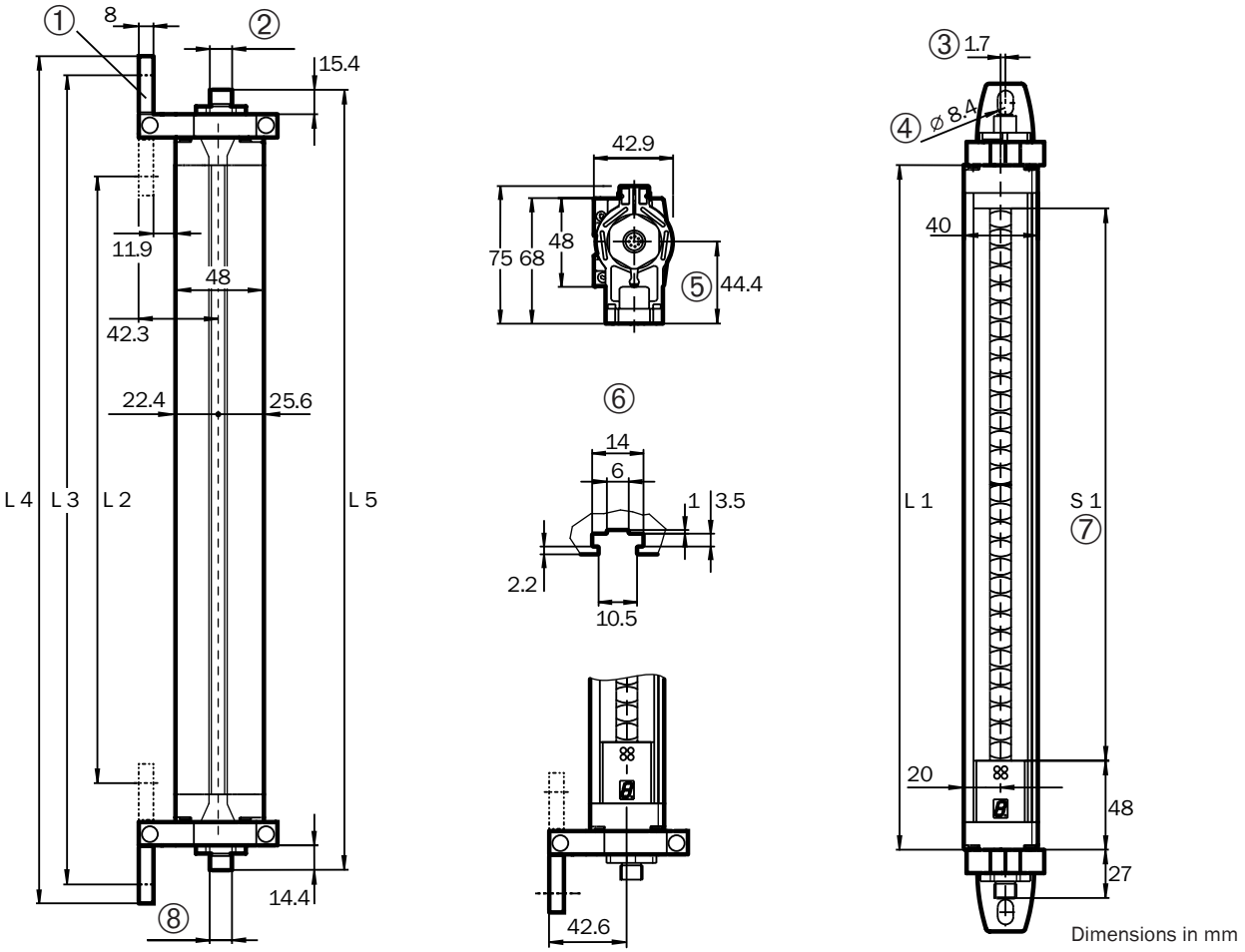
| S 1 | L 1 | L 2 | L 3 | L 4 | L 5 |
|---|---|---|---|---|---|
| **300** | 364 | 322 | 432 | 452 | 411 |
| **450** | 515 | 473 | 582 | 603 | 562 |
| **600** | 666 | 623 | 733 | 754 | 712 |
| **750** | 816 | 774 | 884 | 904 | 863 |
| **900** | 967 | 924 | 1034 | 1055 | 1013 |
| **1050** | 1117 | 1075 | 1185 | 1205 | 1164 |
| **1200** | 1266 | 1224 | 1334 | 1354 | 1313 |

**S1** = protective field height

Dimensions in mm


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## Protective field heights 1350 mm ... 1800 mm




Dimensions in mm

Sender unit with swivel mount, large housing profile (receiver unit mirror image)

① Mounting clamp
② M12 x 1 socket
③ Centre of light beam offset
④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
⑤ Adjustment
⑥ Sliding nut groove for side mounting
⑦ Protective field height
⑧ Plug M12 x 1

| S 1 | L 1 | L 2 | L 3 | L 4 | L 5 |
|---|---|---|---|---|---|
| **1350** | 1426 | 1384 | 1494 | 1514 | 1481 |
| **1500** | 1577 | 1535 | 1644 | 1665 | 1632 |
| **1650** | 1727 | 1685 | 1795 | 1815 | 1782 |
| **1800** | 1878 | 1836 | 1945 | 1966 | 1933 |

**S1 =** protective field height

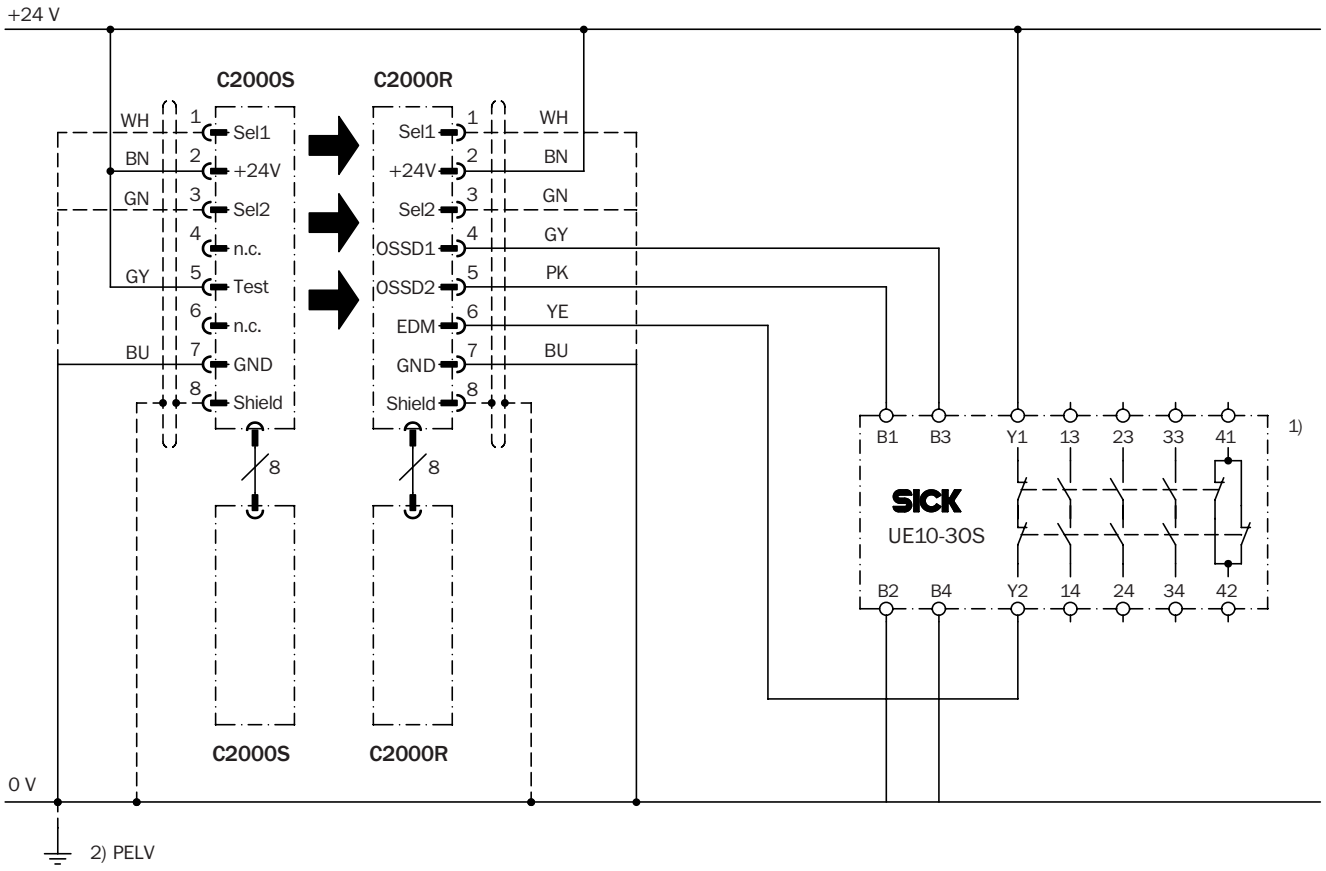
Dimensions in mm


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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## C2000 Cascadable on UE10-3OS safety relay




**Task**

Interfacing two cascaded C2000 safety light curtains to UE10-3OS. Operating mode without restart interlock with external device monitoring. Restart interlock is realised via the machine control.

**Function**

The system is enabled when the light path is clear and the UE10-3OS is de-energised and functioning correctly. The OSSD1 and OSSD2 outputs are live, the UE10-3OS is switched on. On the interruption of one of the light beams, the UE10-3OS is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-3OS will be detected and will not result in the loss of the shutdown function.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

E

# Accessories

**Mounting accessories**

➜ Dimensional drawings for mounting accessories, see page E-146

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 1 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount<br>▪ For protective field height 300 mm ... 1200 mm | 2019649 |
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount<br>▪ For protective field height 1350 mm ... 1800 mm | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ For protective field height 300 mm ... 1200 mm | 2030288 |
| | ▪ 4 pieces<br>▪ Pivoting<br>▪ For protective field height 1350 mm ... 1800 mm | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms<br>▪ For protective field height 1350 mm ... 1800 mm | 2026850 |


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### Connector technology

| System connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |
| Extension connection | Cable sockets/plugs | ▪ Pre-assembled<br>▪ M12<br>▪ 8-pin<br>▪ Straight | 0.25 m | 6021000 |
| | | | 0.5 m | 6021001 |
| | | | 1 m | 6021002 |
| | | | 1.5 m | 6021003 |
| | | | 2 m | 6021004 |
| | | | 2.5 m | 6021005 |
| | | | 3 m | 6021006 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

### Device columns [1)]

→ Dimensional drawings device columns, see page F-86

| Designation | Description | Part number |
|---|---|---|
| Device column with front screen | ▪ For C2000 Standard (protective field height 300 mm ... 1050 mm)<br>▪ For C2000 Cascadable and RES/EDM (protective field height 150 mm ... 900 mm)<br>▪ 1200 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021333 |
| | ▪ For C2000 (protective field height 150 mm ... 1200 mm)<br>▪ 1500 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021242 |
| | ▪ For C2000 (protective field height 150 mm ... 1200 mm)<br>▪ 1700 mm high<br>▪ Including mounting kit 1 (2 pieces) | 2021337 |
| | ▪ For C2000 (protective field height 1350 mm ... 1500 mm)<br>▪ 1700 mm high<br>▪ Including mounting kit 2 (2 pieces) | 2021332 |

[1)] Warning, reduction of the scanning range!

### Laser alignment aid

| Designation | Description | Type | Part number |
|---|---|---|---|
| Laser alignment aid | ▪ Does not require connection to power supply | AR60 | 1015741 |
| Adapter for AR60 | ▪ For large housing profile | – | 4032461 |
| | ▪ For small housing profile | – | 4032462 |

Continued on next page


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### Additional front screens [1)]

| Designation | For protective field height (mm) | Part number |
|---|---|---|
| Additional front screen (weld spark guard) | 300 | 2022405 |
| | 450 | 2022406 |
| | 600 | 2022407 |
| | 750 | 2022408 |
| | 900 | 2022409 |
| | 1050 | 2022410 |
| | 1200 | 2022411 |

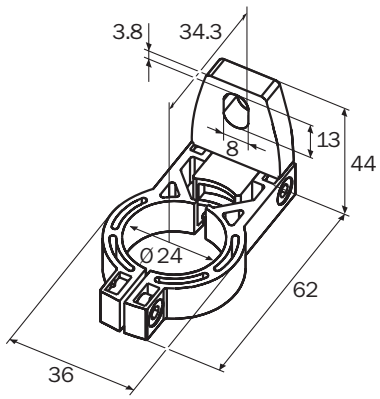
[1)] Warning, reduction of the scanning range!

### Additional front screens Heavy Duty [1)]

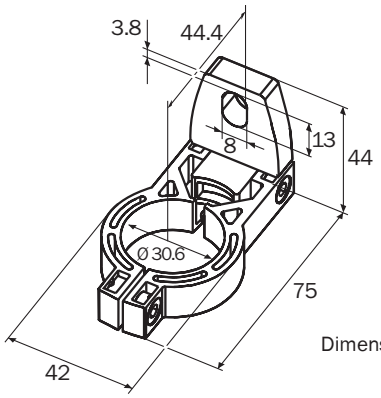
| Designation | For protective field height (mm) | Part number |
|---|---|---|
| Additional front screen Heavy Duty (weld spark guard) with bracket | 1350 | 2026860 |
| | 1500 | 2026861 |
| | 1650 | 2026862 |
| | 1800 | 2026863 |

[1)] Warning, reduction of the scanning range!

## Dimensional drawings mounting accessories

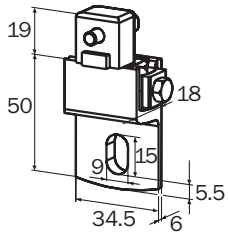



Swivel mount
Mounting kit 1
for protective field height 150 mm ... 1200 mm

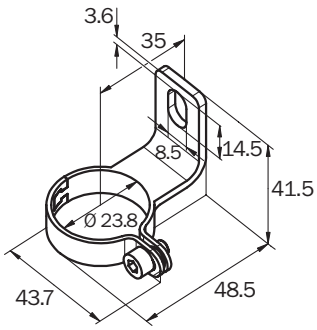



Swivel mount
Mounting kit 2
for protective field height 1350 mm ... 1800 mm

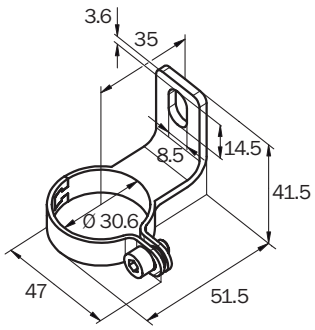
Dimensions in mm



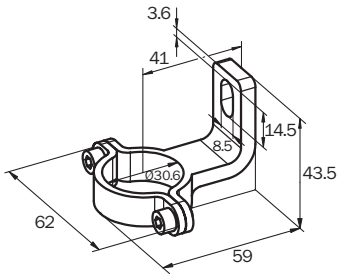

Side bracket
Mounting kit 6




Stainless steel bracket
for protective field height 150 mm ... 1200 mm




Stainless steel bracket
for protective field height 1350 mm ... 1800 mm




Reinforced stainless steel bracket for
protective field height 1350 mm ... 1800 mm


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# Overview of technical specifications

| | |
|---|---|
| **Protective field width** | 0.1 m ... 6 m |
| **Protective field height (depending on type)** | 150 mm ... 900 mm |
| **Resolution** | 30 mm |
| **Type** | Type 2 according to EN 50100 |
| **Enclosure rating** | |
| **Sender/receiver unit** | IP 65 |
| **Control unit** | IP 54 |

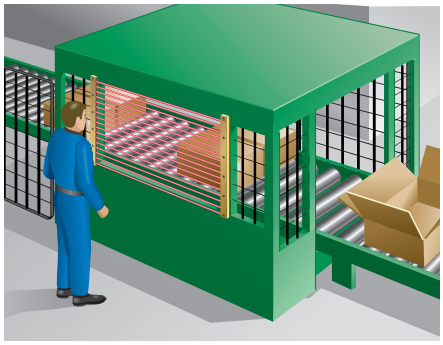
# Product description

Due to its compact design, the LGT safety light curtain is suitable for applications on small machines, where space is limited. Functions and status information integrated in the control unit allow rapid commissioning and prevent unnecessary machine downtimes. Sector-oriented service concepts round off the product range and can be combined to form a customer-specific package of solutions.

# Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: LGT on a packaging machine





- Restart interlock (RES)
- External device monitoring (EDM)
- 7-segment display
- Diagnostics
- Blanking
- Small design

CE

E

| Further information | Page |
|---|---|
| → Ordering information | E-148 |
| → Technical specifications | E-149 |
| → Dimensional drawings | E-150 |
| → Services | A-2 |

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# Ordering information

## LGT

LGT consisting of:
- Sender unit (LGTS) and receiver unit (LGTE)
- Control unit (LGTN)

### Sender and receiver units

| Protective field height (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|
| | Type | Part number | Type | Part number |
| 150 | LGTS015-051 | 1013413 | LGTE015-051 | 1013414 |
| 300 | LGTS030-111 | 1013415 | LGTE030-111 | 1013416 |
| 450 | LGTS045-171 | 1013417 | LGTE045-171 | 1013418 |
| 600 | LGTS060-231 | 1013419 | LGTE060-231 | 1013420 |
| 750 | LGTS075-291 | 1013421 | LGTE075-291 | 1013422 |
| 900 | LGTS090-351 | 1013423 | LGTE090-351 | 1013424 |

### Control units

| Designation | Description | Type | Part number |
|---|---|---|---|
| Control unit | ▪ 24 V DC | LGTN101-511 | 6010683 |
| | ▪ 115 / 230 V AC + 24 V DC | LGTN101-311 | 6010521 |
| | ▪ 24 V DC<br>▪ For installation in control cabinets | LGTN101-521 | 6008527 |
| | ▪ 115 / 230 V AC + 24 V DC<br>▪ For installation in control cabinets | LGTN101-321 | 6008526 |

## Accessories

| Designation | Connection cable | Part number |
|---|---|---|
| Connection cable with socket | 2.5 m | 6009923 |
| | 5 m | 6009924 |
| | 10 m | 6009926 |
| | 15 m | 6008410 |
| | 20 m | 6008411 |
| Snap-on clip | – | 4028654 |


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# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Protective field width** | 0.1 m ... 6 m |
| **Protective field height (depending on type)** | 150 mm ... 900 mm |
| **Resolution** | 30 mm |
| **Enclosure rating** | |
| **Sender/receiver unit** | IP 65 |
| **Control unit LGTN** | IP 54 |
| **Type** | Type 2 according to EN 50100 |
| **Synchronisation** | Electrical synchronisation |
| **Supply voltage $V_s$** [1] | |
| **Direct current** | 24 V (19.2 V ... 28.8 V) DC |
| **Residual ripple** | 5 $V_{PP}$ |
| **Alternating current** | 115 V (92 V ... 126,5 V) AC / 230 V (184 V ... 253 V) AC |
| **Frequency** | 50 Hz (48 Hz ... 62 Hz) |
| **Power consumption** | Max. 13 W / 16 VA |
| **Response time (depending on type)** | Max. 50 ms |
| **Master relay** | |
| **Resistive switching capacity** | Max. 4 A, 45 V DC |
| **Inductive switching capacity** | Max. 4 A, 25 V DC |
| **Auxiliary relay** | |
| **Resistive switching capacity** | Max. 8 A, 55 V DC |
| **Inductive switching capacity** | Max. 8 A, 15 V DC |

## Operating data

| | |
|---|---|
| **Connection type** | PG11 |
| **Connection cable length** | Max. 10 m |
| **Ambient operating temperature $T_A$** | –10 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section** | 10 mm x 30 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |

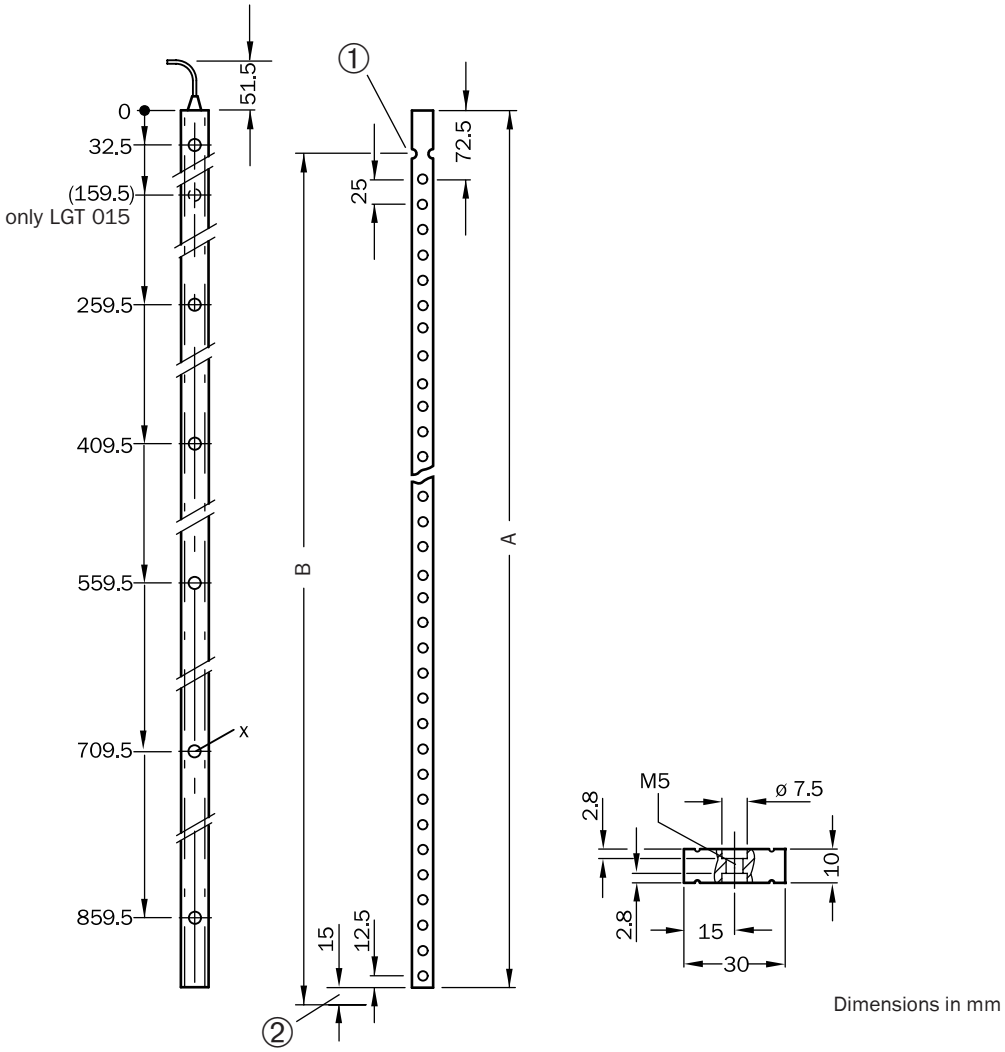
[1] A power supply unit with safe isolation (SELV, PELV circuit) is to be used

E


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# Dimensional drawings

## Sender unit LGTS and receiver unit LGTE



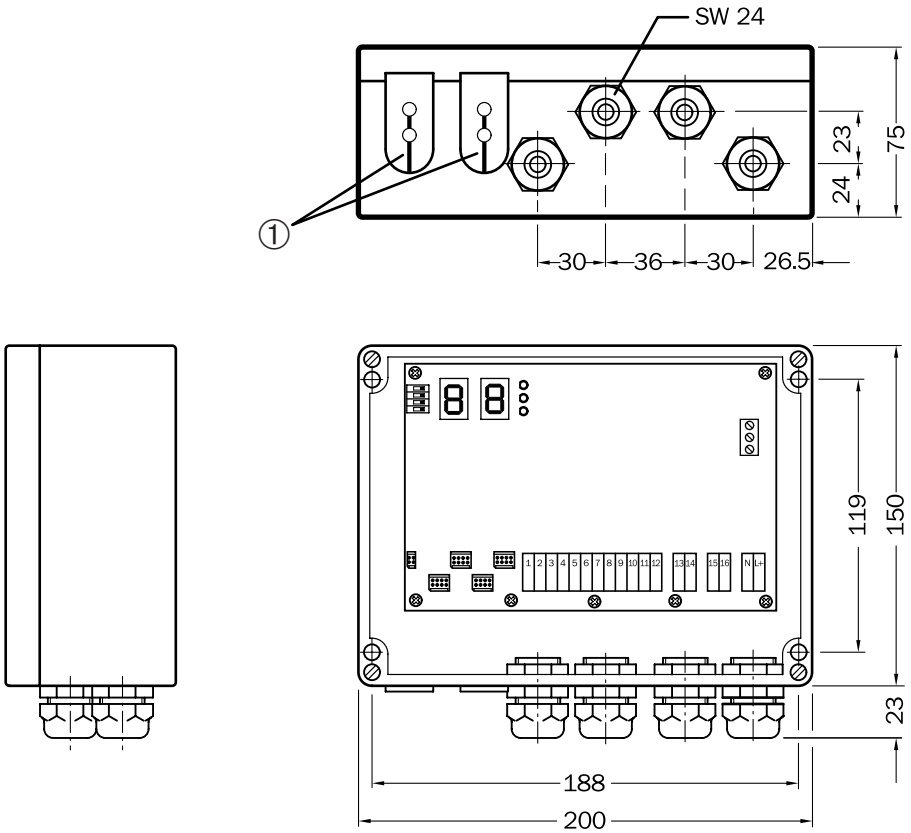

Dimensions in mm

① The upper limit of the protective field is indicated by a cut-out in the housing
② The lower limit of the protective field is 15 mm from the end of the housing

| LGT type | Number of beams | Housing length A (mm) | Protective field height B (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 |


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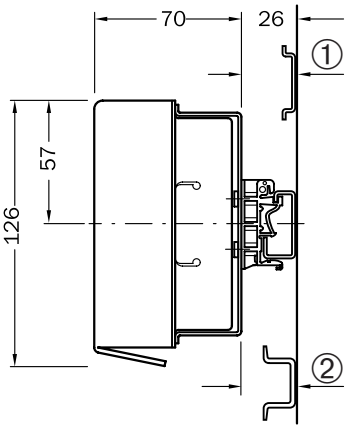
## Control unit LGTN with housing

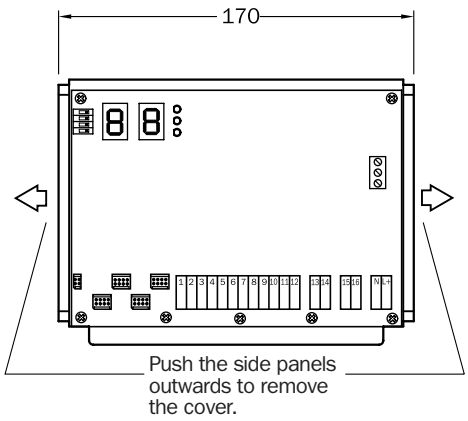



Dimensions in mm

① To insert cable: remove bush and push apart

## Control unit LGTN for installation in control cabinets




Dimensions in mm

① For mounting on low 20 mm mounting rail
② For mounting on high 28 mm mounting rail


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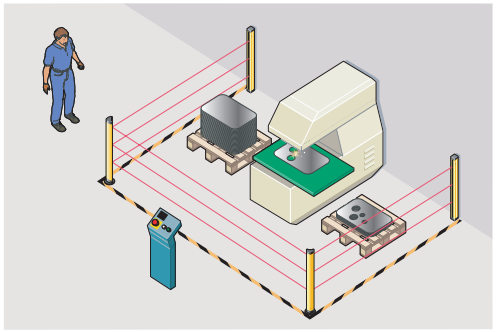
## Principle of operation of multiple light beam safety devices

Multiple light beam safety devices are electrosensitive protective devices comprising a sender unit and a receiver unit or a sender/receiver unit on the active side and one or more deflector mirrors on the passive side. If one or more light beams are interrupted, the multiple light beam safety device provides a shutdown signal that is suitable for interrupting the dangerous state on a machine or system.

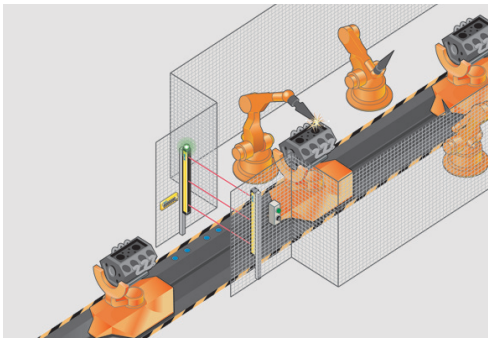
## Applications for multiple light beam safety devices

Multiple light beam safety devices are used wherever access to a hazardous area must be protected or the hazardous area itself must be monitored.

In some applications, the protective device must be able to unambiguously differentiate between man and material.



Machine tool industry: M4000 Standard with mirror column for multi-sided access protection on a punching machine



Automotive industry: M4000 Advanced with UE403 for access protection with muting on a motor machining station

## Advantages of the SICK multiple light beam safety device

SICK's range of multiple light beam safety devices provides a reliable, cost-effective solution for almost every hazardous area protection and access protection application. Customised solutions are produced using standard components that are flexible in use: From simple access protection to the complex muting application with direction monitoring, belt stop and override function.

The M4000 Standard and/or Advanced can be used for access protection and M4000 Area for hazardous area protection (horizontal use) if a type 4 multiple light beam safety device is required. M4000 Advanced in combination with the switching amplifier UE403 offers a comfortable, decentralised muting solution where automatic material transport in and out of the hazardous area is required. In sectors such as warehouse systems and conveyor systems, the M4000 Advanced with UE403 not only complies with safety requirements, but also provides highly efficient automatic material transport.

The M2000 is the right choice for applications where a type 2 multiple light beam safety device is desired. Product variants with differing functionalities are available for countless applications. The use of SICK interfaces also offers numerous advantages. The M2000 variants in IP 67 housings were designed for environments in which very high demands are made of the enclosure rating (IP 67) and the material strength.

## Mounting and operation made easy

SICK provides a comprehensive range of accessories for multiple light beam safety devices. These accessories make it possible to integrate the devices in the machine control and also to mount the devices rapidly, reliably and safely. Device and mirror columns offer an efficient solution to realise multi-sided access protection at minimum assembly expenditure.

## Safety services

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A



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# Multiple light beam safety devices




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| Safety application | Type according to IEC 61496 | Number of beams resp. resolution | Scanning range (m) | Functions: Sender/receiver system | Functions: Active/passive system | Functions: Muting | Functions: Beam coding | Functions: Restart interlock | Functions: External device monitoring | Product | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Type 4 | 2 ... 8 | 0.5 ... 70 | ✔ | – | ✔[1] | ✔ | ✔ | ✔ | M4000 Advanced / UE403 | F-2 |
| | | 2 / 4[2] | 0.5 ... 7.5 / 4.5 | – | ✔ | ✔[1] | ✔ | ✔ | ✔ | M4000 Advanced A/P / UE403 | |
| | | 2 ... 8 | 0.5 ... 70 | ✔ | – | – | ✔ | ✔ | ✔ | M4000 Standard | F-17 |
| | | 2 / 4[2] | 0.5 ... 7.5 / 4.5 | – | ✔ | – | ✔ | ✔ | ✔ | M4000 Standard A/P | |
|  | Type 4 | 60 mm<br>80 mm | 0.5 ... 19<br>0.5 ... 70 | ✔ | – | – | ✔ | ✔ | ✔ | M4000 Area | F-29 |
|  | Type 2 | 2 ... 9<br>2 ... 4 | 0 ... 25<br>0 ... 70 | ✔ | – | ✔[3] | ✔ | – | ✔ | M2000 Standard | F-38 |
| | | | | ✔ | – | ✔[3] | ✔ | – | ✔ | M2000 Standard in IP 67 Housing | F-46 |
| | | | | ✔ | – | ✔[3] | ✔ | ✔ | ✔ | M2000 RES/EDM | F-51 |
| | | 2 ... 9 | 0 ... 25 | ✔ | – | ✔[3] | ✔ | – | ✔ | M2000 Cascadable | F-59 |
| | | 1[2] | 0 ... 6 | – | ✔ | ✔[3] | – | – | ✔ | M2000 A/P Standard | F-67 |
| | | | | – | ✔ | ✔[3] | – | ✔ | ✔ | M2000 A/P RES/EDM | F-75 |

[1] Muting with switching amplifier UE403

[2] Passive side using deflector mirror/deflector unit

[3] Muting with safety evaluation unit LE20 Muting / safety controller UE410 Flexi

➜ Suitable mirror columns and device columns can be found beginning on page F-82



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- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Configuration and diagnosis via PC
- SDL interface
- Muting configurable in conjunction with external switching amplifier UE403
- A/P (active/passive) variant
- Integrated laser alignment aid (optional)
- End cap with integrated LED (optional)

| Further information | Page |
|---|---|
| → Technical specifications | F-5 |
| → Dimensional drawings | F-9 |
| → Connection diagrams | F-11 |
| → Accessories | F-12 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0.5 m ... 70 m / 4.5 m / 7.5 m |
| **Number of beams (depending on type)** | 2 ... 8 |
| **Beam separation (depending on type)** | 220 mm ... 600 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (IEC 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The M4000 Advanced multiple light beam safety device together with the UE403 switching amplifier form the efficient solution for decentralised conventional muting applications involving automatic material transport.
Access protection with muting can be achieved with maximum availability thanks to their integrated functions, easily configured by PC via the RS-232 interface, and the simple in-situ connection of muting signals and control switches to the UE403.

The integrated functions, and status and diagnostic information, permit rapid commissioning and prevent unnecessary machine downtimes.
The modular concept provides a high level of machine safety that takes economic efficiency into account as device properties can be adapted to meet specific requirements. This is especially the case for the M4000 Advanced A/P (active/passive) variants, with which only one side requires electrical connection - considerably simplifying installation and cutting costs.

## In-system added value

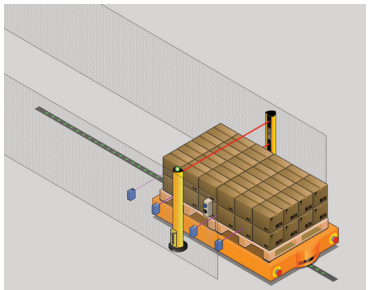
- Combination with safe control solutions by SICK
- M4000 Advanced with UE403 for the connection of:
  - 2 to 4 muting sensors
  - External muting lamp
  - Reset- and override control switch
  - Conveyor belt stop signal
- Further functions:
  - Concurrence monitoring
  - Total muting time monitoring
  - Sensor gap monitoring
  - Sensor test
  - Partial blanking
  - Muting end via ESPE
  - Integrated override

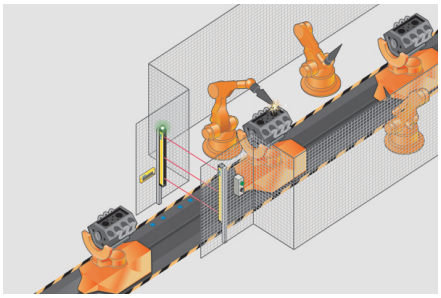
→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

Provides access protection of hazardous areas on machining centres in mechanical engineering applications, robot systems (such as welding lines in the automotive industry) and automated conveying, storage and transport systems.


Access protection with partial blanking on a system with floor transporter


Access protection with muting on a motor machining station

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# Ordering information

## M4000 Advanced

| | | Sender | | Receiver | |
|---|---|---|---|---|---|
| Number of beams | Beam separation | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025003AA0 | 1200060 | M40E-025003RB0 | 1200065 |
| | 600 mm | M40S-026003AA0 | 1200070 | M40E-026003RB0 | 1200096 |
| 3 | 220 mm | M40S-032203AA0 | 1200063 | M40E-032203RB0 | 1200097 |
| | 400 mm | M40S-034003AA0 | 1200061 | M40E-034003RB0 | 1200064 |
| | 450 mm | M40S-034503AA0 | 1200071 | M40E-034503RB0 | 1200098 |
| 4 | 220 mm | M40S-042203AA0 | 1200072 | M40E-042203RB0 | 1200099 |
| | 300 mm | M40S-043003AA0 | 1200073 | M40E-043003RB0 | 1200100 |
| 5 | 220 mm | M40S-052203AA0 | 1200074 | M40E-052203RB0 | 1200101 |
| 6 | 220 mm | M40S-062203AA0 | 1200075 | M40E-062203RB0 | 1200102 |
| 7 | 220 mm | M40S-072203AA0 | 1200076 | M40E-072203RB0 | 1200103 |
| 8 | 220 mm | M40S-082203AA0 | 1200077 | M40E-082203RB0 | 1200104 |

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## M4000 Advanced with integrated alignment aid

| | | Sender | | Receiver | |
|---|---|---|---|---|---|
| Number of beams | Beam separation | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025013AA0 | 1200057 | M40E-025013RB0 | 1200058 |
| | 600 mm | M40S-026013AA0 | 1200078 | M40E-026013RB0 | 1200105 |
| 3 | 400 mm | M40S-034013AA0 | 1200069 | M40E-034013RB0 | 1200106 |
| | 450 mm | M40S-034513AA0 | 1200082 | M40E-034513RB0 | 1200107 |
| 4 | 300 mm | M40S-043013AA0 | 1200080 | M40E-043013RB0 | 1200108 |

## M4000 Advanced with end cap with integrated LED

| | | Sender | | Receiver | |
|---|---|---|---|---|---|
| Number of beams | Beam separation | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025003AA0 | 1200060 | M40E-025023RB0 | 1200062 |
| | 600 mm | M40S-026003AA0 | 1200070 | M40E-026023RB0 | 1200079 |
| 3 | 220 mm | M40S-032203AA0 | 1200063 | M40E-032223RB0 | 1200066 |
| | 400 mm | M40S-034003AA0 | 1200061 | M40E-034023RB0 | 1200067 |
| | 450 mm | M40S-034503AA0 | 1200071 | M40E-034523RB0 | 1200081 |
| 4 | 220 mm | M40S-042203AA0 | 1200072 | M40E-042223RB0 | – [1] |
| | 300 mm | M40S-043003AA0 | 1200073 | M40E-043023RB0 | 1200109 |
| 5 | 220 mm | M40S-052203AA0 | 1200074 | M40E-052223RB0 | – [1] |
| 6 | 220 mm | M40S-062203AA0 | 1200075 | M40E-062223RB0 | – [1] |
| 7 | 220 mm | M40S-072203AA0 | 1200076 | M40E-072223RB0 | 1201247 |
| 8 | 220 mm | M40S-082203AA0 | 1200077 | M40E-082223RB0 | – [1] |

[1] When ordering first time, please use the expression in column "Type" instead of "Part number"

Continued on next page


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## M4000 Advanced with integrated alignment aid and end cap with integrated LED

| Number of beams | Beam separation | Sender | | Receiver | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025013AA0 | 1200057 | M40E-025033RB0 | 1200110 |
| | 600 mm | M40S-026013AA0 | 1200078 | M40E-026033RB0 | 1200111 |
| 3 | 400 mm | M40S-034013AA0 | 1200069 | M40E-034033RB0 | 1200068 |
| | 450 mm | M40S-034513AA0 | 1200082 | M40E-034533RB0 | 1200112 |
| 4 | 300 mm | M40S-043013AA0 | 1200080 | M40E-043033RB0 | 1200113 |

## M4000 Advanced A/P

| Number of beams | Beam separation | Scanning range | System connection | Sender/receiver in one housing | | Deflector unit | |
|---|---|---|---|---|---|---|---|
| | | | | Type | Part number | Type | Part number |
| 2 | 500 mm | 7.5 m | M26 x 11 + FE Hirschmann plug | M40Z-025003RB0 | 1200115 | PSD01-1501 [1] | 1027906 |
| | | 4.5 m | | M40Z-025003TB0 | 1200128 | PSD01-2501 [2] | 1027907 |
| 4 | 300 mm | 4.5 m | | M40Z-043003TB0 | 1200127 | PSD02-2301 [2] | 1027908 |

[1] With mirror deflection (max. usable scanning range 7.5 m)
[2] With fibre-optic deflection (max. usable scanning range 4.5 m)

## M4000 Advanced A/P with end cap with integrated LED

| Number of beams | Beam separation | Scanning range | System connection | Sender/receiver in one housing | | Deflector unit | |
|---|---|---|---|---|---|---|---|
| | | | | Type | Part number | Type | Part number |
| 2 | 500 mm | 7.5 m | M26 x 11 + FE Hirschmann plug | M40Z-025023RB0 | 1200126 | PSD01-1501 [1] | 1027906 |
| | | 4.5 m | | M40Z-025023TB0 | 1200125 | PSD01-2501 [2] | 1027907 |
| 4 | 300 mm | 4.5 m | | M40Z-043023TB0 | 1200131 | PSD02-2301 [2] | 1027908 |

[1] With mirror deflection (max. usable scanning range 7.5 m)
[2] With fibre-optic deflection (max. usable scanning range 4.5 m)

## Muting module UE403

| Type | Part number |
|---|---|
| UE403-A0930 | 1026287 |


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# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## M4000 Advanced

### General data

| | Sender | Receiver |
|---|---|---|
| Number of beams (depending on type) | 2 ... 8 | |
| Beam separation (depending on type) | 220 mm ... 600 mm | |
| Scanning range | | |
| | – | 0.5 m ... 20 m |
| | – | 15 m ... 70 m |
| Configurable | – | ✔ |
| Response time (depending on type) | – | Max. 11 ms |
| Protection class | III (EN 50178:1998) | |
| Enclosure rating | IP 65 (EN 60529) | |
| Synchronisation | Optical, without separate synchronisation | |
| Type | Type 4 (IEC 61496), SIL3 (IEC 61508) | |
| Ambient operating temperature from ... to | 0 °C ... +55 °C | |
| Storage temperature from ... to | –25 °C ... +70 °C | |
| Air humidity from ... to | 15 % ... 95 %, non-dewing | |
| Housing cross section | 52 mm x 55.5 mm | |
| Vibration resistance | 5 g, 10 Hz ... 55 Hz (IEC60068-2-6) | |
| Shock resistance | 10 g, 16 ms (IEC 60068-2-29) | |
| Housing material | Aluminium alloy ALMGSI 0.5 | |
| Front screen material | Polycarbonate, scratch-resistant coating | |

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### Functional data

| | Sender | Receiver |
|---|---|---|
| Safe integration to bus system | ✔ | |
| Restart interlock | – | ✔ |
| Restart interlock (delivery status) | – | Internal |
| External device monitoring | – | ✔ |
| External device monitoring (delivery status) | – | Activated |
| Beam coding | ✔ | |
| Beam coding (delivery status) | Non-coded | |
| Configurable application diagnostic output | – | ✔ |
| Application diagnostic output (delivery status) | – | Contamination (OWS) |
| Sender test | ✔ | – |
| Sender test (delivery status) | Deactivated | – |
| Configurable scanning range | – | ✔ |
| Scanning range (delivery status) | – | 20 m |
| Integrated laser alignment aid (optional) | ✔ | |
| End cap with integrated LED (optional) | – | ✔ |
| SDL interface | ✔ | |
| CDS configuration via RS-232 interface | ✔ | |
| Concurrence monitoring (with UE403) | – | ✔ |
| Monitoring total muting time (with UE403) | – | ✔ |
| Sensor gap monitoring (with UE403) | – | ✔ |
| Sensor test (with UE403) | – | ✔ |
| Partial blanking (with UE403) | – | ✔ |
| End of muting by ESPE (with UE403) | – | ✔ |
| Belt stop (with UE403) | – | ✔ |
| Muting with override (with UE403) | – | ✔ |

Continued on next page


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### Electrical data

| | Sender | Receiver |
|---|---|---|
| **Connection type** | | |
| **System connection** | M26 x 11 + FE Hirschmann plug | M26 x 11 + FE Hirschmann plug |
| **Extension connection** | – | M12 x 5 Plug |
| **Cable length** | 50 m [1] | 50 m [1] |
| **Wire cross-section** | 0.75 mm² | 0.75 mm² |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) [2] | |
| **Ripple** | ±10 % | |
| **Power consumption** | Max. 0.2 A | Max. 0.6 A |
| **Display elements** | LED/7-segment | |
| **Safety outputs (OSSD)** | | |
| **Type of output** | – | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored [3] |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 2.25 V ... $V_S$) |
| **Switching voltage LOW** | – | 0 V DC (0 V DC ... 3.5 V DC) |
| **Switching current** | – | 0 mA ... 500 mA |
| **Application diagnostic output** | | PNP semiconductor, short-circuit protected |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 4.2 V ... $V_S$) |
| **Switching voltage LOW** | – | High resistance |
| **Switching current** | – | 0 mA ... 100 mA |
| **Integrated laser alignment aid** | | ≤1 mW |
| **Wave length** | – | 630 nm ... 680 nm |
| **Laser class** | – | 2 (IEC 60825-1:2001) |

[1] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

[2] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

[3] Applies to a voltage range between –30 V and +30 V.

## M4000 Advanced A/P

### General data

| | Sender/receiver in one housing | Deflector unit |
|---|---|---|
| **Number of beams (depending on type)** | 2 / 4 | |
| **Beam separation (depending on type)** | 500 mm / 300 mm | |
| **Scanning range** | | |
| **(depending on type)** | 0.5 m ... 7.5 m / 0.5 m ... 4.5 m | 7.5 m / 4.5 m |
| **Configurable** | ✔ | – |
| **Response time** | Max. 10 ms | – |
| **Protection class** | III (EN 50178:1998) | – |
| **Enclosure rating** | IP 65 (EN 60529) | – |
| **Synchronisation** | Optical, without separate synchronisation | – |
| **Type** | Type 4 (IEC 61496) | – |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C | – |
| **Storage temperature from ... to** | –25 °C ... +70 °C | – |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | – |
| **Housing cross section** | 52 mm x 55.5 mm | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC60068-2-6) | – |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) | – |
| **Housing material** | Aluminium alloy ALMGSI 0.5 | – |
| **Front screen material** | Polycarbonate, scratch-resistant coating | – |



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## Functional data

| | Sender/receiver in one housing | Deflector unit |
|---|---|---|
| **Safe integration to bus system** | ✔ | – |
| **Restart interlock** | ✔ | – |
| **Restart interlock (delivery status)** | Internal | – |
| **External device monitoring** | ✔ | – |
| **External device monitoring (delivery status)** | Activated | – |
| **Beam coding** | ✔ | – |
| **Beam coding (delivery status)** | Non-coded | – |
| **Configurable application diagnostic output** | ✔ | – |
| **Application diagnostic output (delivery status)** | Contamination (OWS) | – |
| **Configurable scanning range** | ✔ | – |
| **Scanning range (delivery status) (depending on type)** | 7.5 m / 4.5 m | – |
| **End cap with integrated LED (optional)** | ✔ | – |
| **SDL interface** | ✔ | – |
| **CDS configuration via RS-232 interface** | ✔ | – |
| **Concurrence monitoring (with UE403)** | ✔ | – |
| **Monitoring total muting time (with UE403)** | ✔ | – |
| **Sensor gap monitoring (with UE403)** | ✔ | – |
| **Sensor test (with UE403)** | ✔ | – |
| **Partial blanking (with UE403)** | ✔ | – |
| **End of muting by ESPE (with UE403)** | ✔ | – |
| **Belt stop (with UE403)** | ✔ | – |
| **Muting with override (with UE403)** | ✔ | – |

## Electrical data

| | Sender/receiver in one housing | Deflector unit |
|---|---|---|
| **Connection type** | | |
| **System connection** | M26 x 11 + FE Hirschmann plug | – |
| **Extension connection** | M12 x 5 Plug | – |
| **Cable length** | 50 m [1] | – |
| **Wire cross-section** | 0.75 mm² | – |
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC) [2] | – |
| **Ripple** | ±10 % | – |
| **Power consumption** | Max. 0.6 A | – |
| **Display elements** | LED/7-segment | – |
| **Safety outputs (OSSD)** | | |
| **Type of output** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored [3] | – |
| **Switching voltage HIGH** | 24 V DC ($V_S$ – 2.25 V ... $V_S$) | – |
| **Switching voltage LOW** | 0 V DC (0 V DC ... 3.5 V DC) | – |
| **Switching current** | 0 mA ... 500 mA | – |
| **Application diagnostic output** | PNP semiconductor, short-circuit protected | |
| **Switching voltage HIGH** | 24 V DC ($V_S$ – 4.2 V ... $V_S$) | – |
| **Switching voltage LOW** | High resistance | – |
| **Switching current** | 0 mA ... 100 mA | – |

[1] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

[2] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

[3] Applies to a voltage range between –30 V and +30 V.





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# Muting module UE403

## General data

| | |
|---|---|
| **Type of muting sensors** | Optical sensors, inductive sensors, mechanical switches, controller signals |
| **Protection class** | III (EN 50178:1998) |
| **Enclosure rating** | IP 65 (IEC 60529) |
| **Type** | Type 4 (IEC 61496), SIL3 (IEC 61508) |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing |
| **Storage temperature from ... to** | –25 °C ... +70 °C |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Housing material** | Aluminium die-cast, powder coated |
| **Material, Connector strip** | Polyamide |
| **Mounting** | Flexible mounting to the M4000 Advanced or directly in the system |

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## Electrical data

| | |
|---|---|
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC), via connected ESPE |
| **Inputs override, reset, C1, belt stop, muting sensors** | |
| **Switching voltage HIGH** | 24 V DC (11 V DC ... 30 V DC) |
| **Input current HIGH** | 10 mA (6 mA ... 15 mA) |
| **Switching voltage LOW** | 0 V DC (–30 V DC ... 5 V DC) |
| **Input current LOW** | 0 mA (–0.5 mA ... 1.5 mA) |
| **Outputs 24 V DC voltage supply for reset, override, C1, muting sensors** | |
| **Supply voltage** | 24 V DC (15 V DC ... 28.8 V DC) |
| **Output current for muting sensors** | 500 mA [1] |
| **Output current for reset, override, C1** | 400 mA [1] |
| **Muting lamp** | |
| **Output current monitored** | 20 mA ... 400 mA |
| **Output current not monitored** | 0 mA ... 400 mA |
| **Connection type** | Socket M12 x 5 |
| **Cable length** | 10 m [2] |
| **Wire cross-section** | 0.34 mm² |
| **Cable resistance** | <0.5 Ohm (per cable) |

[1] Total of all supply currents from the connections RES/OVR, A1, A2, B1 and B2 (pin 1 in each case): max. 1000 mA

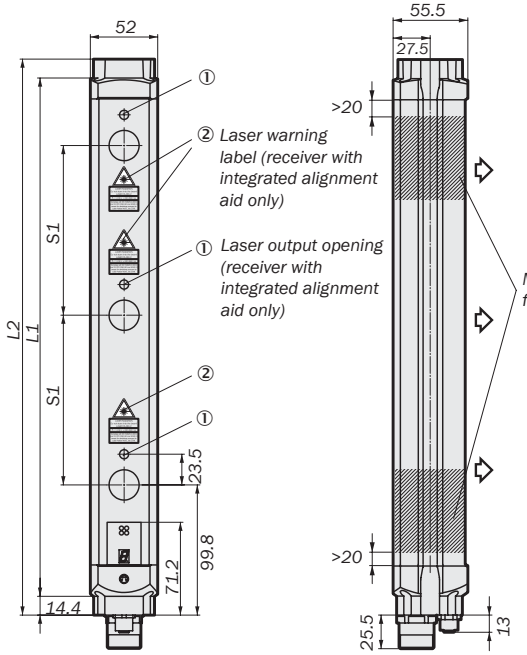
[2] Between UE403 and M4000 Advanced as well as between the muting sensors/control switches/muting lamp and UE403



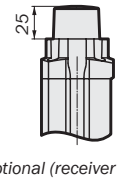
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# Dimensional drawings

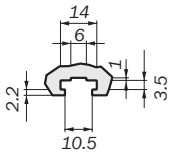
## M4000 Advanced, M4000 Advanced A/P



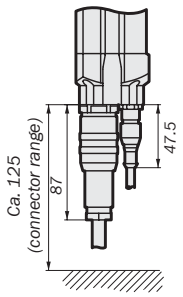

M4000 Advanced (receiver) or M4000 Advanced A/P




Optional (receiver only): Design with integrated LED




Sliding nut groove for side mounting




Cable socket M26 with crimp contacts (for DIN 43 651, left) and cable plug M12 with cable (right, only on receiver)

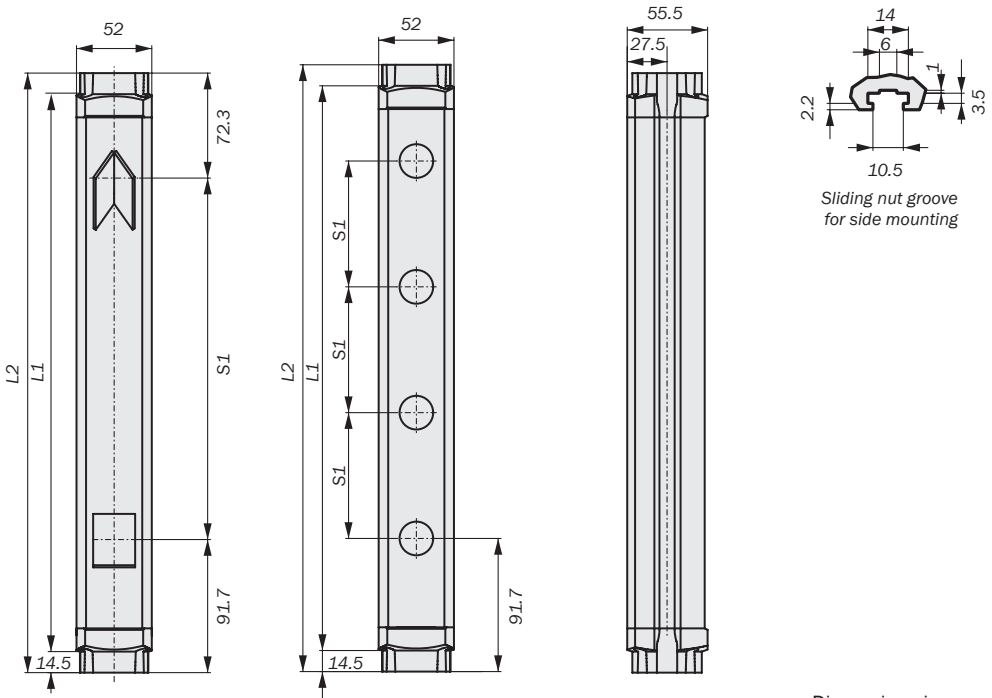
Dimensions in mm

| Number of beams | Beam separation S1 | Dimension L1 | Dimension L2 |
|---|---|---|---|
| 2 | 500 | 643 | 672 |
| 2 | 600 | 743 | 772 |
| 3 | 220 | 583 | 612 |
| 3 | 400 | 943 | 972 |
| 3 | 450 | 1043 | 1072 |
| 4 | 220 | 803 | 832 |
| 4 | 300 | 1043 | 1072 |
| 5 | 220 | 1023 | 1052 |
| 6 | 220 | 1243 | 1272 |
| 7 | 220 | 1462 | 1491 |
| 8 | 220 | 1682 | 1711 |

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## M4000 deflector units



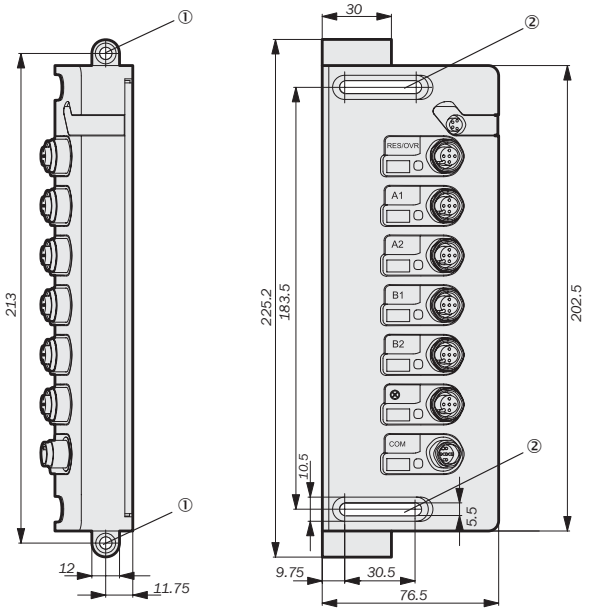

*M4000 Passive (mirror deflection)*

*M4000 Passive (fibre-optic deflection)*

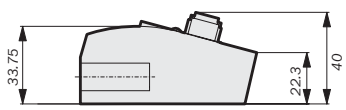
Dimensions in mm

| Number of beams | Beam separation S1 | Dimension L1 | Dimension L2 |
|---|---|---|---|
| 2 | 500 | 643 | 672 |
| 4 | 300 | 1043 | 1072 |

## Muting module UE403




Dimensions in mm



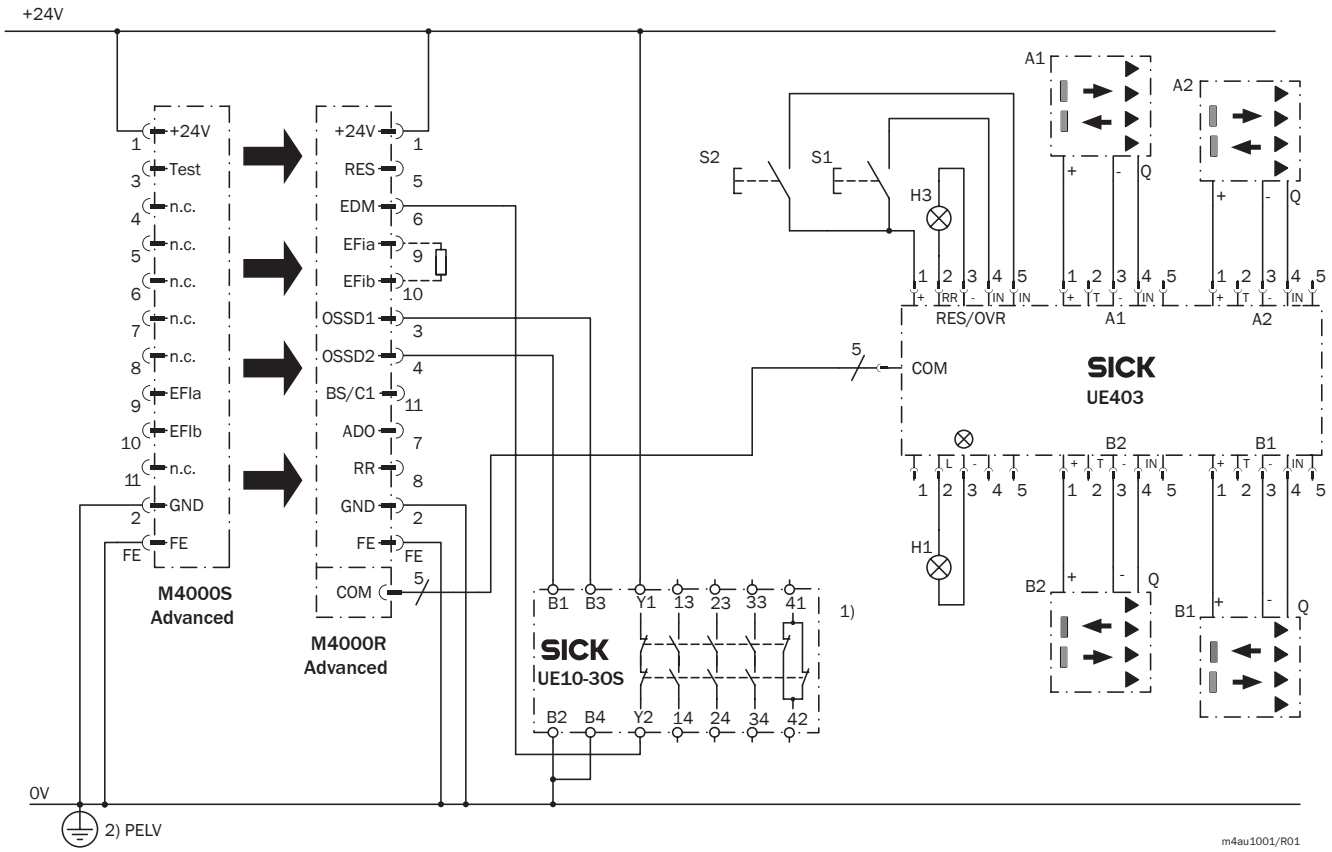

**Note:**
The fixing holes ① and slots ② are suitable for cheese head screws M5 x 30 as per DIN EN ISO 4762.


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# Connection diagrams

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M4000 Advanced with UE403 muting module connected to UE10-3OS safety relay




**Task**

Connection of an M4000 Advanced multiple light beam safety device with UE403 muting module to an UE10-3OS safety relay. Muting with 4 photoelectric reflex switches (dark switching, PNP). Operating mode: with restart interlock and external device monitoring.

**Operating characteristics**

When the light path is clear and the UE10-3OS is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-3OS is switched on. On interruption of one or several of the light beams, the UE10-3OS is de-energised by the OSSD1 and OSSD2 outputs.

**Muting and override**

When the light path is clear and the muting input conditions are valid muting starts. The muting lamp H1 illuminates. Different time and monitoring functions can be configured.
When the light path is interrupted and muting sensors are active, e. g. because of muting errors or a new power-on, override is enabled by pressing and releasing the button S2.

**Fault analysis**

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-3OS will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.
The failure of one muting sensor will be detected by the muting sequence, and prohibit a new muting cycle. On manipulation (e.g. jamming) of the button S2, the system does not enable override. A permanent use of the override function will be inhibited through the device.

**Comments**

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices. This applies particularly on the use of configurable functions.

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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

→ Dimensional drawings for mounting systems, see page F-16

| Type | Property | Packing unit | Part number |
|---|---|---|---|
| Mounting kit 1 | Rigid | 4 | 7021352 |
| Mounting kit 2 | Adjustable | 4 | 2017751 |
| Mounting kit 6 | Swivel function, side bracket | 4 | 2019506 |
| Mounting kit 12 | Swivel Mount | 4 | 2030510 |

### Sliding nuts/sliding blocks

| Type | Remark | Packing unit | Part number |
|---|---|---|---|
| Sliding block (sliding nuts) | Included with delivery | 4 | 2017550 |

### Connection cables

| Connection type | Cable alignment | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26 x 11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |


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### Cable receptacles

| Connection type | Cable alignment | Part number |
|---|---|---|
| Hirschmann cable socket M26 x 11 + FE | Straight | 6020757 |
| | Angled | 6020758 |

### Extension connection cable

| Connection type | Cable alignment | Remark | Cable length | Part number |
|---|---|---|---|---|
| Plug M12 x 5, socket M12 x 5 | Plug straight/socket straight | Connection cable for M4000 Advanced with M12, 5 pin connector and UE403 | 0.6 m | 6025930 |
| | | | 1 m | 6029280 |
| | | | 1.5 m | 6029281 |
| | | | 2 m | 6025931 |
| | | | 5 m | 6029282 |

### Configuration connection cable

| Connection type | Cable length | Remark | Part number |
|---|---|---|---|
| M8 x 4, SUB-D 9-pol | 2 m | For connecting the configuration connection to the PC | 6021195 |

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### Mirror columns and device columns

→ Suitable mirror columns and device columns can be found beginning on page F-82

### Additional front screens

| Suitable for | Packing unit | Remark | Part number |
|---|---|---|---|
| M40x-0250xxxxx | 2 | Including sliding blocks and mounting screws | 2033225 |
| M40x-0260xxxxx | | | 2033226 |
| M40x-0322xxxxx | | | 2033227 |
| M40x-0340xxxxx | | | 2033228 |
| M40x-0345xxxxx | | | 2033229 |
| M40x-0422xxxxx | | | 2033230 |
| M40x-0522xxxxx | | | 2033231 |
| M40x-0622xxxxx | | | 2033232 |
| M40x-0722xxxxx | | | 2033233 |
| M40x-0822xxxxx | | | 2033234 |

### Deflector mirrors

| Type | Remark | Part number |
|---|---|---|
| PNS75-008 | Including mounting adapter (two pieces swivel mount) | 1026647 |

### Laser alignment aid

| Type | Type of light | Scanning range | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | Red light | Max. 60 m | 1015741 |
| AR60 adapter for M4000 | – | – | 4040006 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

Continued on next page


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### Configuration Tools

| Type | Remark | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/ Exit and M4000 Advanced | 1029665 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host Guest Plug | 5318293 |

### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC ... 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

## Muting module UE403

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### Mounting systems

| Property | Packing unit | Remark | Part number |
|---|---|---|---|
| Fixing screws with sliding nuts | 2 | Included in the delivery | 2033250 |

### Muting sensor connecting cables

| Connection type | Cable alignment | Cable length | Remark | Part number |
|---|---|---|---|---|
| Plug M12 x 4 | Plug straight/ socket angled | 1 m | Suitable for muting sensor WL24 and WT24 | 6025974 |
| | | 2 m | Suitable for muting sensor WL24 and WT24 | 6025975 |
| | | 5 m | Suitable for muting sensor WL24 and WT24 | 6025087 |
| | | 1 m | Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected | 6025944 |
| | | 2 m | Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected | 6025945 |
| | | 5 m | Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected | 6025116 |
| Plug M12 x 3 | Plug straight/ socket angled | 1 m | Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected | 6026106 |
| | | 2 m | Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected | 6026107 |
| | | 5 m | Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected | 6025118 |

### Extension connection cables

| Connection type | Cable alignment | Remark | Cable length | Part number |
|---|---|---|---|---|
| Plug M12 x 5, socket M12 x 5 | Plug straight/socket straight | Connection cable for M4000 Advanced with M12, 5 pin connector and UE403 | 0.6 m | 6025930 |
| | | | 1 m | 6029280 |
| | | | 1.5 m | 6029281 |
| | | | 2 m | 6025931 |
| | | | 5 m | 6029282 |

### Configuration connection cables

| Connection type | Cable length | Remark | Part number |
|---|---|---|---|
| M8 x 4, SUB-D 9-pol | 2 m | For connecting the configuration connection to the PC | 6021195 |


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### Connection cables for control switches

| Connection type | Cable alignment | Cable length | Part number |
|---|---|---|---|
| Plug M12 x 5 | Straight | 2 m | 6026133 |
| | | 5 m | 6026134 |
| | | 10 m | 6026135 |

### Connectors

| Connection type | Cable alignment | Type | Part number |
|---|---|---|---|
| Socket M12 x 4 | Angled | DOS-1204-W | 6007303 |
| Plug M12 x 4 | Straight | STE-1204-G | 6009932 |

### Muting indicator lamps

| Type of muting indicator | Connection type | Cable length | Remark | Part number |
|---|---|---|---|---|
| Incandescent lamp | Connector | 2 m | Incl. mounting bracket and mounting kit | 2033116 |
| | | 10 m | Incl. mounting bracket | 2033117 |
| LED | | 2 m | Incl. mounting bracket and mounting kit | 2033118 |
| | | 10 m | Incl. mounting bracket | 2033119 |

### Muting accessories, other

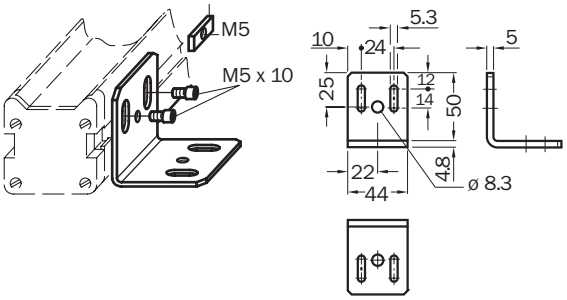
| Type | Part number |
|---|---|
| Protective cap for quick-disconnect socket on UE403 | 6011170 |

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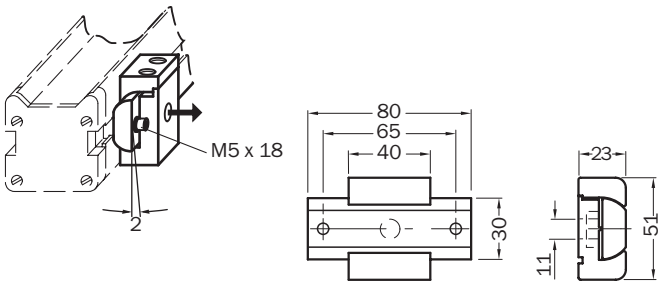

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## Dimensional drawings mounting systems

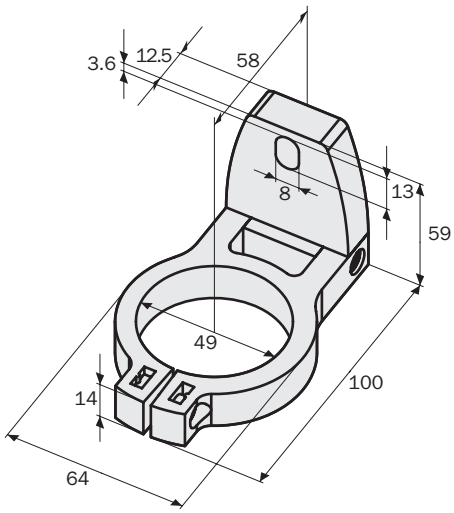
### Mounting kit 1



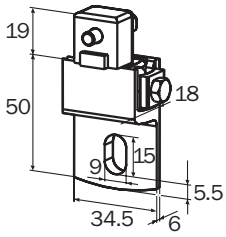

### Mounting kit 2




### Mounting kit 12




### Mounting kit 6




Dimensions in mm


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0.5 m ... 70 m / 4.5 m / 7.5 m |
| **Number of beams (depending on type)** | 2 ... 8 |
| **Beam separation (depending on type)** | 220 mm ... 600 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (IEC 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The M4000 Standard multiple light beam safety device is the solution for one-sided or multi-sided access protection. Efficient perimeter guarding solutions with maximum availability are realised due to the high optical range and comprehensive functions, which are easily configured via configuration buttons.

The integrated functions and status information ensure rapid commissioning and help to minimise machine down time.
The modular concept achieves maximum machine security with economic considerations by harmonising the characteristics of the device precisely to the requirements. Interfaces and service concepts complete the product range to give an ideal industrial solution.

## In-system added value

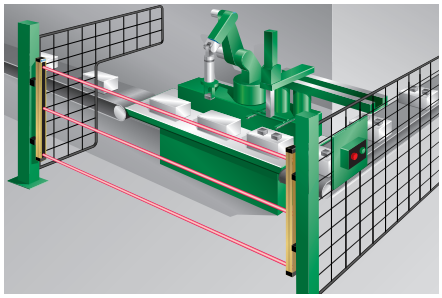
- Combination with safe control solutions by SICK
- Direct integration in AS-Interface Safety at Work bus systems

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

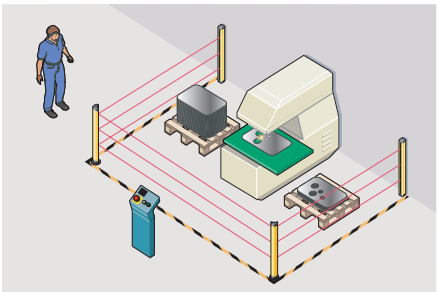
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Machine tool industry
- Material handling
- Packaging industry
- Stone production
- Automotive industry



M4000 Standard on a packing machine



M4000 Standard with mirror columns on a punching machine






- Housing with 3 nut grooves
- Configuration buttons
- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Integrated laser alignment aid (optional)
- End cap with integrated LED (optional)
- Separate reset connection for receiver (optional)

| Further information | Page |
|---|---|
| → Ordering information | F-18 |
| → Technical specifications | F-20 |
| → Dimensional drawings | F-23 |
| → Connection diagrams | F-25 |
| → Accessories | F-26 |
| → Services | A-2 |

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# Ordering information

## M4000 Standard

| | | Sender | | Receiver | |
|---|---|---|---|---|---|
| Number of beams | Beam separation | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025000AR0 | 1200000 | M40E-025000RR0 | 1200017 |
| | 600 mm | M40S-026000AR0 | 1200001 | M40E-026000RR0 | 1200018 |
| 3 | 220 mm | M40S-032200AR0 | 1200002 | M40E-032200RR0 | 1200019 |
| | 400 mm | M40S-034000AR0 | 1200003 | M40E-034000RR0 | 1200020 |
| | 450 mm | M40S-034500AR0 | 1200004 | M40E-034500RR0 | 1200021 |
| 4 | 220 mm | M40S-042200AR0 | 1200005 | M40E-042200RR0 | 1200022 |
| | 300 mm | M40S-043000AR0 | 1200006 | M40E-043000RR0 | 1200023 |
| 5 | 220 mm | M40S-052200AR0 | 1200007 | M40E-052200RR0 | 1200024 |
| 6 | 220 mm | M40S-062200AR0 | 1200008 | M40E-062200RR0 | 1200025 |
| 7 | 220 mm | M40S-072200AR0 | 1200009 | M40E-072200RR0 | 1200026 |
| 8 | 220 mm | M40S-082200AR0 | 1200010 | M40E-082200RR0 | 1200027 |

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## M4000 Standard with integrated alignment aid

| | | Sender | | Receiver | |
|---|---|---|---|---|---|
| Number of beams | Beam separation | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025010AR0 | 1200011 | M40E-025010RR0 | 1200028 |
| | 600 mm | M40S-026010AR0 | 1200012 | M40E-026010RR0 | 1200029 |
| 3 | 400 mm | M40S-034010AR0 | 1200013 | M40E-034010RR0 | 1200030 |
| | 450 mm | M40S-034510AR0 | 1200014 | M40E-034510RR0 | 1200031 |
| 4 | 300 mm | M40S-043010AR0 | 1200015 | M40E-043010RR0 | 1200032 |

## M4000 Standard with end cap with integrated LED

| | | Sender | | Receiver | |
|---|---|---|---|---|---|
| Number of beams | Beam separation | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025000AR0 | 1200000 | M40E-025020RR0 | 1200033 |
| | 600 mm | M40S-026000AR0 | 1200001 | M40E-026020RR0 | 1200034 |
| 3 | 220 mm | M40S-032200AR0 | 1200002 | M40E-032220RR0 | – [1] |
| | 400 mm | M40S-034000AR0 | 1200003 | M40E-034020RR0 | 1200035 |
| | 450 mm | M40S-034500AR0 | 1200004 | M40E-034520RR0 | 1200036 |
| 4 | 220 mm | M40S-042200AR0 | 1200005 | M40E-042220RR0 | – [1] |
| | 300 mm | M40S-043000AR0 | 1200006 | M40E-043020RR0 | 1200037 |
| 5 | 220 mm | M40S-052200AR0 | 1200007 | M40E-052220RR0 | – [1] |
| 6 | 220 mm | M40S-062200AR0 | 1200008 | M40E-062220RR0 | 1200121 |
| 7 | 220 mm | M40S-072200AR0 | 1200009 | M40E-072220RR0 | – [1] |
| 8 | 220 mm | M40S-082200AR0 | 1200010 | M40E-082200RR0 | – [1] |

[1] When ordering first time, please use the expression in column "Type" instead of "Part number"


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## M4000 Standard with integrated alignment aid and end cap with integrated LED

| Number of beams | Beam separation | Sender | | Receiver | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 2 | 500 mm | M40S-025010AR0 | 1200011 | M40E-025030RR0 | 1200038 |
| | 600 mm | M40S-026010AR0 | 1200012 | M40E-026030RR0 | 1200039 |
| 3 | 400 mm | M40S-034010AR0 | 1200013 | M40E-034030RR0 | 1200040 |
| | 450 mm | M40S-034510AR0 | 1200014 | M40E-034530RR0 | 1200041 |
| 4 | 300 mm | M40S-043010AR0 | 1200015 | M40E-043030RR0 | 1200042 |

## M4000 Standard A/P

| Number of beams | Beam separation | Scanning range | System connection | Sender/receiver in one housing | | Deflector unit | |
|---|---|---|---|---|---|---|---|
| | | | | Type | Part number | Type | Part number |
| 2 | 500 mm | 7.5 m | M12 x 8 Plug | M40Z-025000RR0 | 1200120 | PSD01-1501 [1] | 1027906 |
| | | 4.5 m | | M40Z-025000TR0 | 1200122 | PSD01-2501 [2] | 1027907 |
| 4 | 300 mm | 4.5 m | | M40Z-043000TR0 | 1200123 | PSD02-2301 [2] | 1027908 |

[1] With mirror deflection (max. usable scanning range 7.5 m)
[2] With fibre-optic deflection (max. usable scanning range 4.5 m)

## M4000 Standard A/P with end cap with integrated LED

| Number of beams | Beam separation | Scanning range | System connection | Sender/receiver in one housing | | Deflector unit | |
|---|---|---|---|---|---|---|---|
| | | | | Type | Part number | Type | Part number |
| 2 | 500 mm | 7.5 m | M12 x 8 Plug | M40Z-025020RR0 | 1200124 | PSD01-1501 [1] | 1027906 |
| | | 4.5 m | | M40Z-025020TR0 | 1200129 | PSD01-2501 [2] | 1027907 |
| 4 | 300 mm | 4.5 m | | M40Z-043020TR0 | 1200130 | PSD02-2301 [2] | 1027908 |

[1] With mirror deflection (max. usable scanning range 7.5 m)
[2] With fibre-optic deflection (max. usable scanning range 4.5 m)

## Options

| Description |
|---|
| Integrated Interface AS-interface Safety at Work [1] |
| Separate Connection Reset M12 x 5 [1] |

[1] Options cannot be combined. Type and part number are available upon request or via the product finder at www.sickusa.com/products

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# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## M4000 Standard

### General data

| | Sender | Receiver |
|---|---|---|
| **Number of beams (depending on type)** | 2 ... 8 | |
| **Beam separation (depending on type)** | 220 mm ... 600 mm | |
| **Scanning range** | | |
| | – | 0.5 m ... 20 m |
| | – | 15 m ... 70 m |
| **Configurable** | – | ✔ |
| **Response time (depending on type)** | – | Max. 11 ms |
| **Protection class** | III (EN 50178:1998) | |
| **Enclosure rating** | IP 65 (EN 60529) | |
| **Synchronisation** | Optical, without separate synchronisation | |
| **Type** | Type 4 (IEC 61496), SIL3 (IEC 61508) | |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C | |
| **Storage temperature from ... to** | –25 °C ... +70 °C | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | |
| **Housing cross section** | 52 mm x 55.5 mm | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC60068-2-6) | |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) | |
| **Housing material** | Aluminium alloy ALMGSI 0.5 | |
| **Front screen material** | Polycarbonate, scratch-resistant coating | |

### Functional data

| | Sender | Receiver |
|---|---|---|
| **Restart interlock** | – | ✔ |
| **Restart interlock (delivery status)** | – | Activated |
| **External device monitoring** | – | ✔ |
| **External device monitoring (delivery status)** | – | Activated |
| **Beam coding** | ✔ | |
| **Beam coding (delivery status)** | Non-coded | |
| **Configuration buttons** | ✔ | |
| **Configurable application diagnostic output** | – | ✔ |
| **Application diagnostic output (delivery status)** | – | Contamination (OWS) |
| **Sender test** | ✔ | – |
| **Sender test (delivery status)** | Deactivated | – |
| **Configurable scanning range** | – | ✔ |
| **Scanning range (delivery status)** | – | 20 m |
| **Integrated laser alignment aid (optional)** | ✔ | |
| **End cap with integrated LED (optional)** | – | ✔ |

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### Electrical data

| | Sender | Receiver |
|---|---|---|
| **Connection type** | | |
| **System connection** | M12 x 8 Plug | |
| **Cable length** | 15 m [1] | |
| **Wire cross-section** | 0.25 mm² | |
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC) [2] | |
| **Ripple** | ±10 % | |
| **Power consumption** | Max. 0.2 A | Max. 0.6 A |
| **Display elements** | LED/7-segment | |
| **Safety outputs (OSSD)** | | |
| **Type of output (depending on type)** | – | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored [3] |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 2.25 V ... $V_S$) |
| **Switching voltage LOW** | – | 0 V DC (0 V DC ... 3.5 V DC) |
| **Switching current** | – | 0 mA ... 500 mA |
| **Application diagnostic output** | | PNP semiconductor, short-circuit protected |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 4.2 V ... $V_S$) |
| **Switching voltage LOW** | – | High resistance |
| **Switching current** | – | 0 mA ... 100 mA |
| **Integrated laser alignment aid** | | ≤ 1 mW |
| **Wave length** | – | 630 nm ... 680 nm |
| **Laser class** | – | 2 (IEC 60825-1:2001) |

[1] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

[2] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

[3] Applies to a voltage range between –30 V and +30 V.

## M4000 Standard A/P

### General data

| | Sender/receiver in one housing | Deflector unit |
|---|---|---|
| **Number of beams (depending on type)** | 2 / 4 | |
| **Beam separation (depending on type)** | 500 mm / 300 mm | |
| **Scanning range** | | |
| **(depending on type)** | 0.5 m ... 7.5 m / 0.5 m ... 4.5 m | 7.5 m / 4.5 m |
| **Configurable** | ✔ | – |
| **Response time** | Max. 10 ms | – |
| **Protection class** | III (EN 50178:1998) | – |
| **Enclosure rating** | IP 65 (EN 60529) | – |
| **Synchronisation** | Optical, without separate synchronisation | – |
| **Type** | Type 4 (IEC 61496) | – |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C | – |
| **Storage temperature from ... to** | –25 °C ... +70 °C | – |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | – |
| **Housing cross section** | 52 mm x 55.5 mm | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC60068-2-6) | – |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) | – |
| **Housing material** | Aluminium alloy ALMGSI 0.5 | – |
| **Front screen material** | Polycarbonate, scratch-resistant coating | – |

Continued on next page




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## Functional data

| | Sender/receiver in one housing | Deflector unit |
|---|---|---|
| **Restart interlock** | ✔ | – |
| **Restart interlock (delivery status)** | Internal | – |
| **External device monitoring** | ✔ | – |
| **External device monitoring (delivery status)** | Activated | – |
| **Beam coding** | ✔ | – |
| **Beam coding (delivery status)** | Non-coded | – |
| **Configuration buttons** | ✔ | – |
| **Configurable application diagnostic output** | ✔ | – |
| **Application diagnostic output (delivery status)** | Contamination (OWS) | – |
| **Configurable scanning range** | ✔ | – |
| **Scanning range (delivery status) (depending on type)** | 7.5 m / 4.5 m | – |
| **End cap with integrated LED (optional)** | ✔ | – |

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## Electrical data

| | Sender/receiver in one housing | Deflector unit |
|---|---|---|
| **Connection type** | | |
| **System connection** | M12 x 8 Plug | – |
| **Cable length** | 15 m [1] | – |
| **Wire cross-section** | 0.25 mm² | – |
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC) [2] | – |
| **Ripple** | ±10 % | – |
| **Power consumption** | Max. 0.6 A | – |
| **Display elements** | LED/7-segment | – |
| **Safety outputs (OSSD)** | | |
| **Type of output** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored [3] | – |
| **Switching voltage HIGH** | 24 V DC ($V_S$ – 2.25 V ... $V_S$) | – |
| **Switching voltage LOW** | 0 V DC (0 V DC ... 3.5 V DC) | – |
| **Switching current** | 0 mA ... 500 mA | – |
| **Application diagnostic output** | PNP semiconductor, short-circuit protected | – |
| **Switching voltage HIGH** | 24 V DC ($V_S$ – 4.2 V ... $V_S$) | – |
| **Switching voltage LOW** | High resistance | – |
| **Switching current** | 0 mA ... 100 mA | – |

[1] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

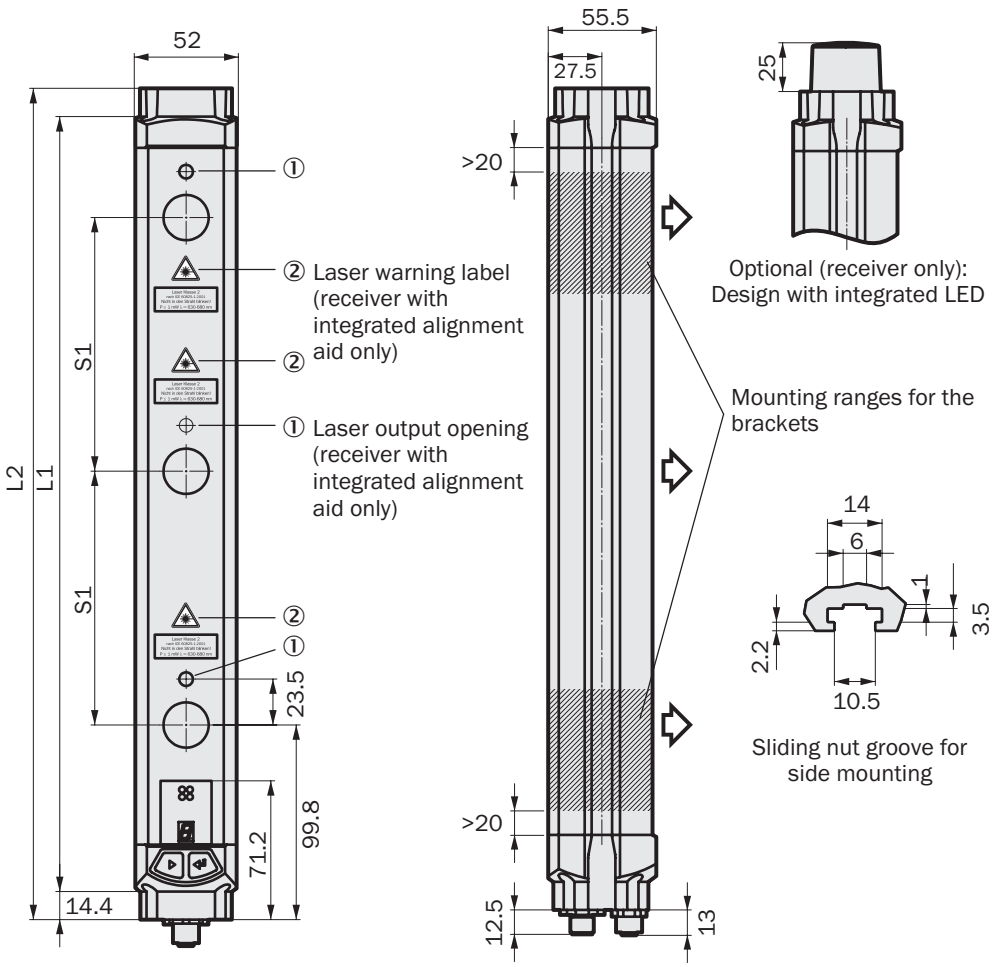
[2] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

[3] Applies to a voltage range between –30 V and +30 V.

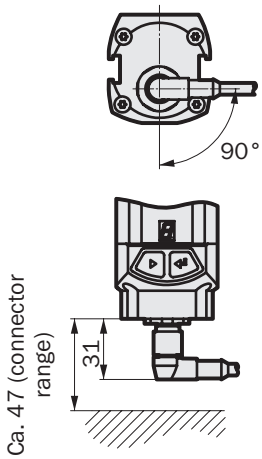

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# Dimensional drawings

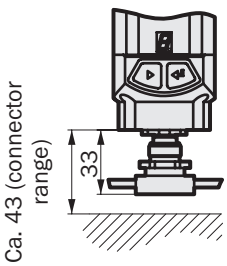
## M4000 Standard



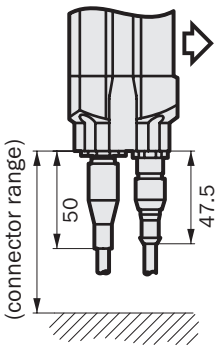

Dimensions in mm




Cable socket M12 angled (only with AS-Interface: aligned)




AS-Interface clip M12 (aligned)




Cable socket M12 with cable (left) and cable plug M12 with cable (right, optional, only on receiver)

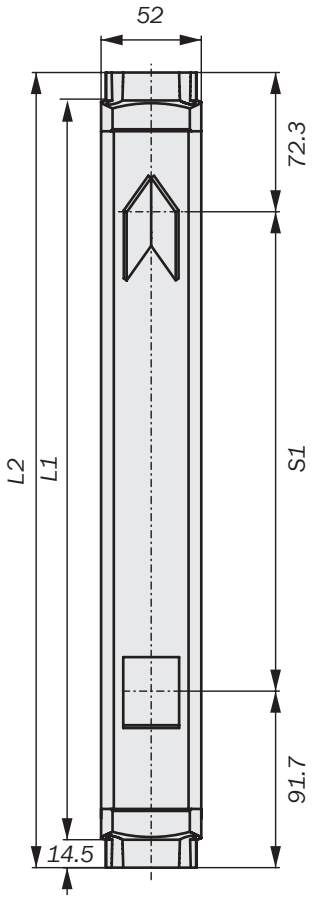
Table with dimensions see next page


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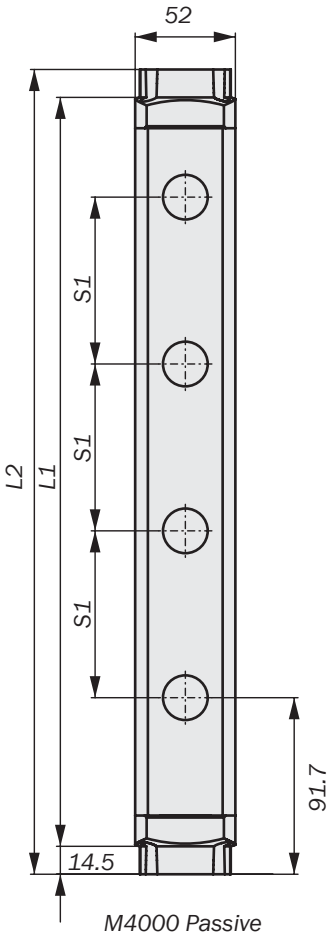
| Number of beams | Beam separation S1 | Dimension L1 | Dimension L2 |
|---|---|---|---|
| 2 | 500 | 643 | 672 |
| 2 | 600 | 743 | 772 |
| 3 | 220 | 583 | 612 |
| 3 | 400 | 943 | 972 |
| 3 | 450 | 1043 | 1072 |
| 4 | 220 | 803 | 832 |
| 4 | 300 | 1043 | 1072 |
| 5 | 220 | 1023 | 1052 |
| 6 | 220 | 1243 | 1272 |
| 7 | 220 | 1462 | 1491 |
| 2 | 500 | 643 | 672 |

## M4000 deflector units

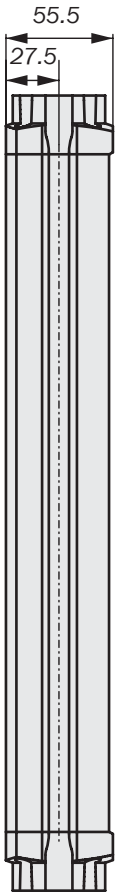
F

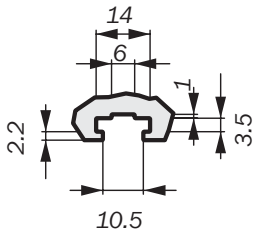



*M4000 Passive (mirror deflection)*




*M4000 Passive (fibre-optic deflection)*




*Sliding nut groove for side mounting*

Dimensions in mm

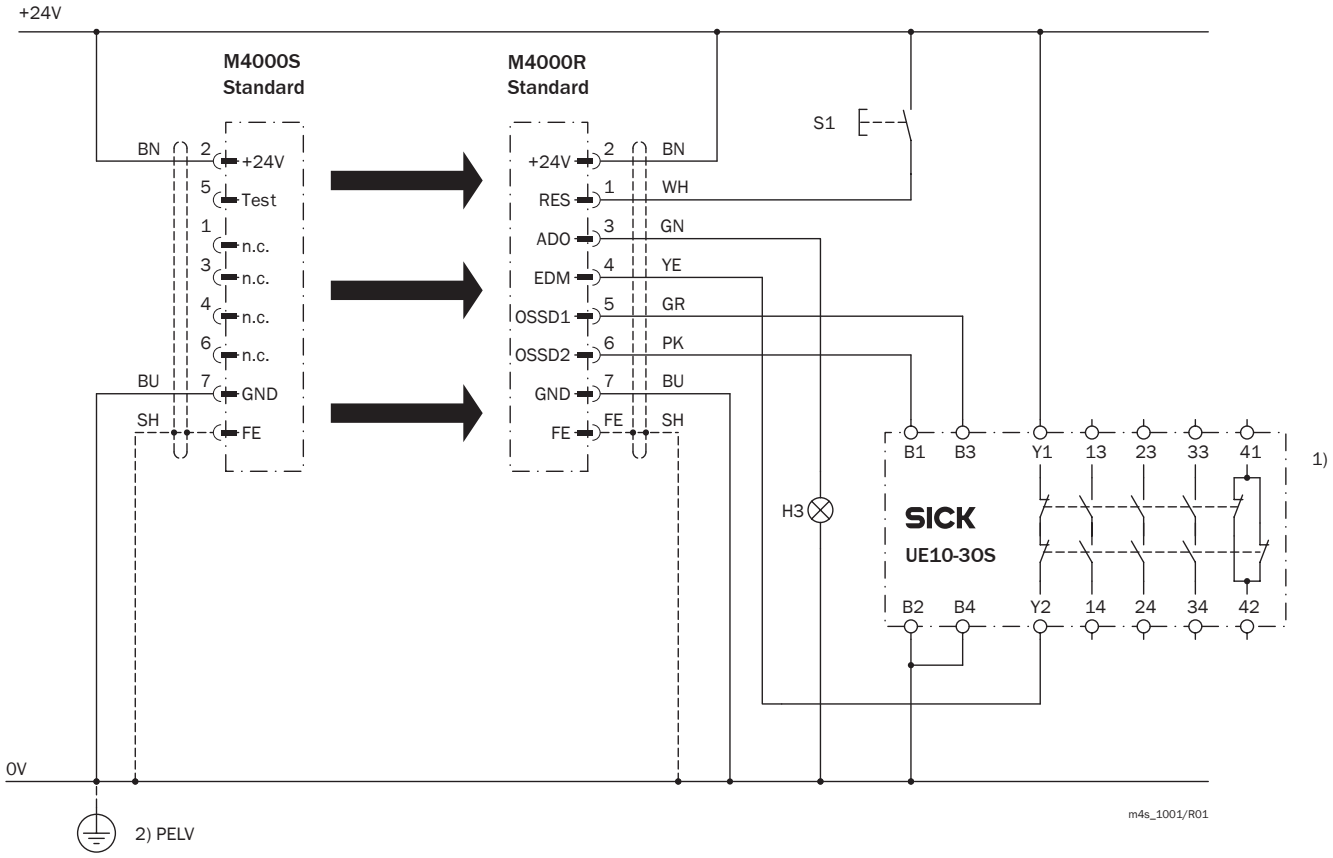
| Number of beams | Beam separation S1 | Dimension L1 | Dimension L2 |
|---|---|---|---|
| 2 | 500 | 643 | 672 |
| 4 | 300 | 1043 | 1072 |


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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M4000 Standard connected to UE10-3OS safety relay




**Task**

Connection of an M4000 Standard multiple light beam safety device to a UE10-3OS safety relay.

Operating mode: with restart interlock and external device monitoring.

**Operating characteristics**

When the light path is clear and the UE10-3OS is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-3OS is switched on. On interruption of one or several of the light beams, the UE10-3OS is de-energised by the OSSD1 and OSSD2 outputs.

**Fault analysis**

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-3OS will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.

**Comments**

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

→ Dimensional drawings for mounting systems, see page F-28

| Type | Property | Packing unit | Part number |
|---|---|---|---|
| Mounting kit 1 | Rigid | 4 | 7021352 |
| Mounting kit 2 | Adjustable | 4 | 2017751 |
| Mounting kit 6 | Swivel function, side bracket | 4 | 2019506 |
| Mounting kit 12 | Swivel Mount | 4 | 2030510 |

### Sliding nuts/sliding blocks

| Type | Remark | Packing unit | Part number |
|---|---|---|---|
| Sliding block (sliding nuts) | Included with delivery | 4 | 2017550 |

### Connection cable

| Connection type | Remark | Cable alignment | Cable length | Part number |
|---|---|---|---|---|
| Socket M12 x 7 + FE | Suitable for M4000 Standard | Straight | 2.5 m | 6020537 |
| | | | 5 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10 m | 6020352 |
| | | | 15 m | 6020872 |
| Plug M12 x 5 | Suitable for M4000 Standard with additional reset connection | Straight | 2 m | 6026133 |
| | | | 5 m | 6026134 |
| | | | 10 m | 6026135 |


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### Connectors

| Connection type | Cable alignment | Type | Part number |
|---|---|---|---|
| Socket M12 x 8 | Straight | DOS-1208-G | 6028422 |
| Plug M12 x 5 | Straight | STE-1205-G | 6022083 |

### Mirror columns and device columns

➜ Suitable mirror columns and device columns can be found beginning on page F-82

### Additional front screens

| Suitable for | Packing unit | Remark | Part number |
|---|---|---|---|
| M40x-0250xxxxx | 2 | Including sliding blocks and mounting screws | 2033225 |
| M40x-0260xxxxx | | | 2033226 |
| M40x-0322xxxxx | | | 2033227 |
| M40x-0340xxxxx | | | 2033228 |
| M40x-0345xxxxx | | | 2033229 |
| M40x-0422xxxxx | | | 2033230 |
| M40x-0522xxxxx | | | 2033231 |
| M40x-0622xxxxx | | | 2033232 |
| M40x-0722xxxxx | | | 2033233 |
| M40x-0822xxxxx | | | 2033234 |

### Deflector mirrors

| Type | Remark | Part number |
|---|---|---|
| PNS75-008 | Including mounting adapter (two pieces swivel mount) | 1026647 |
| PSK45 | For 90° deflection, incl. mounting set, not suitable for column mounting | 5306053 |

### AS-Interface module lower part

| Type | Part number |
|---|---|
| ASI-M12 | 6022472 |

### Laser alignment aid

| Type | Scanning range | Type of light | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | Max. 60 m | Red light | 1015741 |
| AR60 adapter for M4000 | – | – | 4040006 |

### Power supply units

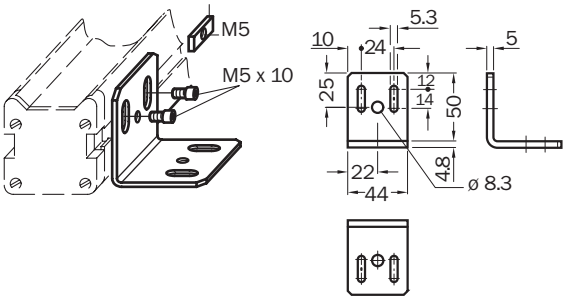
| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC ... 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

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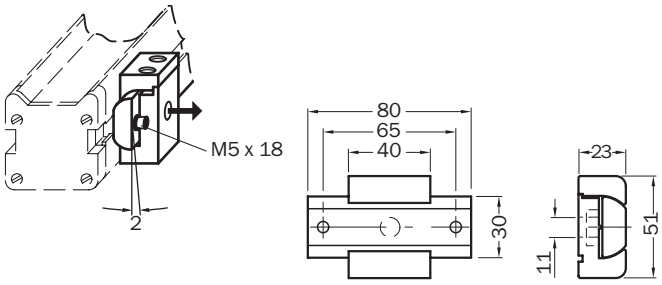

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## Dimensional drawings mounting systems

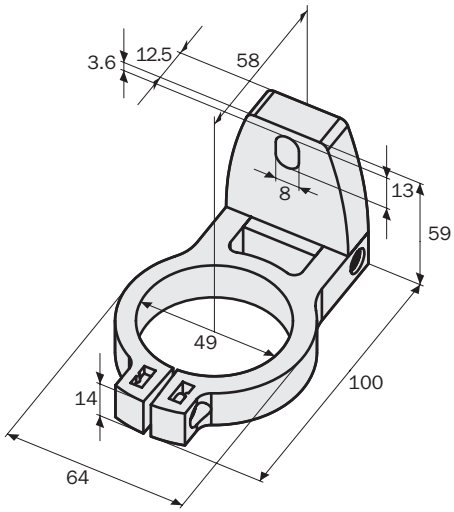
### Mounting kit 1



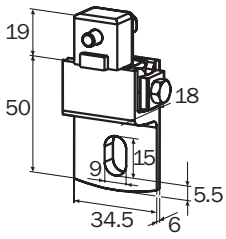

### Mounting kit 2




### Mounting kit 12




### Mounting kit 6




Dimensions in mm


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0.5 m ... 19 m / 0.5 m ... 70 m |
| **Length of the monitored area (depending on type)** | 300 mm ... 1800 mm |
| **Resolution (depending on type)** | 60 mm / 80 mm |
| **Type** | Type 4 (IEC 61496), SIL3 (IEC 61508) |
| **Enclosure rating** | IP 65 |

## Product description

The M4000 Area multiple light beam safety device is the efficient solution for area protection or for preventing employees from standing behind the point-of-operation. Area protection can be achieved with maximum availability, due to its long range and integrated functions, easily configured by PC via the RS-232 interface.
The integrated functions, and status and diagnostic information, permit rapid commissioning and prevent unnecessary machine downtimes.

## In-system added value

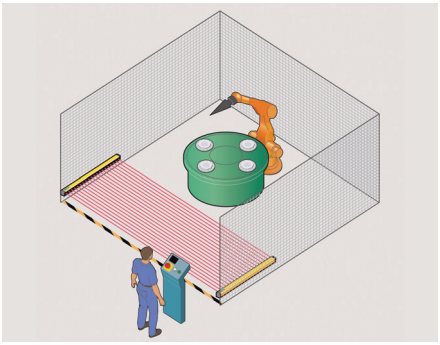
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

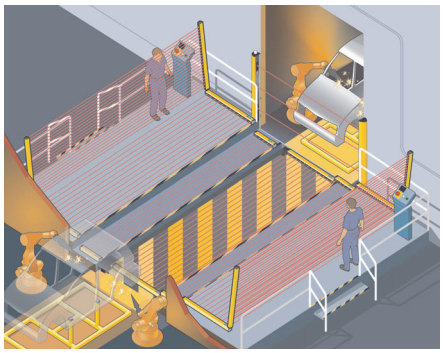
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

Provides area protection or point-of-operation guarding of a hazardous point e.g. on robots, machining centres in mechanical engineering applications or on paper roll machines.



Hazardous area protection with M4000 Area on a robot



Point-of-operation guarding with M4000 Area at an output conveyor in the automobile industry






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- 60 or 80 mm resolution
- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Configuration and diagnosis via PC
- SDL interface

| Further information | Page |
|---|---|
| → Ordering information | F-30 |
| → Technical specifications | F-31 |
| → Dimensional drawings | F-33 |
| → Connection diagrams | F-34 |
| → Accessories | F-35 |
| → Services | A-2 |



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# Ordering information

## M4000 Area

| Resolution | Length of the monitored area | Sender | | Receiver | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 60 mm | 300 mm | M40S-60A005AA0 | 1200915 | M40E-60A005RA0 | 1200916 |
| | 450 mm | M40S-61A005AA0 | 1200138 | M40E-61A005RA0 | 1200137 |
| | 600 mm | M40S-60A005AA0 | 1201067 | M40E-62A005RA0 | 1201068 |
| | 750 mm | M40S-63A005AA0 | 1200674 | M40E-63A005RA0 | 1200914 |
| | 900 mm | M40S-64A005AA0 | 1200506 | M40E-64A005RA0 | 1200508 |
| | 1050 mm | M40S-65A005AA0 | 1200507 | M40E-65A005RA0 | 1200509 |
| | 1200 mm | M40S-66A005AA0 | 1200805 | M40E-66A005RA0 | 1200806 |
| | 1350 mm | M40S-67A005AA0 | 1200837 | M40E-67A005RA0 | 1200838 |
| | 1500 mm | M40S-68A005AA0 | 1200850 | M40E-68A005RA0 | 1200849 |
| | 1650 mm | M40S-60A005AA0 | 1200912 | M40E-69A005RA0 | 1200913 |
| | 1800 mm | M40S-70A005AA0 | 1200147 | M40E-70A005RA0 | 1200146 |
| 80 mm | 600 mm | M40S-62A105AA0 | 1200139 | M40E-62A105RA0 | 1200140 |
| | 750 mm | M40S-63A105AA0 | 1200134 | M40E-63A105RA0 | 1200685 |
| | 900 mm | M40S-64A105AA0 | 1201655 | M40E-64A105RA0 | 1201656 |
| | 1050 mm | M40S-65A105AA0 | 1200586 | M40E-65A105RA0 | 1200587 |
| | 1200 mm | M40S-66A105AA0 | 1201046 | M40E-66A105RA0 | 1201045 |
| | 1350 mm | M40S-67A105AA0 | 1200604 | M40E-67A105RA0 | 1200605 |
| | 1500 mm | M40S-68A105AA0 | 1200588 | M40E-68A105RA0 | 1200589 |
| | 1650 mm | M40S-69A105AA0 | 1200686 | M40E-69A105RA0 | 1200687 |
| | 1800 mm | M40S-70A105AA0 | 1200149 | M40E-70A105RA0 | 1200148 |




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# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | Sender | Receiver |
|---|---|---|
| **Resolution (depending on type)** | 60 mm / 80 mm | |
| **Length of the monitored area (depending on type)** | 300 mm ... 1800 mm | |
| **Scanning range** | | |
| **for resolution 60 mm** | – | 0.5 m ... 6 m / 5 m ... 19 m |
| **for resolution 80 mm** | – | 0.5 m ... 20 m / 15 m ... 70 m |
| **Configurable** | – | ✔ |
| **Response time** | – | Max. 17 ms |
| **Protection class** | III (EN 50178:1998) | |
| **Enclosure rating** | IP 65 (EN 60529) | |
| **Synchronisation** | Optical, without separate synchronisation | |
| **Type** | Type 4 (IEC 61496), SIL3 (IEC 61508) | |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C | |
| **Storage temperature from ... to** | –25 °C ... +70 °C | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | |
| **Housing cross section** | 52 mm x 55.5 mm | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC60068-2-6) | |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) | |
| **Housing material** | Aluminium alloy ALMGSI 0.5 | |
| **Front screen material** | Polycarbonate, scratch-resistant coating | |

## Functional data

| | Sender | Receiver |
|---|---|---|
| **Safe integration to bus system** | ✔ | |
| **Restart interlock** | – | ✔ |
| **Restart interlock (delivery status)** | – | Internal |
| **External device monitoring** | – | ✔ |
| **External device monitoring (delivery status)** | – | Activated |
| **Beam coding** | ✔ | |
| **Beam coding (delivery status)** | Non-coded | |
| **Configurable application diagnostic output** | – | ✔ |
| **Application diagnostic output (delivery status)** | – | Contamination (OWS) |
| **Sender test** | ✔ | – |
| **Sender test (delivery status)** | Deactivated | – |
| **Configurable scanning range** | – | ✔ |
| **Scanning range (delivery status) (depending on type)** | – | 6 m / 20 m |
| **SDL interface** | ✔ | |
| **CDS configuration via RS-232 interface** | ✔ | |

Continued on next page

F


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## Electrical data

| | Sender | Receiver |
|---|---|---|
| **Connection type** | | |
| **System connection** | M26 x 11 + FE Hirschmann plug | |
| **Cable length** | 50 m [1] | |
| **Wire cross-section** | 0.75 mm² | |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) [2] | |
| **Ripple** | ±10 % | |
| **Power consumption** | Max. 0.2 A | Max. 0.6 A |
| **Display elements** | LED/7-segment | |
| **Safety outputs (OSSD)** | | |
| **Type of output** | – | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored [3] |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 2.25 V ... $V_S$) |
| **Switching voltage LOW** | – | 0 V DC (0 V DC ... 3.5 V DC) |
| **Switching current** | – | 0 mA ... 500 mA |
| **Application diagnostic output** | | PNP semiconductor, short-circuit protected |
| **Switching voltage HIGH** | – | 24 V DC ($V_S$ – 4.2 V ... $V_S$) |
| **Switching voltage LOW** | – | High resistance |
| **Switching current** | – | 0 mA ... 100 mA |

[1] Depending on load, power supply and wire cross-section. The technical specifications must be observed.

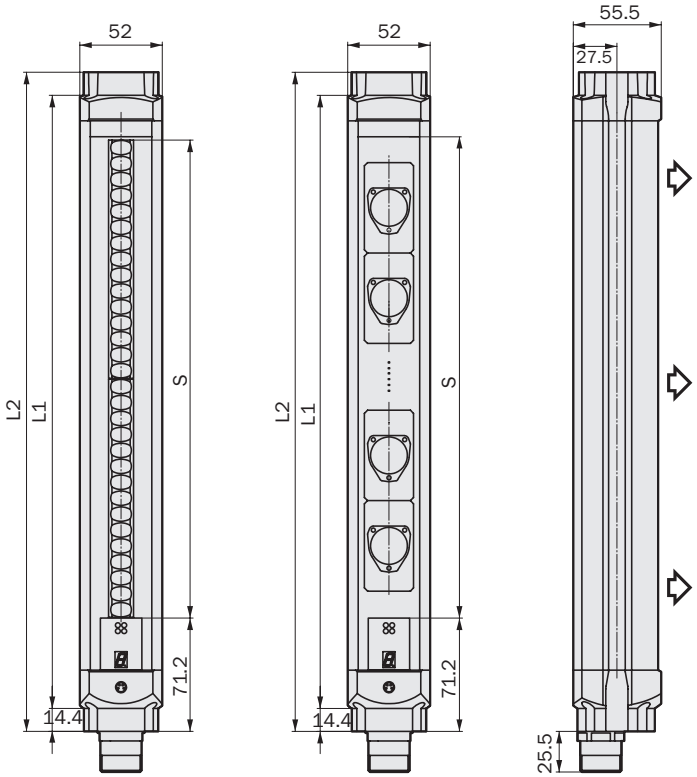
[2] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

[3] Applies to a voltage range between –30 V and +30 V.

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# Dimensional drawings

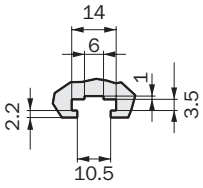



M4000 Area 60

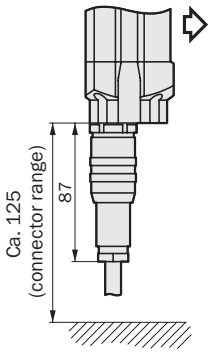



M4000 Area 80




Sliding nut groove for side mounting




Cable socket M26 with crimp contacts (for DIN 43 651)

Dimensions in mm

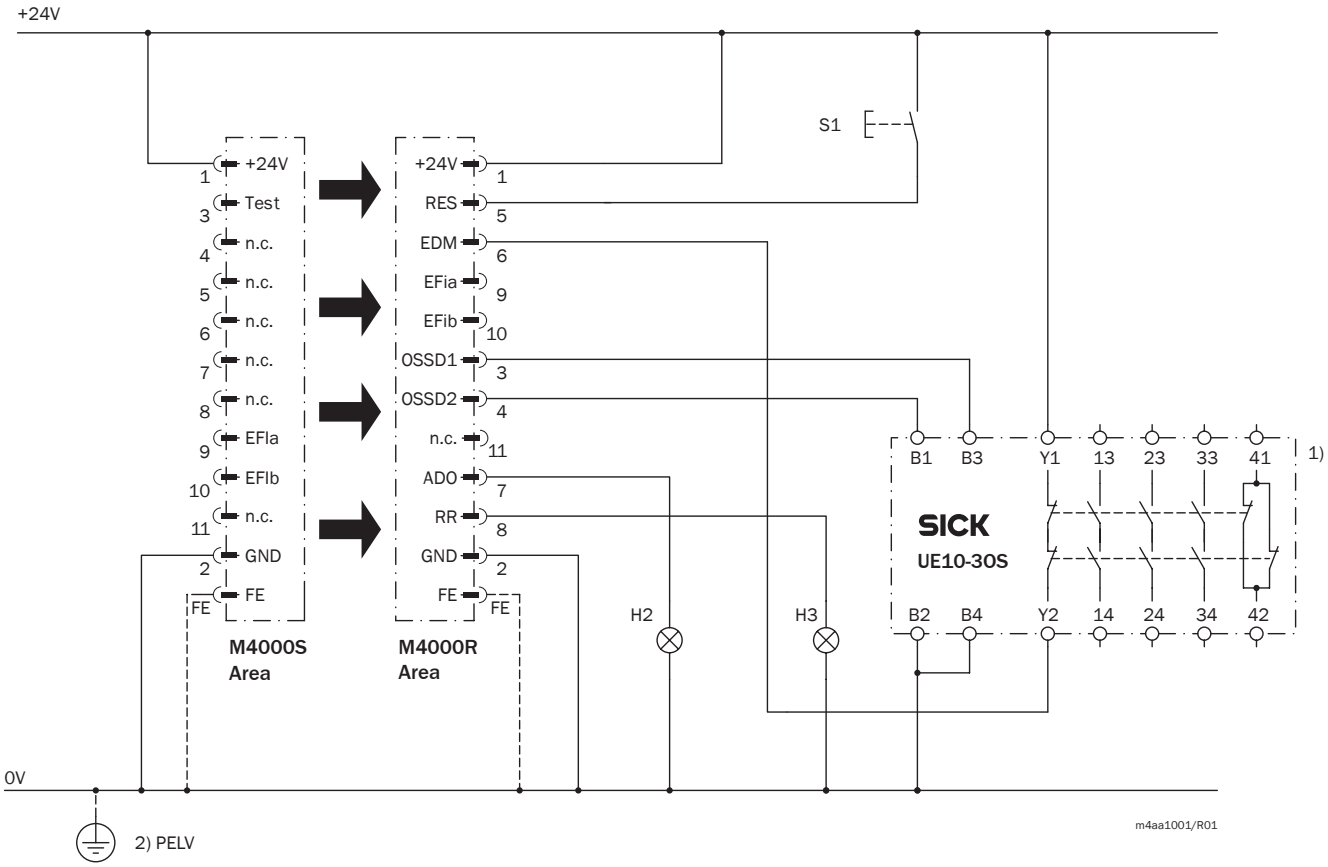
| Length of the monitored area S | Dimension L1 | Dimension L2 |
|---|---|---|
| 300 | 387 | 416 |
| 450 | 537 | 566 |
| 600 | 687 | 716 |
| 750 | 837 | 866 |
| 900 | 987 | 1016 |
| 1050 | 1137 | 1166 |
| 1200 | 1287 | 1316 |
| 1350 | 1437 | 1466 |
| 1500 | 1587 | 1616 |
| 1650 | 1737 | 1766 |
| 1800 | 1887 | 1916 |


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# Connection diagrams

→ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M4000 Area connected to UE10-3OS safety relay




**Task**

Connection of an M4000 Area multiple light beam safety device to a UE10-3OS safety relay.

Operating mode: with restart interlock and external device monitoring.

**Operating characteristics**

When the light path is clear and the UE10-3OS is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-3OS is switched on. On interruption of one or several of the light beams, the UE10-3OS is de-energised by the OSSD1 and OSSD2 outputs.

If the optics are dirty, indicator H2 illuminates.

**Fault analysis**

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-3OS will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.

**Comments**

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices. This applies particularly on the use of configurable functions.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

➜ Dimensional drawings for mounting systems, see page F-37

| Type | Property | Packing unit | Part number |
|---|---|---|---|
| Mounting kit 1 | Rigid | 4 | 7021352 |
| Mounting kit 2 | Adjustable | 4 | 2017751 |
| Mounting kit 6 | Swivel function, side bracket | 4 | 2019506 |
| Mounting kit 12 | Swivel Mount | 4 | 2030510 |

### Sliding nuts/sliding blocks

| Type | Remark | Packing unit | Part number |
|---|---|---|---|
| Sliding block (sliding nuts) | Included with delivery | 4 | 2017550 |

### Cable receptacles

| Connection type | Cable alignment | Part number |
|---|---|---|
| Hirschmann cable socket M26 x 11 + FE | Straight | 6020757 |
| | Angled | 6020758 |

### Connection cables

| Connection type | Cable alignment | Cable length | Part number |
|---|---|---|---|
| Hirschmann cable socket M26 x 11 + FE | Straight | 2.5 m | 2022544 |
| | | 5 m | 2022545 |
| | | 7.5 m | 2022546 |
| | | 10 m | 2022547 |
| | | 15 m | 2022548 |
| | | 20 m | 2022549 |
| | | 30 m | 2022550 |

Continued on next page


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### Device columns

→ Suitable device columns can be found beginning on page F-82

### Additional front screens

| Suitable for | Packing unit | Remark | Part number |
|---|---|---|---|
| M40x-0250xxxxx | 2 | Including sliding blocks and mounting screws | 2033225 |
| M40x-0260xxxxx | | | 2033226 |
| M40x-0322xxxxx | | | 2033227 |
| M40x-0340xxxxx | | | 2033228 |
| M40x-0345xxxxx | | | 2033229 |
| M40x-0422xxxxx | | | 2033230 |
| M40x-0522xxxxx | | | 2033231 |
| M40x-0622xxxxx | | | 2033232 |
| M40x-0722xxxxx | | | 2033233 |
| M40x-0822xxxxx | | | 2033234 |

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### Laser alignment aid

| Type | Type of light | Scanning range | Part number |
|---|---|---|---|
| Laser alignment aid AR60 | Red light | Max. 60 m | 1015741 |
| AR60 adapter for M4000 | – | – | 4040006 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Configuration Tools

| Type | Remark | Part number |
|---|---|---|
| Clone Plug for C4000 and M4000 | For C4000 Standard / Advanced / Palletizer / Entry/ Exit and M4000 Advanced | 1029665 |
| Wall mount | Packing unit: 1 | 5318443 |
| Protective cap | For Clone Plug / Host Guest Plug | 5318293 |

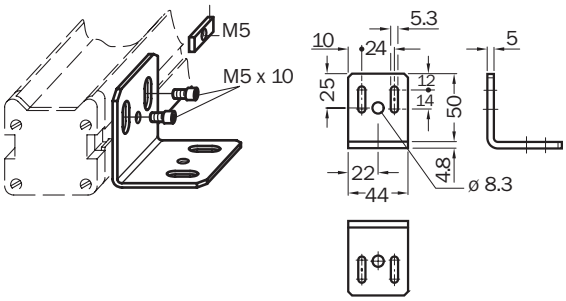
### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC ... 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

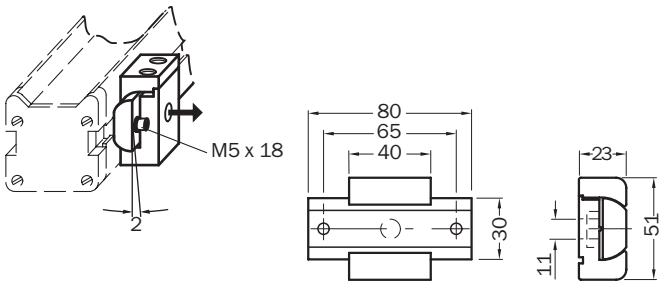

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## Dimensional drawings mounting systems

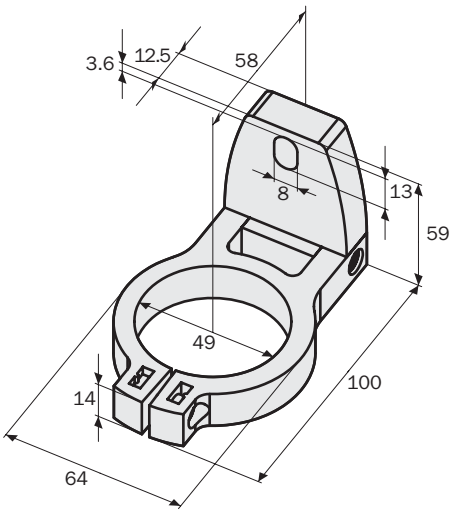
### Mounting kit 1



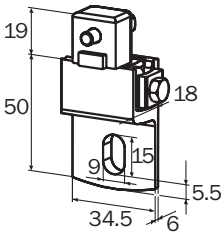

### Mounting kit 2




### Mounting kit 12




### Mounting kit 6




Dimensions in mm

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- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding

F

| Further information | Page |
|---|---|
| → Technical specifications | F-40 |
| → Dimensional drawings | F-41 |
| → Connection diagram | F-42 |
| → Accessories | F-43 |
| → Dimensional drawings accessories | F-45 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 25 m / 0 m ... 70 m |
| **Number of beams (depending on type)** | 2 ... 9 |
| **Beam separation or resolution (depending on type)** | 116 mm / 170 mm / 300 mm / 400 mm / 500 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

With its high signal reserve, the M2000 Standard multi-beam safety device is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considera-tions by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

## In-system added value

- Combination with safe control solutions from SICK

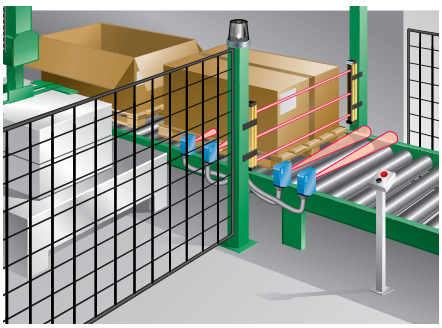
| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

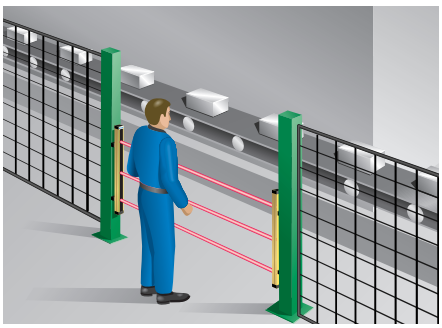
## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: M2000 Standard with LE20 on a packaging machine



Storage and conveyor technology: M2000 on a conveyor belt system

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# Ordering information

M2000 Standard
- With external device monitoring [1] (EDM)
- Consisting of sender and receiver unit

→ Accessories, see page F-43

## Scanning range 0 ... 25 m

| Number of beams | Beam separation / Resolution (mm) | Connection plug | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 2 | 500 | Hirschmann 6-pin + PE | M20S-02150A120 | 1016405 | M20E-02150A120 | 1016421 |
| | | M12, 8-pin | M20S-02150A122 | 1018186 | M20E-02150A122 | 1018187 |
| 3 | 400 | Hirschmann 6-pin + PE | M20S-03140A120 | 1016428 | M20E-03140A120 | 1016429 |
| | | M12, 8-pin | M20S-03140A122 | 1018188 | M20E-03140A122 | 1018189 |
| 4 | 300 | Hirschmann 6-pin + PE | M20S-04130A120 | 1016509 | M20E-04130A120 | 1016510 |
| | | M12, 8-pin | M20S-04130A122 | 1018190 | M20E-04130A122 | 1018191 |
| 6 | 170 | Hirschmann 6-pin + PE | M20S-061A3A120 | 1016446 | M20E-061A3A120 | 1016447 |
| | | M12, 8-pin | M20S-061A3A122 | 1018192 | M20E-061A3A122 | 1018193 |
| 7 | 170 | Hirschmann 6-pin + PE | M20S-071A3A120 | 1016434 | M20E-071A3A120 | 1016435 |
| | | M12, 8-pin | M20S-071A3A122 | 1018194 | M20E-071A3A122 | 1018195 |
| 8 | 116 | Hirschmann 6-pin + PE | M20S-081A2A120 | 1016438 | M20E-081A2A120 | 1016439 |
| | | M12, 8-pin | M20S-081A2A122 | 1018196 | M20E-081A2A122 | 1018197 |
| | 170 | Hirschmann 6-pin + PE | M20S-081A3A120 | 1016440 | M20E-081A3A120 | 1016441 |
| | | M12, 8-pin | M20S-081A3A122 | 1018198 | M20E-081A3A122 | 1018199 |
| 9 | 170 | Hirschmann 6-pin + PE | M20S-091A3A120 | 1016442 | M20E-091A3A120 | 1016443 |
| | | M12, 8-pin | M20S-091A3A122 | 1018200 | M20E-091A3A122 | 1018201 |

## Scanning range 0 ... 70 m

| Number of beams | Beam separation (mm) | Connection plug | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 2 | 500 | Hirschmann 6-pin + PE | M20S-02250A120 | 1018172 | M20E-02250A120 | 1018173 |
| | | M12, 8-pin | M20S-02250A122 | 1018174 | M20E-02250A122 | 1018175 |
| 3 | 400 | Hirschmann 6-pin + PE | M20S-03240A120 | 1018176 | M20E-03240A120 | 1018177 |
| | | M12, 8-pin | M20S-03240A122 | 1018178 | M20E-03240A122 | 1018179 |
| 4 | 300 | Hirschmann 6-pin + PE | M20S-04230A120 | 1018180 | M20E-04230A120 | 1018181 |
| | | M12, 8-pin | M20S-04230A122 | 1018182 | M20E-04230A122 | 1018183 |

[1] External device monitoring only available with devices with M12 plug!

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# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 25 m / 0 m ... 70 m |
| **Number of beams (depending on type)** | 2 ... 9 |
| **Beam separation or resolution (depending on type)** | 116 mm / 170 mm / 300 mm / 400 mm / 500 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

## Sender unit

| | |
|---|---|
| **Power consumption** | Max. 3.7 W |

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## Receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors (short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 8 ms |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 5 W |

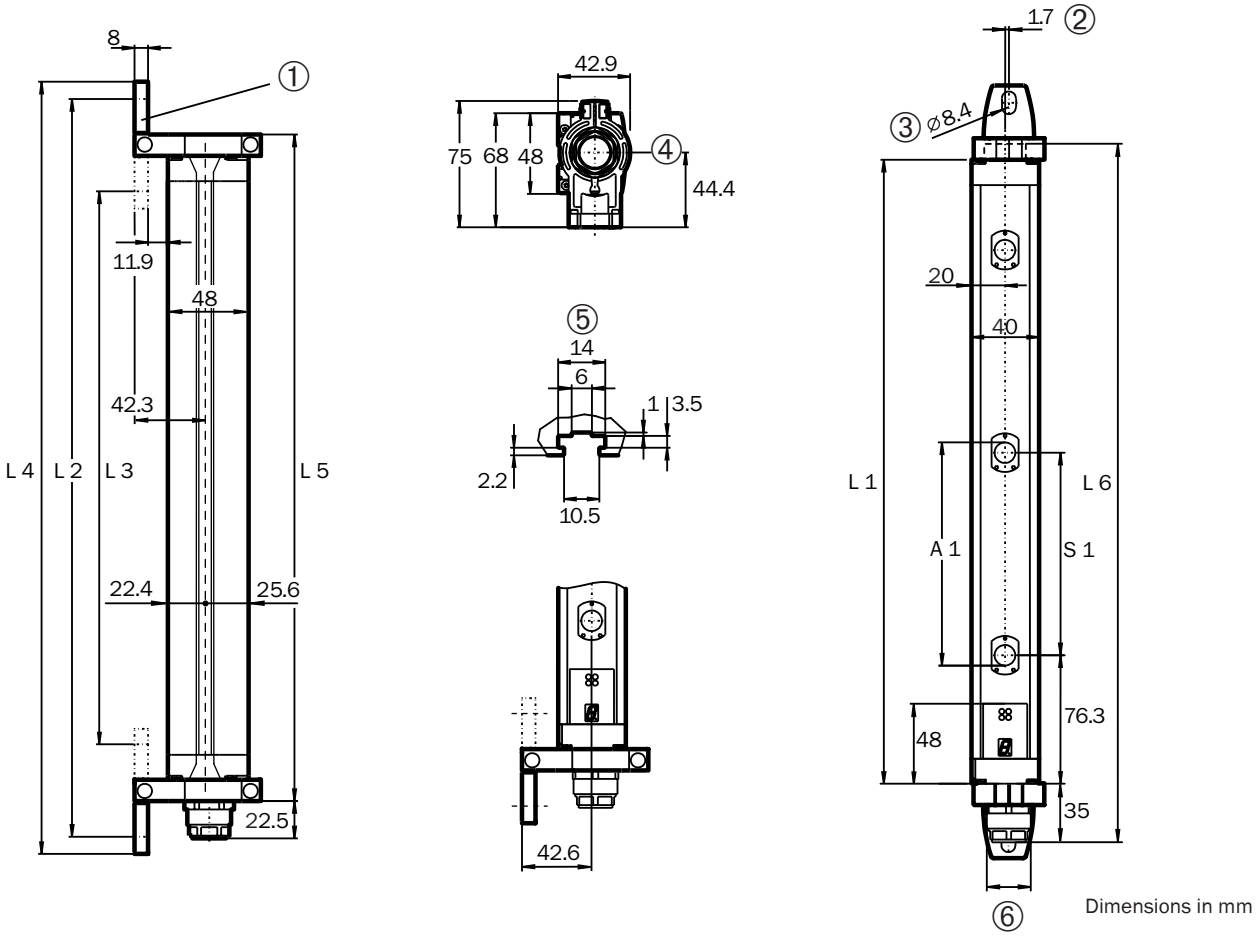
## Operating data

| | |
|---|---|
| **Connection type (depending on type)** | Hirschmann plug 6-pin + PE<br>M12 plug, 8-pin |
| **Connection cable wire cross-section** | |
| **Hirschmann plug** | Max. 1 $mm^2$ |
| **M12 plug** | Max. 0.25 $mm^2$ |
| **Connection cable length** | |
| **for wire cross-section 1 $mm^2$** | Max. 60 m |
| **for wire cross-section 0.25 $mm^2$** | Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight (depending on type)** | 1.25 kg ... 2.86 kg |


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# Dimensional drawings

➜ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature




Dimensions in mm

Sender unit with swivel mount (receiver unit mirror image)
① Mounting clamp
② Centre of light beam offset
③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
④ Adjustment
⑤ Sliding nut groove for side mounting
⑥ Plug PG13.5 according to DIN 43651

| N | S 1 | A 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|---|---|
| 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 | 851 | 919 | 809 | 939 | 877 | 896 |
| 6 | – | 170 | 916 | 983 | 874 | 1004 | 941 | 960 |
| 7 | – | 170 | 1073 | 1140 | 1031 | 1161 | 1098 | 1118 |
| 8 | – | 170 | 1231 | 1298 | 1189 | 1319 | 1256 | 1275 |
| 9 | – | 170 | 1388 | 1455 | 1346 | 1476 | 1413 | 1433 |

Dimensions in mm

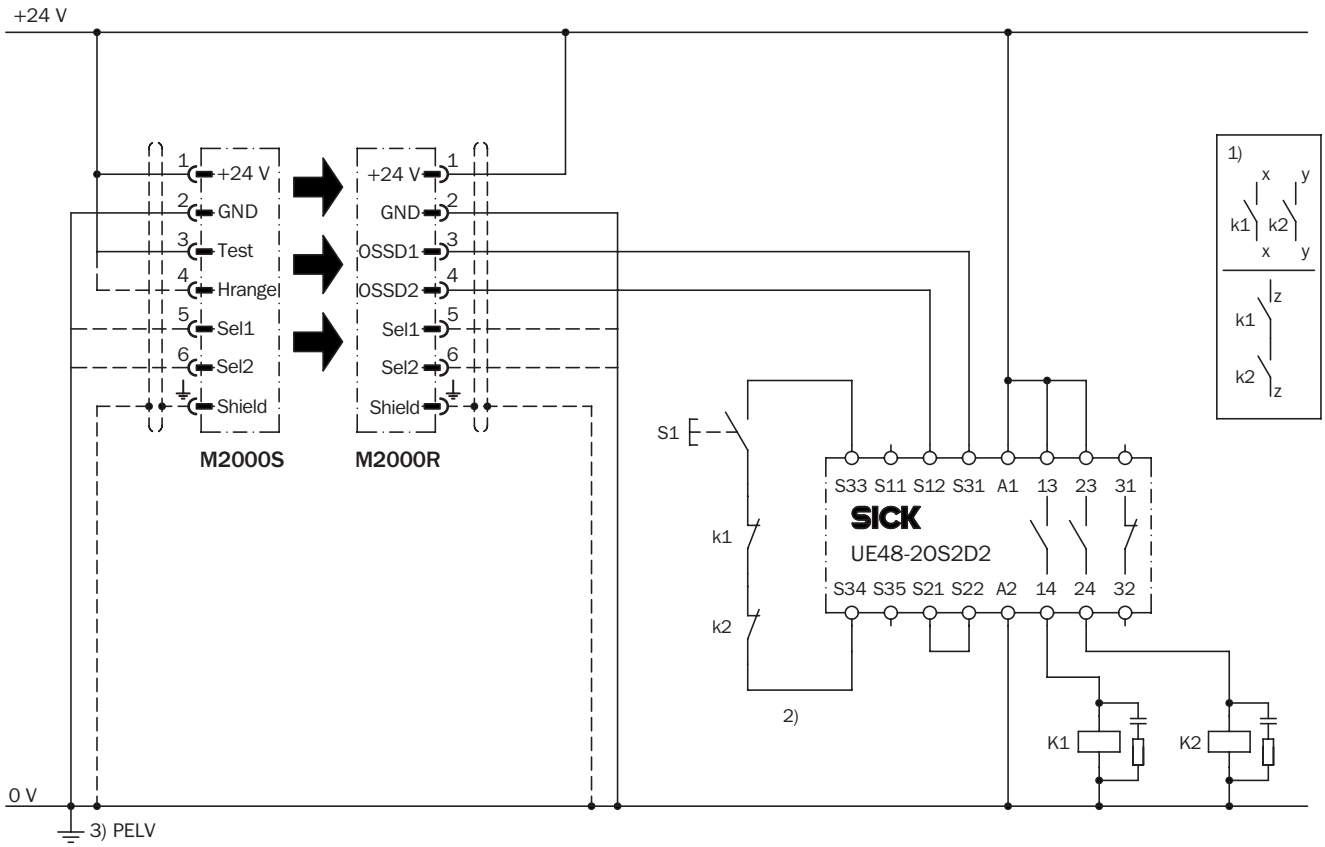
**N** Number of beams
**S 1** Beam separation
**A 1** Resolution


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# Connection diagram

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M2000 Standard on UE48-20S safety relay




**Task**

Interfacing an M2000 Standard multi-beam photoelectric safety switch to UE48-20S. Operating mode with restart interlock and external device monitoring.

**Function**

If the light path is clear, the OSSD1 and OSSD2 outputs are live. The system is ready to switch on if K1 and K2 are de-energised. By pressing S1 (button is pressed and released) the UE48 relay is energised and its contacts 13-14 and 23-24 activate K1 and K2. On interruption of one of the light beams, the UE48-20S is de-energised by the OSSD1 and OSSD2 outputs and K1 and K2 are deactivated.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the K1 or K2 contactors will be detected and does not result in the loss of the shutdown function. Jamming of the S1 button will prevent the UE48-20S from enabling.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) The external device monitoring is only static.

3) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

F

# Accessories

**Mounting systems**

→ Dimensional drawings for mounting systems, see page F-45

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Large housing profile | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026850 |

Continued on next page


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### Connector technology

| System connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| Hirschmann plug | Hirschmann cable socket | ▪ 6-pin + PE<br>▪ Straight | – | 6006612 |
| | | ▪ 6-pin + PE<br>▪ Angled with screw connections | – | 6007363 |
| M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |

### Device columns

F

| Designation | Description | Part number |
|---|---|---|
| Device column without front screen | ▪ 2-beam, 500 mm beam separation<br>▪ Including mounting kit | 2021328 |
| | ▪ 3-beam, 400 mm beam separation<br>▪ Including mounting kit | 2021329 |
| Device column with front screen [1] | ▪ Length 1200 mm<br>▪ Including mounting kit | 2021330 |
| | ▪ Length 1500 mm<br>▪ Including mounting kit | 2021331 |
| | ▪ Length 1700 mm<br>▪ Including mounting kit | 2021332 |

[1] Warning, reduction of the scanning range!

### Device columns for outdoor use

| Designation | Description | Part number |
|---|---|---|
| Device column with heating 220 V | ▪ Suitable for M20-02x50Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2023707 |
| | ▪ Suitable for M20-03x40Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2025441 |

### Mirror columns [1]

| Designation | Description | Part number |
|---|---|---|
| Mirror column, fully assembled with mirrors | ▪ Suitable for M20x-02xxxxx, 2-beam, 500 mm beam separation | 1015041 |
| | ▪ Suitable for M20x-03xxxxx, 3-beam, 400 mm beam separation | 1015040 |
| | ▪ Suitable for M20x-04xxxxx, 4-beam, 300 mm beam separation | 1019115 |

[1] Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to page F-82

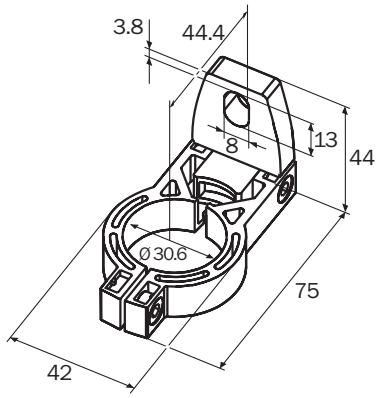
### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

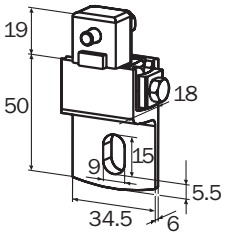

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## Dimensional drawings mounting systems

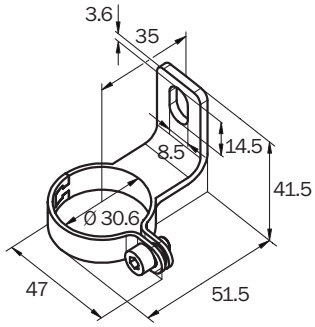
Dimensions in mm



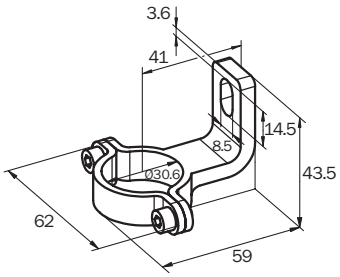

Swivel mount
Mounting kit 2




Side bracket
Mounting kit 6




Stainless steel bracket




Reinforced stainless steel bracket

F


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- High durability
- Compact design
- External device monitoring (EDM)
- Self-testing
- On-site diagnostics
- Beam coding

CE

| Further information | Page |
|---|---|
| → Dimensional drawings | F-48 |
| → Connection diagram | F-42 |
| → Accessories | F-49 |
| → Dimensional drawings accessories | F-50 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Resistant materials** | Stainless steel (V4A), PMMA, PA, PVC |
| **Enclosure rating** | IP 67 |
| **Scanning range** | 0 m ... 19 m |
| **Number of beams (depending on type)** | 2 / 3 / 4 |
| **Beam separation (depending on type)** | 300 mm / 400 mm / 500 mm |
| **Type** | Type 2 according to EN 61496 |

## Product description

The IP 67 housing, in conjunction with the multi-beam safety device M2000, achieves the enclosure rating IP 67. The materials used (V4A, PMMA, PA, PVC) have a high level of resistance against common cleaning agents.

A compensating element (membrane) prevents the plastic tubes from misting up and the entry of liquids.
The cable is fed into the device through the proven PG connector.

## In-system added value

- Combination with safe control solutions from SICK

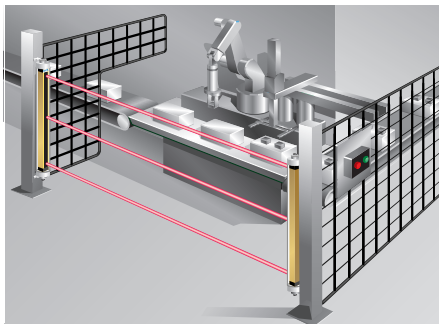
| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-20S** | ✔ | ✔ | – | N-42 |
| **UE48-30S** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Access protection on a processing centre in the hygiene area

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7024240

# Ordering information

IP 67 Housing with integrated sender or receiver unit M2000, including 15 m PVC cable

➜ Accessories, see page F-49

## Scanning range 0 ... 19 m

| Number of beams | Beam separation (mm) | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|
| | | Type | Part number | Type | Part number |
| 2 | 500 | M25S-02150C112 | 1024208 | M25E-02150C112 | 1024209 |
| 3 | 400 | M25S-03140C112 | 1024210 | M25E-03140C112 | 1024211 |
| 4 | 300 | M25S-04130C112 | 1024212 | M25E-04130C112 | 1024213 |

# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

F

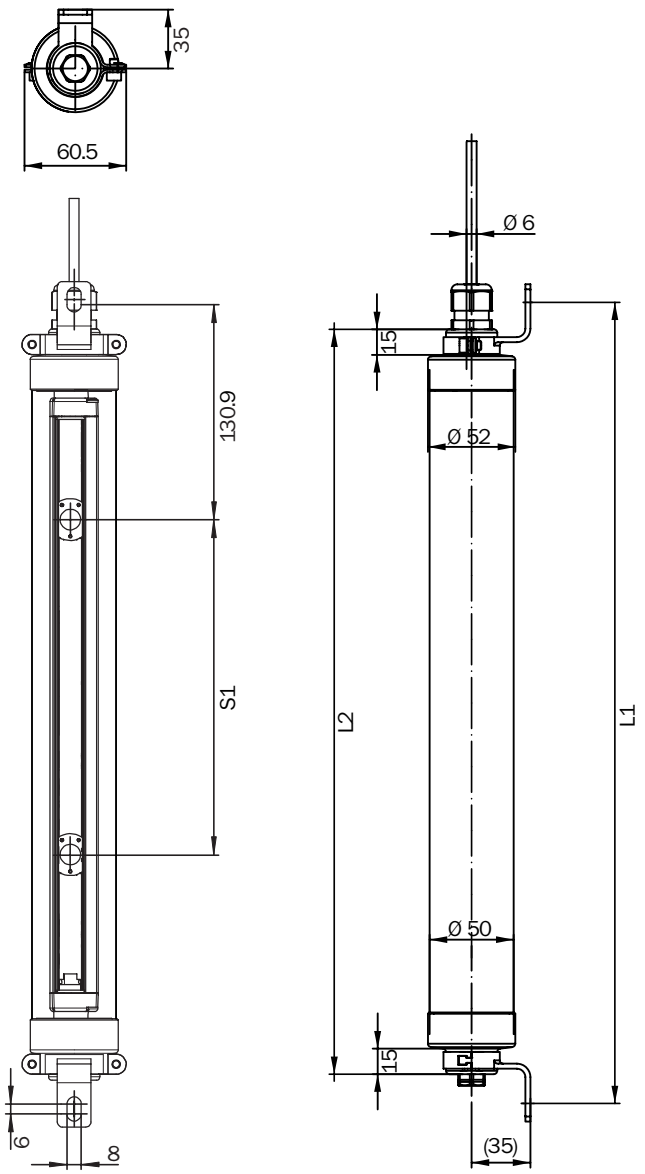
### M2000 Standard in IP 67 Housing

➜ M2000 specific data see M2000 Standard, page F-40

| | |
|---|---|
| **Scanning range** | 0 m ... 19 m |
| **Number of beams (depending on type)** | 2 / 3 / 4 |
| **Beam separation (depending on type)** | 300 mm / 400 mm / 500 mm |
| **Enclosure rating** | IP 66, IP 67 |
| **Type** | Type 2 according to EN 61496 |
| **Materials** | |
| **End caps** | Stainless steel |
| **Plastic tube** | PMMA |
| **Compensating element (membrane)** | PA 6 |
| **PG connector** | PA 6 |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |


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## Dimensional drawings




Dimensions in mm

Illustration with stainless steel bracket (not supplied with delivery)

| Number of beams | Beam separation S 1 | L 1 | L 2 |
|---|---|---|---|
| **2** | 500 | 777 | 744 |
| **3** | 400 | 1078 | 1045 |
| **4** | 300 | 1228 | 1195 |

Dimensions in mm


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## Connection diagram

→ Connection diagram M2000 Standard on safety relay UE48, see page F-42
→ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

F

## Accessories

**Mounting systems**

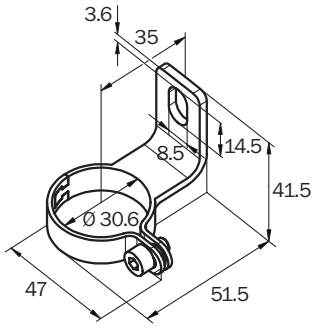
→ Dimensional drawings for mounting systems, see page F-50

| Designation | Description | Part number |
|---|---|---|
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026850 |
| Stainless steel support bracket | ▪ 2 pieces<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026849 |
| Mounting key | ▪ For M12 cable socket on device replacement | 4034690 |
| Venting membrane | – | 5309082 |

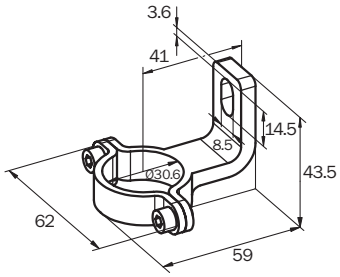

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## Dimensional drawings mounting systems

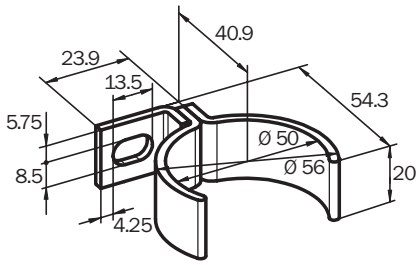
Dimensions in mm




Stainless steel bracket




Reinforced stainless steel bracket




Stainless steel support bracket



Mounting key

F


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 25 m / 0 m ... 70 m |
| **Number of beams (depending on type)** | 2 ... 9 |
| **Beam separation or resolution (depending on type)** | 116 mm / 170 mm / 300 mm / 400 mm / 500 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

With its high signal reserve, the M2000 RES/EDM multi-beam safety device is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considera-tions by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

The integrated restart interlock in the M2000 RES/EDM offers the advantages of shorter cable runs and quicker commissioning compared to traditional solutions.

## In-system added value

- Combination with safe control solutions from SICK

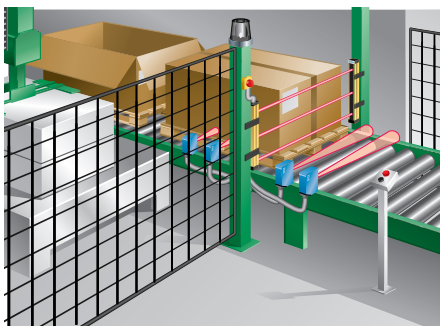
| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

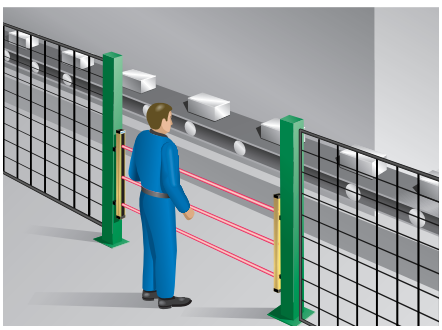
## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: M2000 RES/EDM with LE20 on a packaging machine



Storage and conveyor technology: M2000 on a conveyor belt system






- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding

F

| Further information | Page |
|---|---|
| → Ordering information | F-52 |
| → Technical specifications | F-53 |
| → Dimensional drawings | F-54 |
| → Connection diagram | F-55 |
| → Accessories | F-56 |
| → Dimensional drawings accessories | F-58 |
| → Services | A-2 |



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# Ordering information

M2000 RES/EDM

- With restart interlock (RES) and external device monitoring (EDM)
- For usage as a stand-alone system
- Consisting of sender and receiver unit

→ Accessories, see page F-56

## Scanning range 0 ... 25 m

| Number of beams | Beam separation / Resolution (mm) | Connection plug Sender unit / Receiver unit | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 2 | 500 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-02150A120 | 1016405 | M20E-02150A221 | 1018032 |
| | | M12, 8-pin | M20S-02150A122 | 1018186 | M20E-02150A222 | 1018213 |
| 3 | 400 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-03140A120 | 1016428 | M20E-03140A221 | 1018034 |
| | | M12, 8-pin | M20S-03140A122 | 1018188 | M20E-03140A222 | 1018215 |
| 4 | 300 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-04130A120 | 1016509 | M20E-04130A221 | 1018217 |
| | | M12, 8-pin | M20S-04130A122 | 1018190 | M20E-04130A222 | 1018219 |
| 6 | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-061A3A120 | 1016446 | M20E-061A3A221 | 1018221 |
| | | M12, 8-pin | M20S-061A3A122 | 1018192 | M20E-061A3A222 | 1018223 |
| 7 | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-071A3A120 | 1016434 | M20E-071A3A221 | 1018225 |
| | | M12, 8-pin | M20S-071A3A122 | 1018194 | M20E-071A3A222 | 1018227 |
| 8 | 116 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-081A2A120 | 1016438 | M20E-081A2A221 | 1018229 |
| | | M12, 8-pin | M20S-081A2A122 | 1018196 | M20E-081A2A222 | 1018231 |
| | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-081A3A120 | 1016440 | M20E-081A3A221 | 1018233 |
| | | M12, 8-pin | M20S-081A3A122 | 1018198 | M20E-081A3A222 | 1018235 |
| 9 | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-091A3A120 | 1016442 | M20E-091A3A221 | 1018036 |
| | | M12, 8-pin | M20S-091A3A122 | 1018200 | M20E-091A3A222 | 1018237 |

## Scanning range 0 ... 70 m

| Number of beams | Beam separation (mm) | Connection plug Sender unit / Receiver unit | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 2 | 500 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-02250A120 | 1018172 | M20E-02250A221 | 1018206 |
| | | M12, 8-pin | M20S-02250A122 | 1018174 | M20E-02250A222 | 1018207 |
| 3 | 400 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-03240A120 | 1018176 | M20E-03240A221 | 1018208 |
| | | M12, 8-pin | M20S-03240A122 | 1018178 | M20E-03240A222 | 1018209 |
| 4 | 300 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-04230A120 | 1018180 | M20E-04230A221 | 1018210 |
| | | M12, 8-pin | M20S-04230A122 | 1018182 | M20E-04230A222 | 1018211 |


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# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 25 m / 0 m ... 70 m |
| **Number of beams (depending on type)** | 2 ... 9 |
| **Beam separation or resolution (depending on type)** | 116 mm / 170 mm / 300 mm / 400 mm / 500 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

## Sender unit

| | |
|---|---|
| **Power consumption** | Max. 3.7 W |

## Receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors (short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 8 ms |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 5 W |

## Operating data

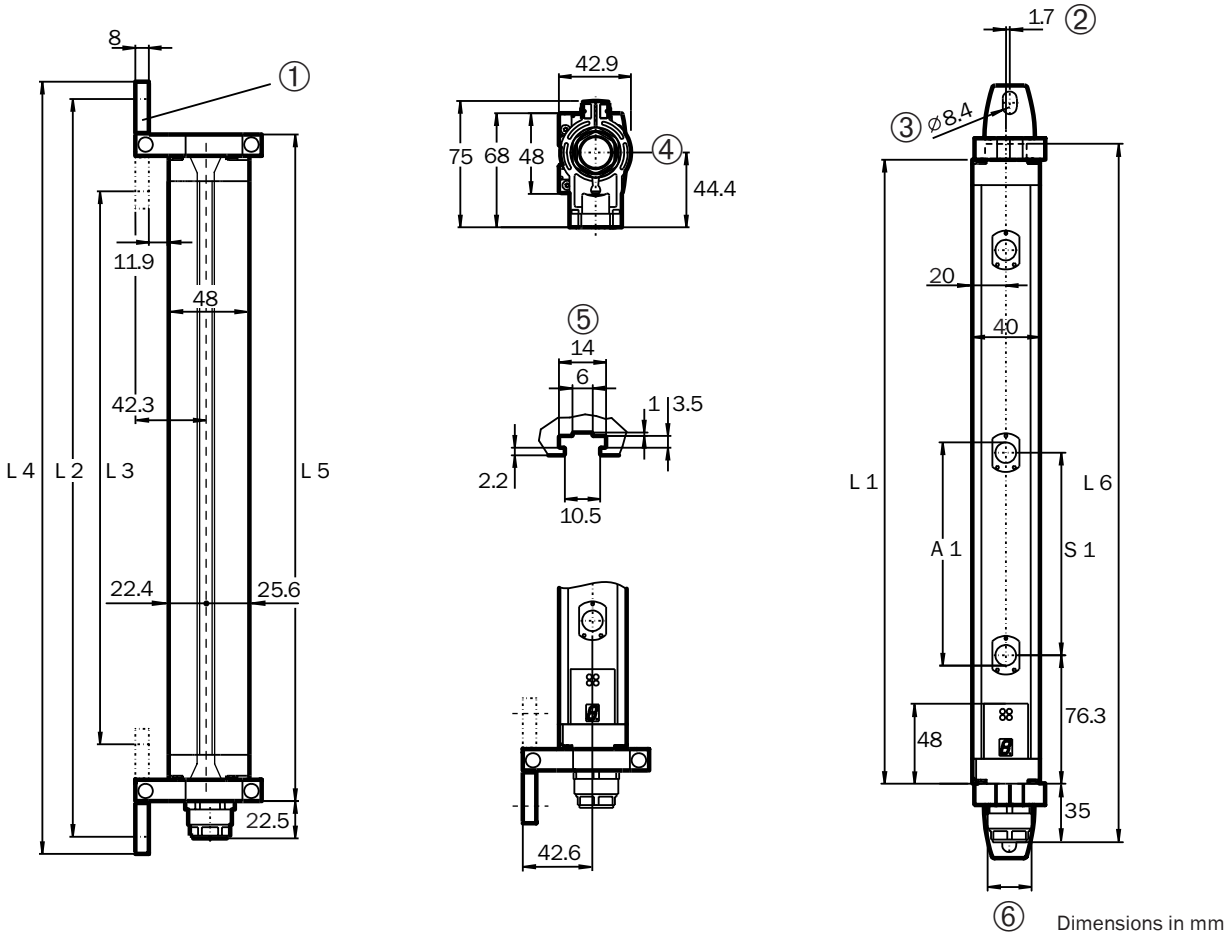
| | |
|---|---|
| **Connection type (depending on type)** | Hirschmann plug<br>(sender unit: 6-pin + PE, receiver unit: 11-pin + PE)<br>M12 plug, 8-pin |
| **Connection cable wire cross-section** | |
| **Hirschmann plug** | Max. 1 $mm^2$ |
| **M12 plug** | Max. 0.25 $mm^2$ |
| **Connection cable length** | |
| **for wire cross-section 1 $mm^2$** | Max. 60 m |
| **for wire cross-section 0.25 $mm^2$** | Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight (depending on type)** | 1.25 kg ... 2.86 kg |

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# Dimensional drawings

➜ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature




Dimensions in mm

Sender unit with swivel mount (receiver unit not mirror image. Dimensions as M2000 Cascadable, see page F-62)
① Mounting clamp
② Centre of light beam offset
③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
④ Adjustment
⑤ Sliding nut groove for side mounting
⑥ Plug PG13.5 according to DIN 43651

| N | S 1 | A 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|---|---|
| 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 | 851 | 919 | 809 | 939 | 877 | 896 |
| 6 | – | 170 | 916 | 983 | 874 | 1004 | 941 | 960 |
| 7 | – | 170 | 1073 | 1140 | 1031 | 1161 | 1098 | 1118 |
| 8 | – | 170 | 1231 | 1298 | 1189 | 1319 | 1256 | 1275 |
| 9 | – | 170 | 1388 | 1455 | 1346 | 1476 | 1413 | 1433 |

Dimensions in mm

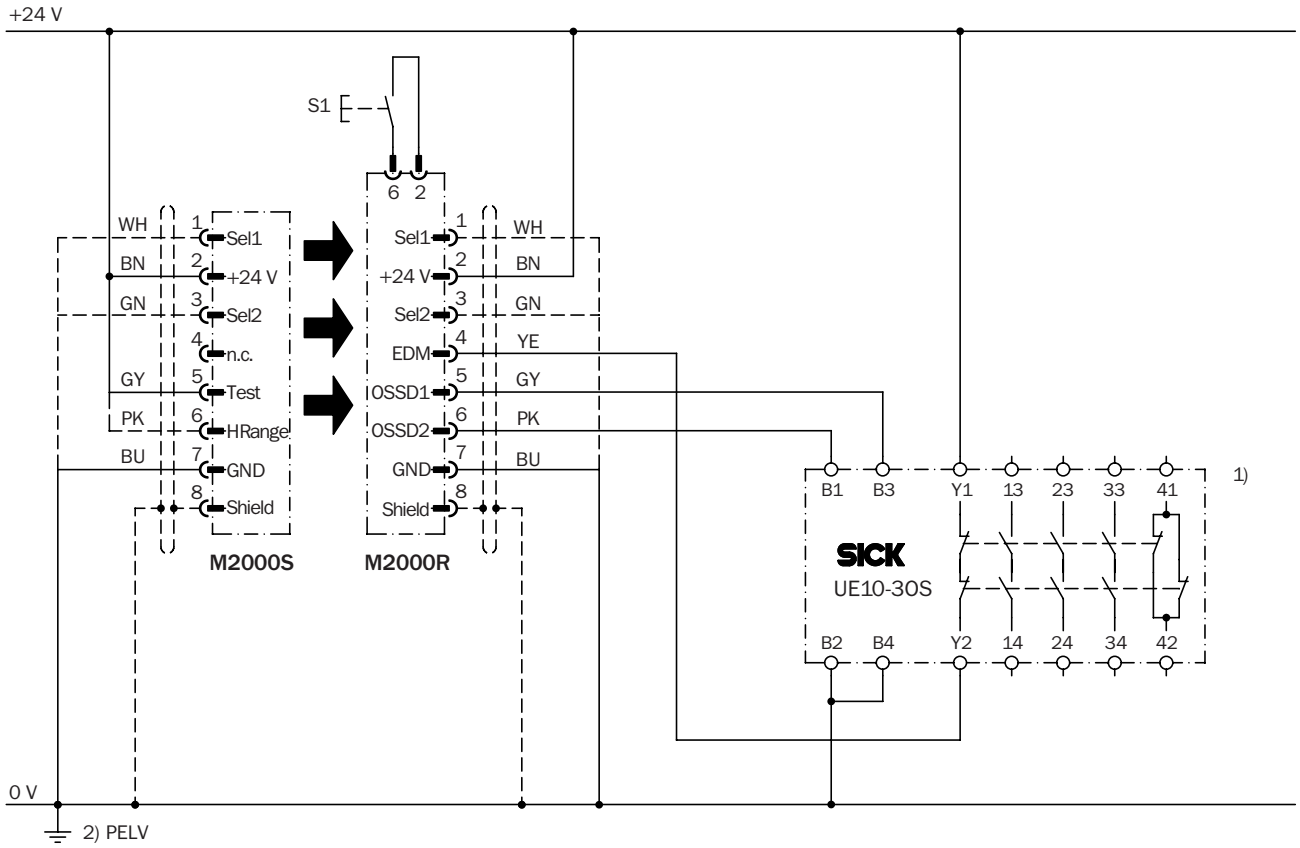
**N** Number of beams
**S 1** Beam separation
**A 1** Resolution


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# Connection diagram

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M2000 RES/EDM on UE10-3OS safety relay




**Task**

Interfacing an M2000 RES/EDM multi-beam photoelectric safety switch to UE10-3OS. Operating mode with restart interlock and external device monitoring.

**Function**

The yellow LED on the receiver flashes when the light path is clear and the UE10-3OS is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-3OS is switched on. On the interruption of one of the light beams, the UE10-3OS is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

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## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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## Accessories

**Mounting systems**

➜ Dimensional drawings for mounting systems, see page F-58

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Large housing profile | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026850 |


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### Connector technology

| Connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| System connection Hirschmann plug | Hirschmann cable socket | ▪ 6-pin + PE<br>▪ Straight | – | 6006612 |
| | | ▪ 6-pin + PE<br>▪ Angled with screw connections | – | 6007363 |
| | | ▪ 11-pin + PE<br>▪ Straight | – | 6020757 |
| | | ▪ 11-pin + PE<br>▪ Angled | – | 6020758 |
| System connection M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |
| Extension connection | M12 cable plug | ▪ For the connection of a control switch<br>▪ 8-pin<br>▪ Straight | 5 m | 6021204 |
| | | | 15 m | 6021205 |
| | | ▪ For the connection of a control switch<br>▪ 8-pin<br>▪ Angled | 5 m | 6021830 |
| | | | 15 m | 6021831 |
| | M12 plug | ▪ For deactivation of the integrated restart interlock<br>▪ Pre-assembled | – | 6021238 |

### Device columns

| Designation | Description | Part number |
|---|---|---|
| Device column without front screen | ▪ 2-beam, 500 mm beam separation<br>▪ Including mounting kit | 2021328 |
| | ▪ 3-beam, 400 mm beam separation<br>▪ Including mounting kit | 2021329 |
| Device column with front screen [1)] | ▪ Length 1200 mm<br>▪ Including mounting kit | 2021330 |
| | ▪ Length 1500 mm<br>▪ Including mounting kit | 2021331 |
| | ▪ Length 1700 mm<br>▪ Including mounting kit | 2021332 |

[1)] Warning, reduction of the scanning range!

### Device columns for outdoor use

| Designation | Description | Part number |
|---|---|---|
| Device column with heating 220 V | ▪ Suitable for M20-02x50Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2023707 |
| | ▪ Suitable for M20-03x40Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2025441 |

Continued on next page


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### Mirror columns [1)]

| Designation | Description | Part number |
|---|---|---|
| Mirror column, fully assembled with mirrors | ▪ Suitable for M20x-02xxxxx, 2-beam, 500 mm beam separation | 1015041 |
| | ▪ Suitable for M20x-03xxxxx, 3-beam, 400 mm beam separation | 1015040 |
| | ▪ Suitable for M20x-04xxxxx, 4-beam, 300 mm beam separation | 1019115 |

[1)] Warning, reduction of the scanning range!

➜ For dimensional drawings of the device columns and mirror columns please refer to page F-82

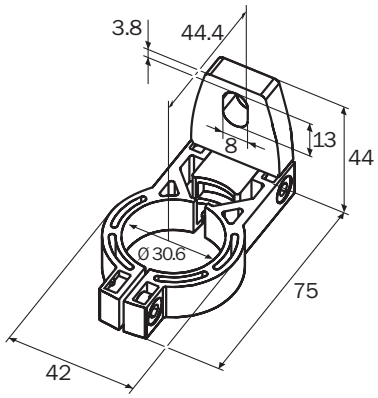
### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

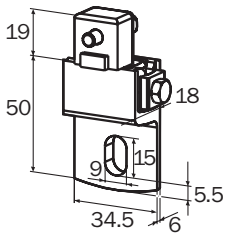
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## Dimensional drawings mounting systems

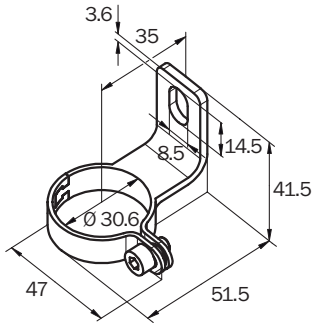
Dimensions in mm



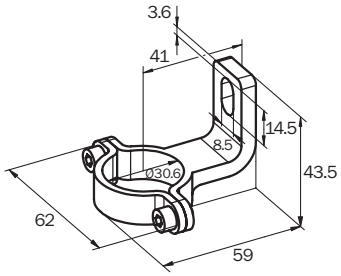

Swivel mount
Mounting kit 2




Side bracket
Mounting kit 6




Stainless steel bracket




Reinforced stainless steel bracket


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range** | 0 m ... 25 m |
| **Number of beams** | 2 ... 9 |
| **Beam separation or resolution (depending on type)** | 116 mm / 170 mm / 300 mm / 400 mm / 500 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

With its high signal reserve, the M2000 Cascadable multi-beam safety device is also reliable under harsh industrial conditi-ons. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime. The modular concept achieves maximum machine security while taking into account economic consid-erations by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.
With the cascadable variants, photoelectric safety switches can be flexibly adapted to the existing installation.

## In-system added value

- Combination with safe control solutions from SICK

| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry






- Cascade
  - Max. 3 devices
  - Max. 3 m cable length
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding

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| Further information | Page |
|---|---|
| → Ordering information | F-60 |
| → Technical specifications | F-61 |
| → Dimensional drawings | F-62 |
| → Connection diagram | F-63 |
| → Accessories | F-64 |
| → Dimensional drawings accessories | F-66 |
| → Services | A-2 |


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# Ordering information

M2000 Cascadable
- With integrated external device monitoring function (EDM)
- For usage as cascaded device
- Consisting of sender and receiver unit

→ Accessories, see page F-64

## Scanning range 0 ... 25 m

| Number of beams | Beam separation / Resolution (mm) | Connection plug Sender unit / Receiver unit | Sender unit | | Receiver unit | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 2 | 500 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-02150A220 | 1018031 | M20E-02150A221 | 1018032 |
| | | M12, 8-pin | M20S-02150A222 | 1018212 | M20E-02150A222 | 1018213 |
| 3 | 400 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-03140A220 | 1018033 | M20E-03140A221 | 1018034 |
| | | M12, 8-pin | M20S-03140A222 | 1018214 | M20E-03140A222 | 1018215 |
| 4 | 300 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-04130A220 | 1018216 | M20E-04130A221 | 1018217 |
| | | M12, 8-pin | M20S-04130A222 | 1018218 | M20E-04130A222 | 1018219 |
| 6 | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-061A3A220 | 1018220 | M20E-061A3A221 | 1018221 |
| | | M12, 8-pin | M20S-061A3A222 | 1018222 | M20E-061A3A222 | 1018223 |
| 7 | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-071A3A220 | 1018224 | M20E-071A3A221 | 1018225 |
| | | M12, 8-pin | M20S-071A3A222 | 1018226 | M20E-071A3A222 | 1018227 |
| 8 | 116 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-081A2A220 | 1018228 | M20E-081A2A221 | 1018229 |
| | | M12, 8-pin | M20S-081A2A222 | 1018230 | M20E-081A2A222 | 1018231 |
| | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-081A3A220 | 1018232 | M20E-081A3A221 | 1018233 |
| | | M12, 8-pin | M20S-081A3A222 | 1018234 | M20E-081A3A222 | 1018235 |
| 9 | 170 | Hirschmann 6-pin + PE / 11-pin + PE | M20S-091A3A220 | 1018035 | M20E-091A3A221 | 1018036 |
| | | M12, 8-pin | M20S-091A3A222 | 1018236 | M20E-091A3A222 | 1018237 |

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# Detailed technical specifications

➜ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

## General system data

| | |
|---|---|
| **Scanning range** | 0 m ... 25 m |
| **Number of beams** | 2 ... 9 |
| **Beam separation or resolution (depending on type)** | 116 mm / 170 mm / 300 mm / 400 mm / 500 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

## Sender unit

| | |
|---|---|
| **Power consumption** | Max. 3.7 W |

## Receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors (short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 8 ms |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 5 W |

## Operating data

| | |
|---|---|
| **Connection type (depending on type)** | Hirschmann plug<br>(sender unit: 6-pin + PE, receiver unit: 11-pin + PE)<br>M12 plug, 8-pin |
| **Connection cable wire cross-section** | |
| **Hirschmann plug** | Max. 1 $mm^2$ |
| **M12 plug** | Max. 0.25 $mm^2$ |
| **Connection cable length** | |
| **for wire cross-section 1 $mm^2$** | Max. 60 m |
| **for wire cross-section 0.25 $mm^2$** | Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight (depending on type)** | 1.25 kg ... 2.86 kg |

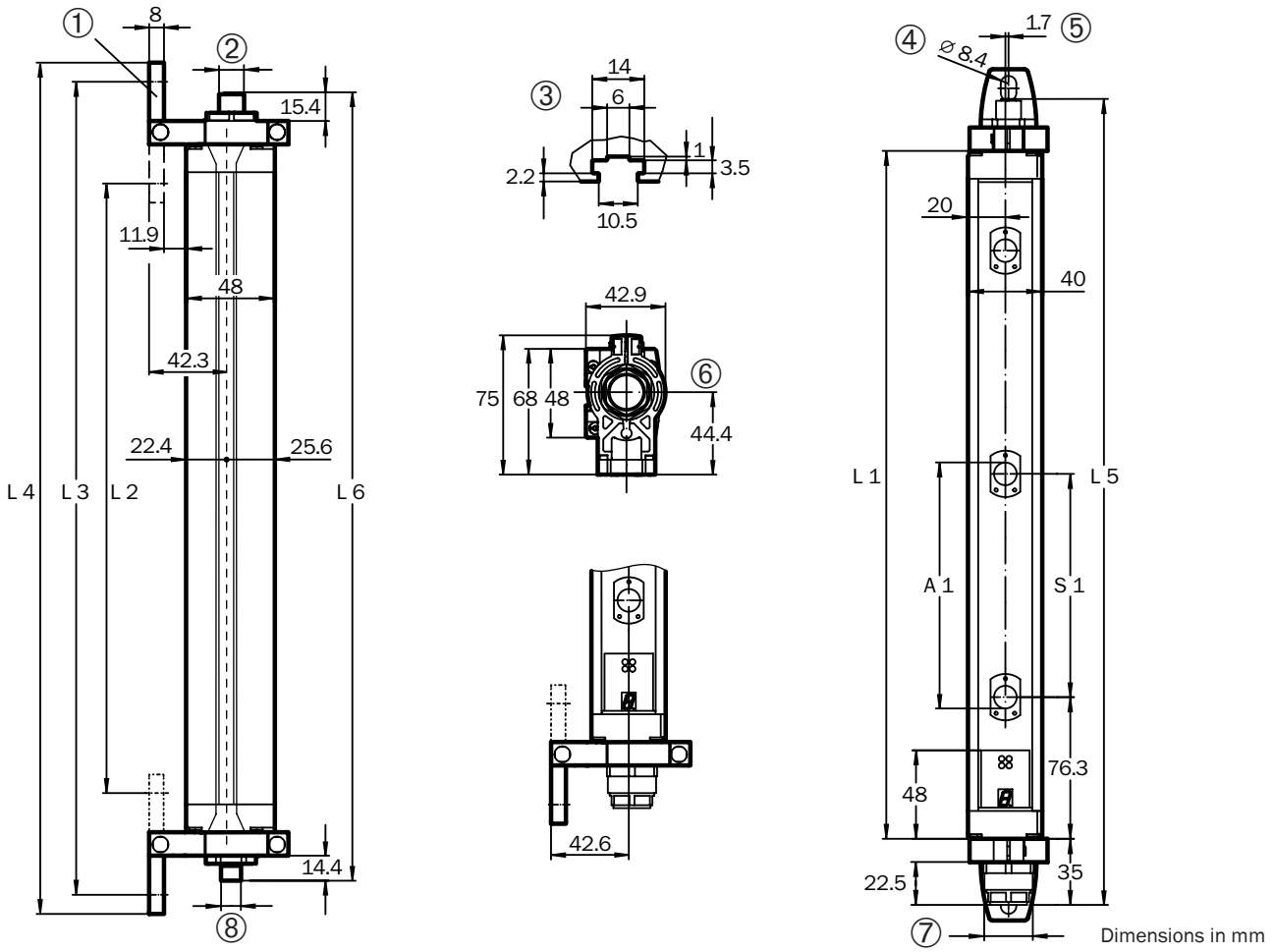
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# Dimensional drawings

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➜ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature




Sender unit with swivel mount (receiver unit mirror image)
① Mounting clamp
② M12 x 1 socket (standard)
③ Sliding nut groove for side mounting
④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
⑤ Centre of light beam offset
⑥ Adjustment
⑦ Plug PG13.5 according to DIN 43651
⑧ Plug M12 x 1

| N | S 1 | A 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|---|---|
| 2 | 500 | – | 630 | 588 | 697 | 718 | 694 | 686 |
| 3 | 400 | – | 931 | 888 | 998 | 1019 | 995 | 987 |
| 4 | 300 | – | 1031 | 989 | 1098 | 1119 | 1095 | 1087 |
| 8 | – | 116 | 851 | 809 | 919 | 939 | 915 | 907 |
| 6 | – | 170 | 916 | 874 | 983 | 1004 | 979 | 971 |
| 7 | – | 170 | 1073 | 1031 | 1140 | 1161 | 1137 | 1129 |
| 8 | – | 170 | 1231 | 1189 | 1298 | 1319 | 1294 | 1286 |
| 9 | – | 170 | 1388 | 1346 | 1455 | 1476 | 1452 | 1444 |

**N** Number of beams **A 1** Resolution **S 1** Beam separation

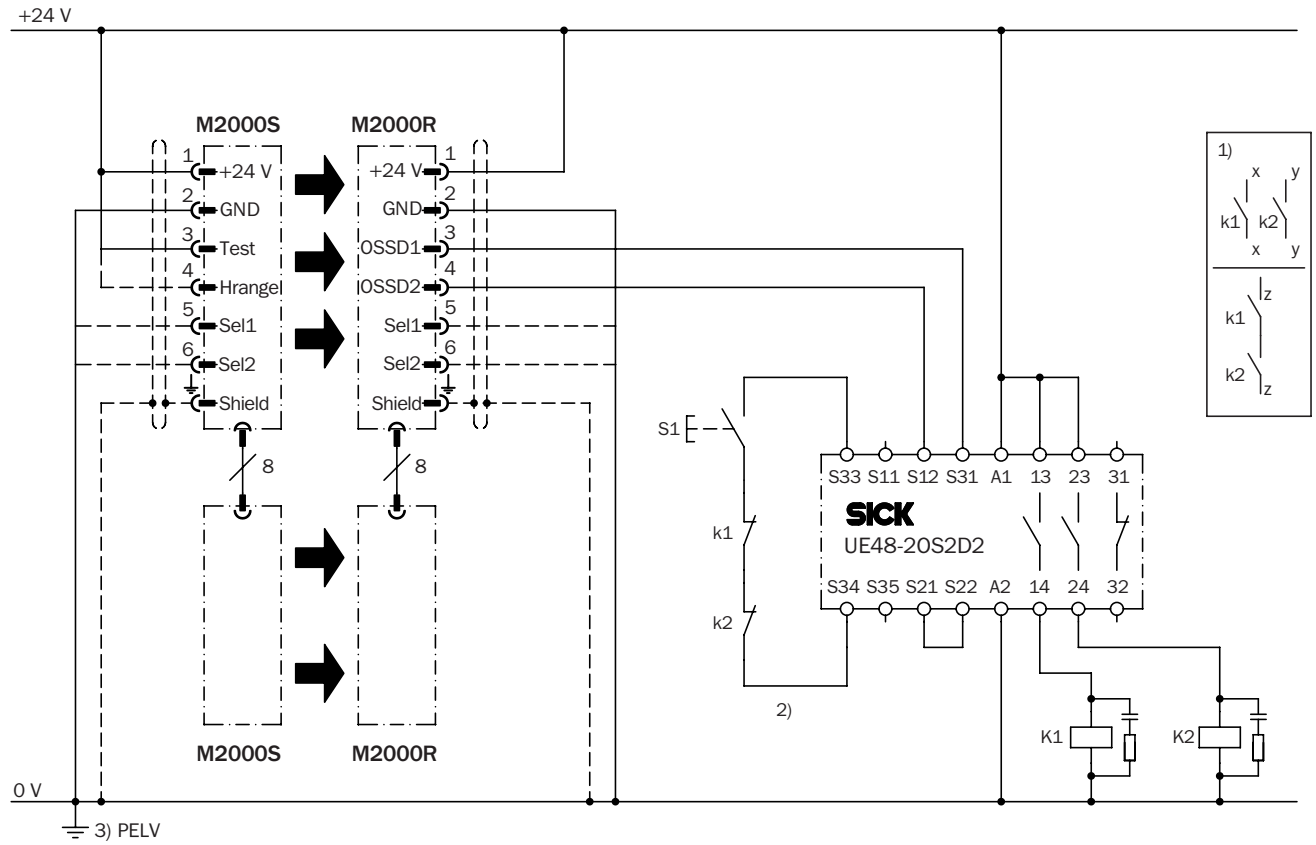
Dimensions in mm


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# Connection diagram

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M2000 Cascadable on UE48-2OS safety relay




**Task**

Interfacing two M2000 Cascadable multi-beam photoelectric safety switches to UE48-2OS. Operating mode with restart interlock and external device monitoring.

**Function**

If the light path is clear, the OSSD1 and OSSD2 outputs are live. The system is ready to switch on if K1 and K2 are de-energised. By pressing S1 (button is pressed and released) the UE48-2OS relay is energised and its contacts 13-14 and 23-24 activate K1 and K2.

On interruption of one of the light beams, the UE48-2OS is de-energised by the OSSD1 and OSSD2 outputs and K1 and K2 are deactivated.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the K1 or K2 contactors will be detected and does not result in the loss of the shutdown function. Jamming of the S1 button will prevent the UE48-2OS from enabling.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) The external device monitoring is only static.

3) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

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## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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## Accessories

**Mounting systems**

→ Dimensional drawings for mounting systems, see page F-66

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Large housing profile | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026850 |


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### Connector technology

| Connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| System connection Hirschmann plug | Hirschmann cable socket | ▪ 6-pin + PE<br>▪ Straight | – | 6006612 |
| | | ▪ 6-pin + PE<br>▪ Angled with screw connections | – | 6007363 |
| System connection M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |
| Extension connection | M12 cable sockets and plugs | ▪ Pre-assembled<br>▪ 8-pin<br>▪ Straight | 0.25 m | 6021000 |
| | | | 0.5 m | 6021001 |
| | | | 1 m | 6021002 |
| | | | 1.5 m | 6021003 |
| | | | 2 m | 6021004 |
| | | | 2.5 m | 6021005 |
| | | | 3 m | 6021006 |

### Device columns

| Designation | Description | Part number |
|---|---|---|
| Device column without front screen | ▪ 2-beam, 500 mm beam separation<br>▪ Including mounting kit | 2021328 |
| | ▪ 3-beam, 400 mm beam separation<br>▪ Including mounting kit | 2021329 |
| Device column with front screen [1] | ▪ Length 1200 mm<br>▪ Including mounting kit | 2021330 |
| | ▪ Length 1500 mm<br>▪ Including mounting kit | 2021331 |
| | ▪ Length 1700 mm<br>▪ Including mounting kit | 2021332 |

[1] Warning, reduction of the scanning range!

### Device columns for outdoor use

| Designation | Description | Part number |
|---|---|---|
| Device column with heating 220 V | ▪ Suitable for M20-02x50Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2023707 |
| | ▪ Suitable for M20-03x40Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2025441 |

Continued on next page

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### Mirror columns [1)]

| Designation | Description | Part number |
|---|---|---|
| Mirror column, fully assembled with mirrors | ▪ Suitable for M20x-02xxxxx, 2-beam, 500 mm beam separation | 1015041 |
| | ▪ Suitable for M20x-03xxxxx, 3-beam, 400 mm beam separation | 1015040 |
| | ▪ Suitable for M20x-04xxxxx, 4-beam, 300 mm beam separation | 1019115 |

[1)] Warning, reduction of the scanning range!

➜ For dimensional drawings of the device columns and mirror columns please refer to page F-82

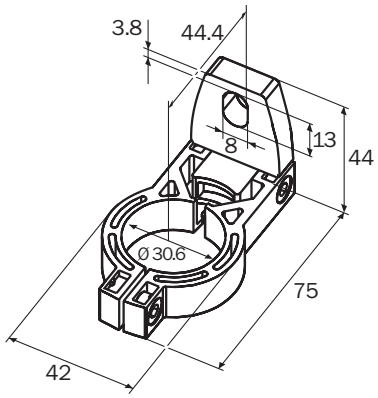
### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

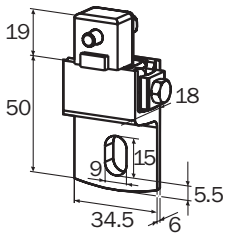
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## Dimensional drawings mounting systems

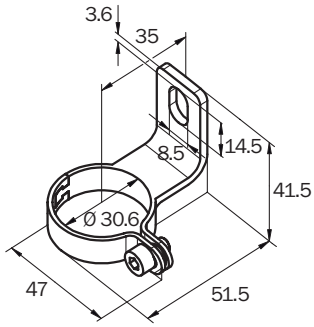
Dimensions in mm



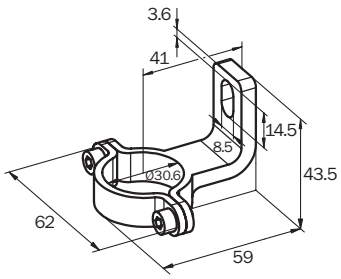

Swivel mount
Mounting kit 2




Side bracket
Mounting kit 6




Stainless steel bracket




Reinforced stainless steel bracket


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range** | 0 m ... 6 m |
| **Number of beams** | 1 |
| **Beam separation** | 500 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

The M2000-A/P Standard multi-beam safety device comprises a sender/receiver unit on the active side (A) and one or more deflector mirrors on the passive side (P). With their high signal reserve, they are also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime.
Interfaces and service concepts complete the product range to provide an ideal solution.

## In-system added value

- Combination with safe control solutions from SICK

| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20** | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry






- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid

| Further information | Page |
|---|---|
| → Ordering information | F-68 |
| → Technical specifications | F-68 |
| → Dimensional drawings | F-69 |
| → Connection diagram | F-70 |
| → Accessories | F-72 |
| → Dimensional drawings accessories | F-74 |
| → Services | A-2 |

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# Ordering information

M2000-A/P Standard
- With external device monitoring [1] (EDM)
- Comprising a sender/receiver unit as the active side and a deflector mirror as the passive side

→ Accessories, see page F-72

## Scanning range 0 ... 6 m

| Number of beams | Beam separation (mm) | Connection plug | Sender and receiver unit | | Deflector mirror | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 1 | 500 | Hirschmann 11-pin + PE | M20Z-02550A121 | 1016513 | PSR01-1501 | 1016677 |
| | | M12, 8-pin | M20Z-02550A122 | 1018361 | | |

[1] External device monitoring only available with devices with M12 plug!

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# Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

### General system data

| | |
|---|---|
| **Scanning range** | 0 m ... 6 m |
| **Number of beams** | 1 |
| **Beam separation** | 500 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

### Sender/receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors<br>(short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 7 ms |
| **Switching voltage** | |
| **$HIGH_{min}$** | $V_S$ – 2.25 V |
| **$LOW_{max}$** | 1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 7.5 W |

### Operating data

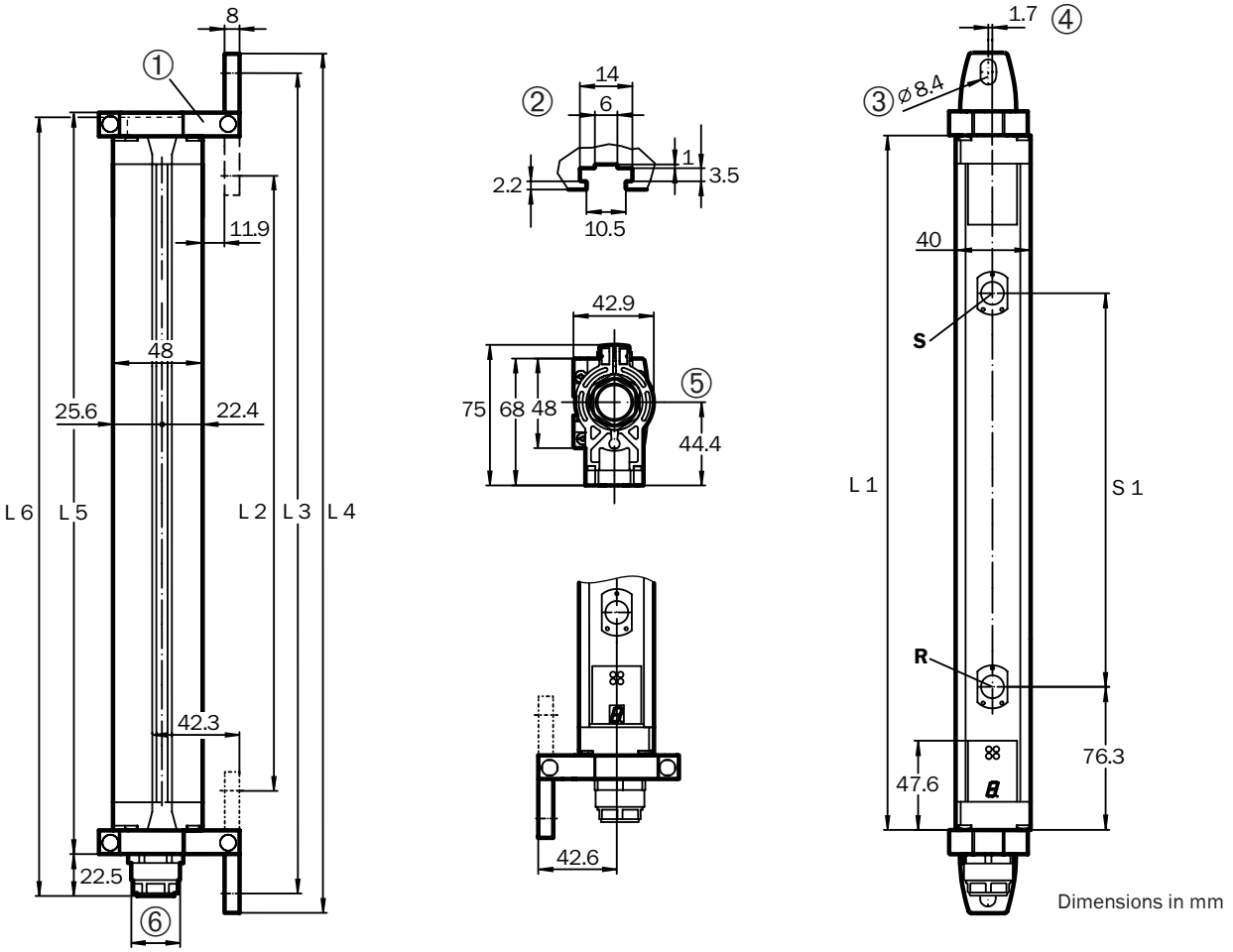
| | |
|---|---|
| **Connection type (depending on type)** | Hirschmann plug 11-pin + PE<br>M12 plug, 8-pin |
| **Connection cable wire cross-section** | |
| **Hirschmann plug** | Max. 1 $mm^2$ |
| **M12 plug** | Max. 0.25 $mm^2$ |
| **Connection cable length** | |
| **for wire cross-section 1 $mm^2$** | Max. 60 m |
| **for wire cross-section 0.25 $mm^2$** | Max. 15 m |


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| | |
|---|---|
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight** | 1.41 kg |

## Dimensional drawings

➜ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature




Dimensions in mm

Sender/receiver unit with swivel mount

① Mounting clamp
② Sliding nut groove for side mounting
③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
④ Adjustment
⑤ Centre of light beam offset
⑥ Hirschmann plug DIN 43651

**S** Sender **R** Receiver

| N | S 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|---|
| 2 | 500 | 653 | 611 | 720 | 741 | 678 | 700 |

**N** Number of beams **S 1** Beam separation

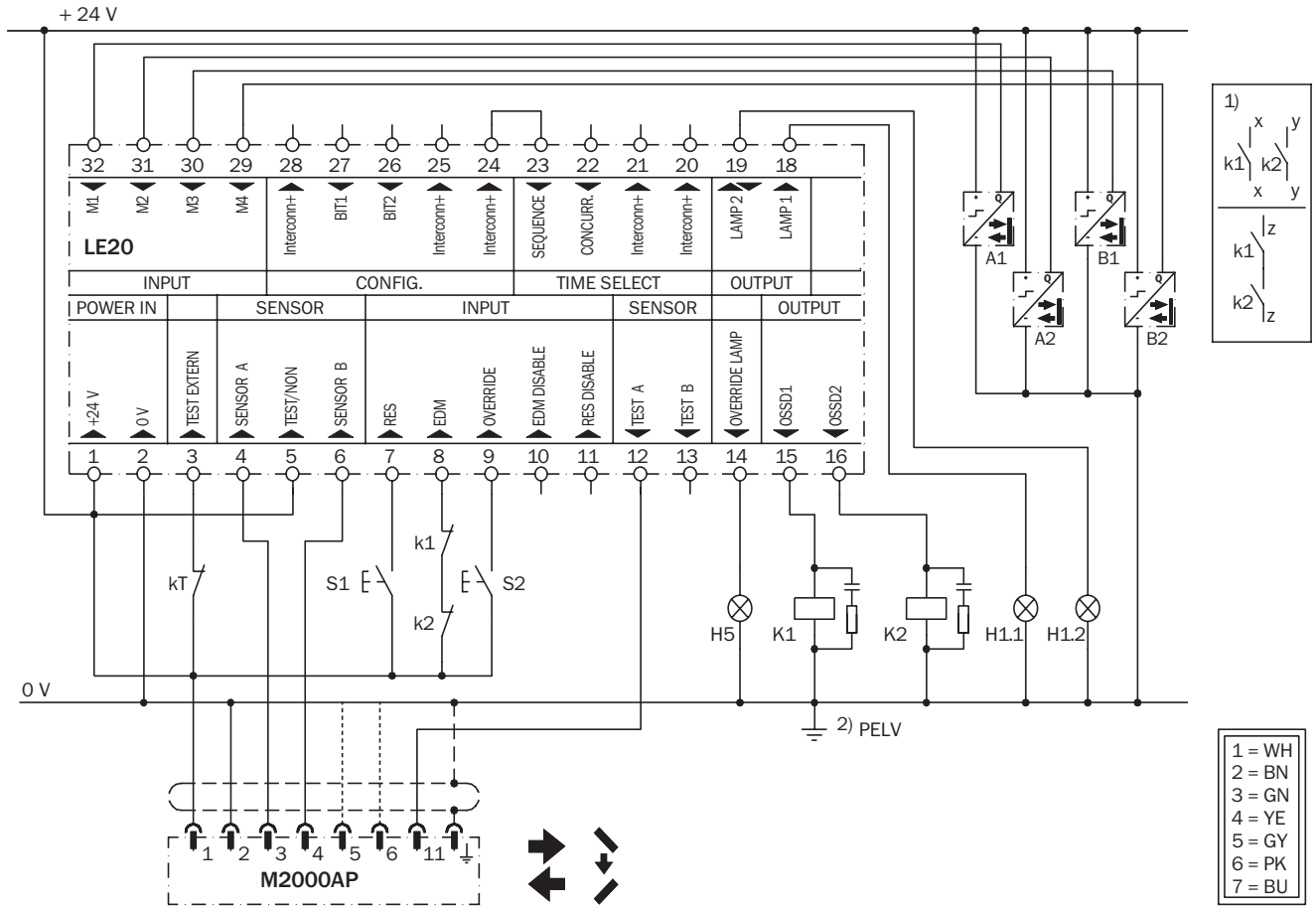
Dimensions in mm


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# Connection diagram

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M2000-A/P Standard on LE20 Muting safety evaluation unit




See next page for a description of the connection diagram


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**Task**

Integration of an M2000-A/P Standard multi-beam photoelectric safety switch in a control system via an LE20. Muting using 4 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors, operating mode with restart interlock and external device monitoring.

**Function**

If the light beams are clear and the K1 and K2 contactors are de-energised, the OSSDs on the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If a light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

**Muting**

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A or B is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting, also on switching from A1 & A2 to B1 & B2.

**Override**

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if a valid combination of muting signals is present at the LE20. This situation is indicated by illumination of the override lamp H5.

**Possible faults**

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing, and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

**Comments**

[1] Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

[2] PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

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## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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## Accessories

**Mounting systems**

→ Dimensional drawings for mounting systems, see page F-74

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Mounting kit 9 | ▪ 2 pieces swivel mount, pivoting for sender/receiver unit M2000-A/P/active<br>▪ 2 pieces side brackets, pivoting for deflector mirror PSR01-1501 | 2021569 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Large housing profile | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026850 |


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### Connector technology

| Connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| System connection Hirschmann plug | Hirschmann cable socket | ▪ 11-pin + PE<br>▪ Straight | – | 6020757 |
| | | ▪ 11-pin + PE<br>▪ Angled | – | 6020758 |
| System connection M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |

### Device columns

| Designation | Description | Part number |
|---|---|---|
| Device column without front screen | ▪ 2-beam, 500 mm beam separation<br>▪ Including mounting kit | 2021328 |
| Device column with front screen [1] | ▪ Length 1200 mm<br>▪ Including mounting kit | 2021330 |
| | ▪ Length 1500 mm<br>▪ Including mounting kit | 2021331 |
| | ▪ Length 1700 mm<br>▪ Including mounting kit | 2021332 |

[1] Warning, reduction of the scanning range!

### Mirror column [1]

| Designation | Description | Part number |
|---|---|---|
| Mirror column, fully assembled with mirrors 45° | ▪ Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation | 1015042 |

[1] Warning, reduction of the scanning range!

### Deflector mirror [1]

| Designation | Description | Part number |
|---|---|---|
| Deflector mirror PSR01-S04 | ▪ Suitable for M20Z-02550xxxx with end caps for swivel mount bracket (large housing) and front screen | 1025227 |

[1] Warning, reduction of the scanning range!

➜ For dimensional drawings of the device columns, mirror columns and deflector mirrors please refer to the operating instructions/technical description. Download at www.sickusa.com/literature

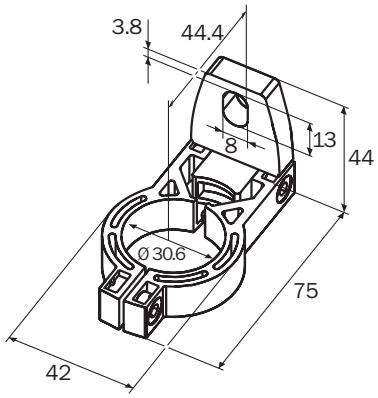
### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

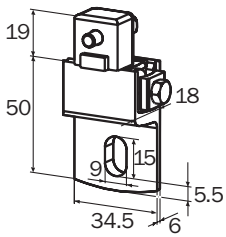

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## Dimensional drawings mounting systems

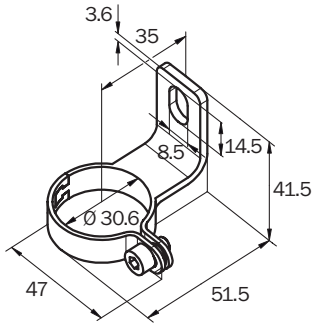
Dimensions in mm



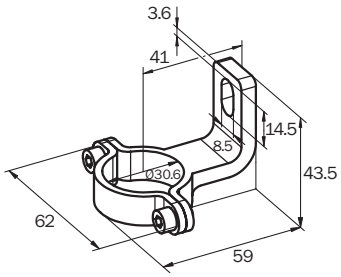

Swivel mount
Mounting kit 2
Mounting kit 9




Side bracket
Mounting kit 6
Mounting kit 9




Stainless steel bracket




Reinforced stainless steel bracket

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## Overview of technical specifications

| | |
|---|---|
| **Scanning range** | 0 m ... 6 m |
| **Number of beams** | 1 |
| **Beam separation** | 500 mm |
| **Type** | Type 2 according to EN 61496 |
| **Enclosure rating** | IP 65 |

## Product description

The M2000-A/P RES/EDM multi-beam safety device is composed of a sender/receiver unit on the active side (A) and one or more deflector mirrors on the passive side (P).
With their high signal reserve, they are also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.
The integrated restart interlock in the M2000-A/P RES/EDM offers the advantages of shorter cable runs and quicker commissioning compared to traditional solutions.

## In-system added value

- Combination with safe control solutions from SICK

| Combination with | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|
| **LE20 Muting** | ✔ | ✔ | ✔ | N-64 |
| **UE48-2OS** | ✔ | ✔ | – | N-42 |
| **UE48-3OS** | ✔ | ✔ | – | N-48 |
| **UE10-3OS** | Relay module | | | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry






- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid

F

| Further information | Page |
|---|---|
| → Ordering information | F-76 |
| → Technical specifications | F-76 |
| → Dimensional drawings | F-77 |
| → Connection diagram | F-78 |
| → Accessories | F-79 |
| → Dimensional drawings accessories | F-81 |
| → Services | A-2 |


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# Ordering information

M2000-A/P RES/EDM
- Comprising a sender/receiver unit as the active side and a deflector mirror as the passive side

→ Accessories, see page F-79

## Scanning range 0 ... 6 m

| Number of beams | Beam separation (mm) | Connection plug | Sender and receiver unit | | Deflector mirror | |
|---|---|---|---|---|---|---|
| | | | Type | Part number | Type | Part number |
| 1 | 500 | Hirschmann 11-pin + PE | M20Z-02550A221 | 1018239 | PSR01-1501 | 1016677 |
| | | M12, 8-pin | M20Z-02550A222 | 1018362 | | |

# Detailed technical specifications

F

→ You can find more detailed data in the operating instructions/technical description. Download at www.sickusa.com/literature

### General system data

| | |
|---|---|
| **Scanning range** | 0 m ... 6 m |
| **Number of beams** | 1 |
| **Beam separation** | 500 mm |
| **Enclosure rating** | IP 65 |
| **Type** | Type 2 according to EN 61496 |
| **Synchronisation** | Optical, without separate synchronisation |
| **Supply voltage $V_S$** | 24 V (19.2 V ... 28.8 V) DC |

### Sender/receiver unit

| | |
|---|---|
| **Switching outputs (OSSDs)** | 2 PNP semiconductors<br>(short-circuit protected, cross-circuit monitored) |
| **Response time (depending on type)** | Max. 7 ms |
| **Switching voltage**<br>**$HIGH_{min}$**<br>**$LOW_{max}$** | <br>$V_S$ – 2.25 V<br>1 V |
| **Switching current** | Max. 500 mA |
| **Power consumption** | Max. 7.5 W |

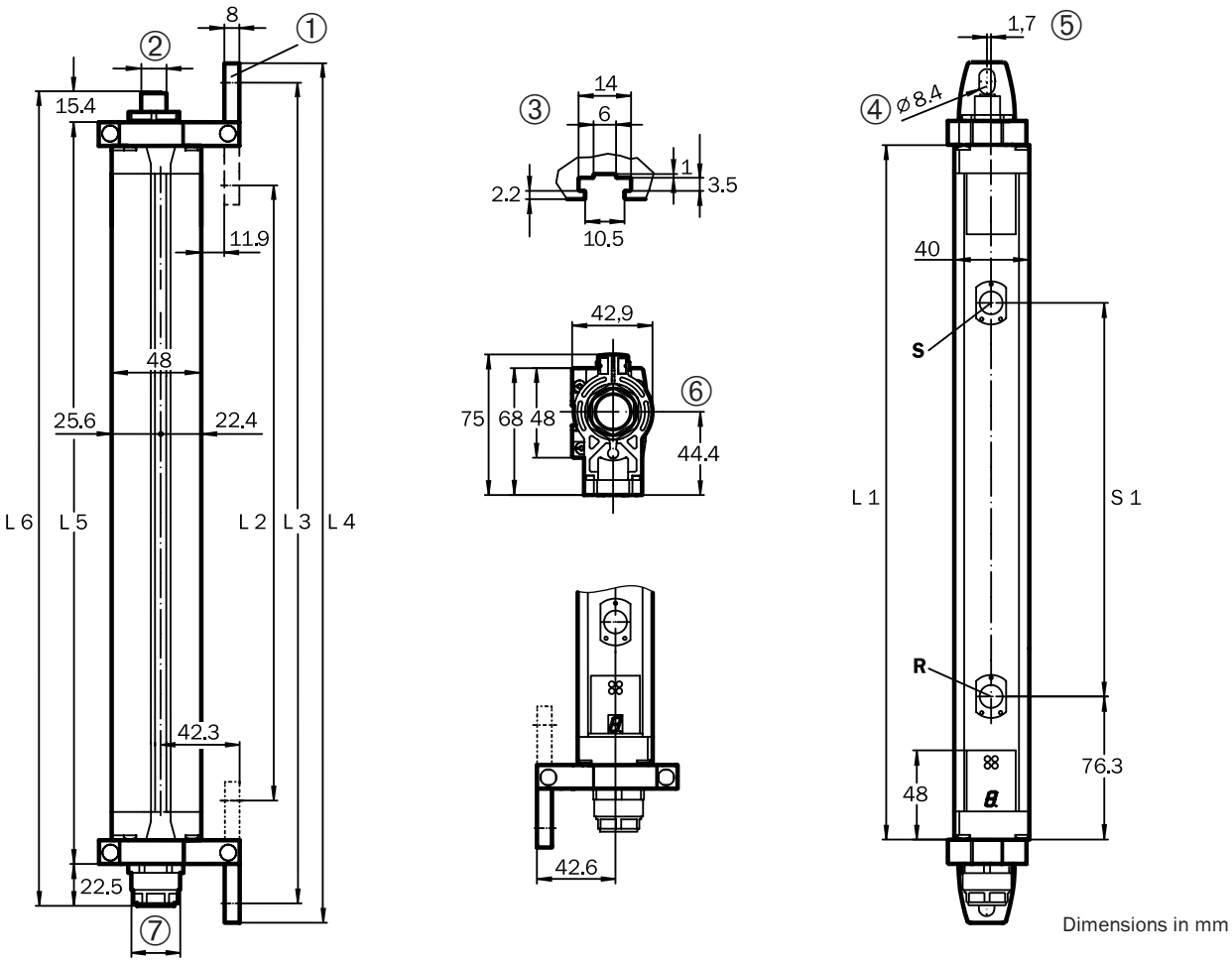
### Operating data

| | |
|---|---|
| **Connection type (depending on type)** | Hirschmann plug 11-pin + PE<br>M12 plug, 8-pin |
| **Connection cable wire cross-section**<br>**Hirschmann plug**<br>**M12 plug** | <br>Max. 1 $mm^2$<br>Max. 0.25 $mm^2$ |
| **Connection cable length**<br>**for wire cross-section 1 $mm^2$**<br>**for wire cross-section 0.25 $mm^2$** | <br>Max. 60 m<br>Max. 15 m |
| **Ambient operating temperature $T_A$** | 0 °C ... +55 °C |
| **Storage temperature $T_S$** | –25 °C ... +70 °C |
| **Air humidity** | 15 % ... 95 % |
| **Housing cross-section** | 48 mm x 40 mm |
| **Vibration resistance** | 5 g, 10 ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |
| **Weight (depending on type)** | 1.25 kg ... 2.86 kg |


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# Dimensional drawings

➜ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sickusa.com/literature




Dimensions in mm

Sender/receiver unit with swivel mount

① Mounting clamp
② M12 x 1 socket (standard)
③ Sliding nut groove for side mounting
④ Hex screw M8, DIN 933 with washer. DIN 9021 (not supplied with delivery)
⑤ Centre of light beam offset
⑥ Adjustment
⑦ Plug PG13.5 according to DIN 43651
**S** Sender
**R** Receiver

| N | S 1 | L 1 | L 2 | L 3 | L 4 | L 5 | L 6 |
|---|---|---|---|---|---|---|---|
| 2 | 500 | 653 | 611 | 720 | 741 | 678 | 716 |

**N** Number of beams **S 1** Beam separation

Dimensions in mm

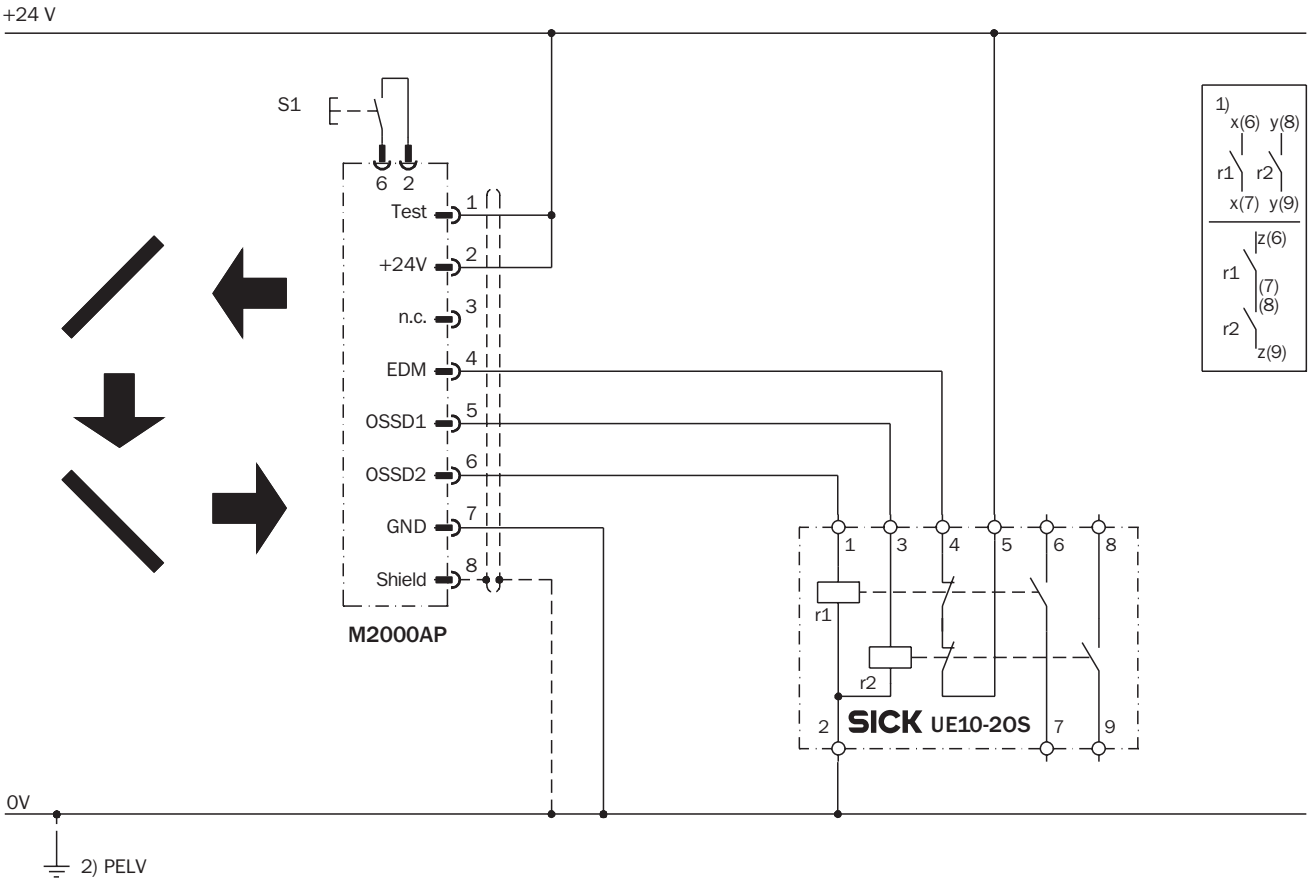
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# Connection diagram

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## M2000-A/P RES/EDM on UE10-2OS safety relay




**Task**

Interfacing an M2000-A/P RES/EDM multi-beam photoelectric safety switch to UE10-2OS. Operating mode with restart interlock and external device monitoring.

**Function**

The yellow LED on the M2000-A/P RES/EDM flashes when the light path is clear and the UE10-2OS is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-2OS is switched on. On interruption of one of the light beams, the UE10-2OS is de-energised by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-2OS will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

**Comments**

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

F

# Accessories

**Mounting systems**

→ Dimensional drawings for mounting systems, see page F-81

| Designation | Description | Part number |
|---|---|---|
| Mounting kit 2 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Swivel mount | 2019659 |
| Mounting kit 6 | ▪ 4 pieces<br>▪ Pivoting<br>▪ Side bracket | 2019506 |
| Mounting kit 9 | ▪ 2 pieces swivel mount, pivoting for sender/receiver unit M2000-A/P/active<br>▪ 2 pieces side brackets, pivoting for deflector mirror PSR01-1501 | 2021569 |
| Stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Large housing profile | 2023708 |
| Reinforced stainless steel bracket | ▪ 4 pieces<br>▪ Pivoting<br>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz<br>▪ Shock resistance 10 g, 16 ms | 2026850 |

Continued on next page


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### Connector technology

| Connection | Designation | Description | Connection cable | Part number |
|---|---|---|---|---|
| System connection Hirschmann plug | Hirschmann cable socket | ▪ 11-pin + PE<br>▪ Straight | – | 6020757 |
| | | ▪ 11-pin + PE<br>▪ Angled | – | 6020758 |
| System connection M12 plug | M12 cable socket | ▪ 8-pin<br>▪ Straight | 2.5 m | 6020537 |
| | | | 5.0 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10.0 m | 6020352 |
| | | | 15.0 m | 6020872 |
| | | ▪ 8-pin<br>▪ Angled | 5.0 m | 6021342 |
| | | | 15.0 m | 6021343 |

### Device columns

| Designation | Description | Part number |
|---|---|---|
| Device column without front screen | ▪ 2-beam, 500 mm beam separation<br>▪ Including mounting kit | 2021328 |
| Device column with front screen [1] | ▪ Length 1200 mm<br>▪ Including mounting kit | 2021330 |
| | ▪ Length 1500 mm<br>▪ Including mounting kit | 2021331 |
| | ▪ Length 1700 mm<br>▪ Including mounting kit | 2021332 |

[1] Warning, reduction of the scanning range!

### Device columns for outdoor use

| Designation | Description | Part number |
|---|---|---|
| Device column with heating 220 V | ▪ Suitable for M20-02x50Axxx and M20Z-02x50Axxx<br>▪ With brackets and cable socket<br>▪ Without photoelectric safety switch | 2023707 |

### Mirror column [1]

| Designation | Description | Part number |
|---|---|---|
| Mirror column, fully assembled with mirrors 45° | ▪ Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation | 1015042 |

[1] Warning, reduction of the scanning range!

### Deflector mirror [1]

| Designation | Description | Part number |
|---|---|---|
| Deflector mirror PSR01-S04 | ▪ Suitable for M20Z-02550xxxx with end caps for swivel mount bracket (large housing) and front screen | 1025227 |

[1] Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns, mirror columns and deflector mirrors please refer to the operating instructions/technical description. Download at www.sickusa.com/literature

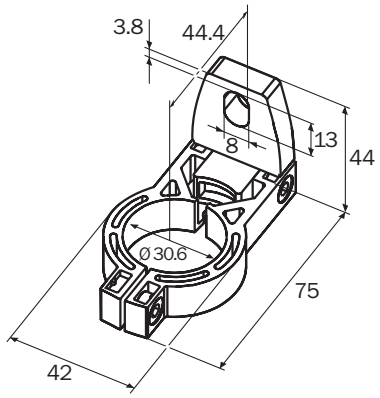
### Power supply units

| Input voltage | Output voltage | Maximum output current | Part number |
|---|---|---|---|
| 100 V AC, 240 V AC | 24 V DC | 2.1 A | 7028789 |
| | | 3.9 A | 7028790 |

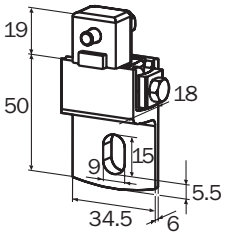

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## Dimensional drawings mounting systems

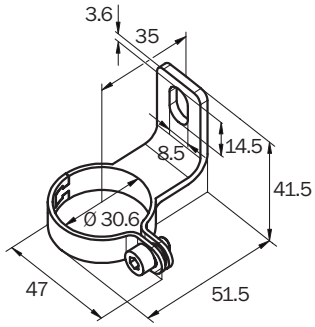
Dimensions in mm



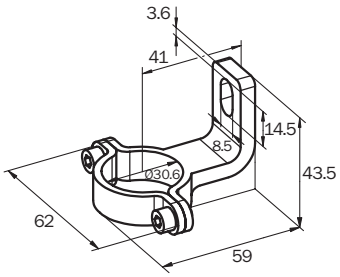

Swivel mount
Mounting kit 2
Mounting kit 9




Side bracket
Mounting kit 6
Mounting kit 9



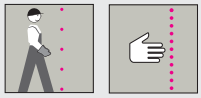

Stainless steel bracket




Reinforced stainless steel bracket

F


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- Easy to mount
- Optimal adjustment
- Protection of the light beam safety devices
- Very stable
- Of universal application for:
  - Multiple light beam safety devices
  - Safety light curtains

F

## Overview of technical specifications

| | |
|---|---|
| **Suitable for** | M4000<br>M2000<br>C4000<br>C2000 |
| **Number of beams (depending on type)** | 2, 3, 4 |
| **Protective field heights (depending on type)** | 150 mm ... 1350 mm |
| **Column heights (depending on type)** | 1200 mm, 1500 mm, 1700 mm |
| **Design versions (depending on type)** | ▪ With front plate<br>▪ With front screen<br>▪ With front screen heating for outdoor use (up to –15 °C) |

## Product description

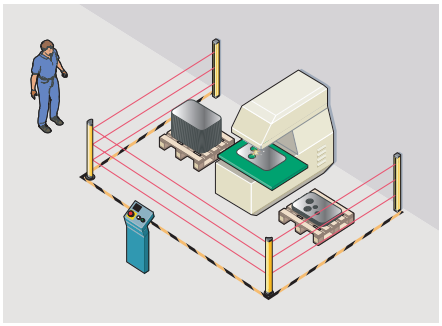
Mirror columns and device columns are used where protection on several sides is necessary or there are problems mounting optoelectronic protective devices.
On machining centres the optoelectronic protective devices must be positioned free-standing in the room. The combination of light beam safety devices with deflector mirrors is the right solution here: as there are only two active sides, the wiring effort is considerably reduced.

The adjustment of the deflector mirrors mounted in sturdy columns is very straightforward. Here the unhindered access for loading as well as for changing tools and programs is a further advantage over mechanical fencing.
The use of mirror columns and device columns results in increased productivity.

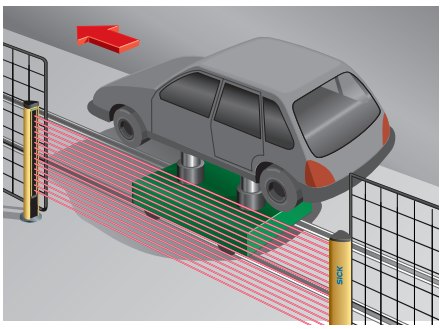
## Applications

→ For more applications please refer to the application finder at www.sickusa.com/applications

- Machine tool industry
- Storage and conveyor technology
- Packaging industry
- Stone production
- Automotive industry



Machine tool industry: Access protection with deflector mirror columns on a punching machine



Automotive industry: Hazardous point protection on an assembly line


| Further information | Page |
|---|---|
| → Accessories | F-85 |
| → Dimensional drawings | F-86 |




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# Ordering information

## Mirror columns for multiple light beam safety devices [1)]

| Description | Suitable for | Number of beams | Beam separation (mm) | Type | Part number |
|---|---|---|---|---|---|
| ▪ Horizontal deflection | ▪ M40#-0250#####<br>▪ M20S-02#50####<br>▪ M20E-02#50#### | 2 | 500 | PM3S96-00240020 | 1040619 |
| | ▪ M40#-03400####<br>▪ M40#-03401####<br>▪ M20#-03#40#1## | 3 | 400 | PM3S11-00330030 | 1040625 |
| | ▪ M40#-0430#####<br>▪ M20#-04#30#### | 4 | 300 | PM3S13-00430040 | 1040626 |
| | ▪ M40#-0260##### | 2 | 600 | PM3S96-00230060 | 1040620 |
| | ▪ M40#-0345##### | 3 | 450 | PM3S13-00330050 | 1040624 |
| ▪ Vertical deflection | ▪ M40Z-0250#####<br>▪ M20Z-02####### | 2 | 500 | PM2Z96-30240020 | 1027265 |
| ▪ Horizontal deflection<br>▪ With mirror for viewing the rear of the machine | ▪ M40#-0250#####<br>▪ M20S-02#50####<br>▪ M20E-02#50#### | 2 | 500 | PM3S96-S17 | 1040622 |

[1)] Warning, reduction of the scanning range!
The scanning range is reduced per mirror deflection (n) in accordance with the following formula:
Scanning range (with mirror deflection) = Scanning range (of the light beam safety device without mirror deflection) × $\sqrt{0{,}8^n}$

Example: M2000 with a scanning range of 25 m is deflected three times. The scanning range is now 25 m × $\sqrt{0{,}8^3}$ = 17.8 m

## Device columns with front plate for multiple light beam safety devices

| Description | Suitable for | Number of beams | Beam separation (mm) | Type | Part number |
|---|---|---|---|---|---|
| ▪ Without cut-out for indicator lamps<br>▪ Including mounting kit | ▪ M40#-02500####<br>▪ M40#-02501#### | 2 | 500 | PU2M96-10240020 | 2031438 |
| | ▪ M40#-03400####<br>▪ M40#-03401#### | 3 | 400 | PU2M11-10330030 | 2032465 |
| | ▪ M40#-04300####<br>▪ M40#-04301#### | 4 | 300 | PU2M13-10430040 | 2032466 |
| | ▪ M40#-02600####<br>▪ M40#-02601#### | 2 | 600 | PU2M96-10230060 | 2032969 |
| | ▪ M40#-03450####<br>▪ M40#-03451#### | 3 | 450 | PU2M13-10330050 | 2032971 |
| | ▪ M20S-02#50#1##<br>▪ M20E-02#50#1## | 2 | 500 | PU2G96-10240020 | 2032039 |
| | ▪ M20#-02#50#2## | 2 | 500 | PUG12-1024002 | 2021328 |
| | ▪ M20#-03#40#1## | 3 | 400 | PU2G11-10330030 | 2032040 |
| | ▪ M20#-03#40#2## | 3 | 400 | PUG12-1033003 | 2021329 |
| ▪ With cut-out for indicator lamps<br>▪ Including mounting kit | ▪ M40#-02502####<br>▪ M40#-02503#### | 2 | 500 | PU2M96-50240020 | 2032467 |
| | ▪ M40#-03402####<br>▪ M40#-03403#### | 3 | 400 | PU2M11-50330030 | 2032468 |
| | ▪ M40#-04302####<br>▪ M40#-04303#### | 4 | 300 | PU2M13-50430040 | 2032469 |
| | ▪ M40#-02602####<br>▪ M40#-02603#### | 2 | 600 | PU2M96-50230060 | 2032970 |
| | ▪ M40#-03452####<br>▪ M40#-03453#### | 3 | 450 | PU2M13-50330050 | 2032972 |

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## Device columns with front screen for multiple light beam safety devices and safety light curtains [1)]

| Suitable for | Protective field height (mm) | Max. installation length (mm) | Description | Type | Part number |
|---|---|---|---|---|---|
| ▪ M4000 | – | 1200 | ▪ Including mounting kit | PUM12-4 | 2018608 |
| | | 1700 | | PUM17-4 | 2018767 |
| ▪ M2000 | – | 1200 | ▪ Including mounting kit 2 (2 pieces) | PUG12-4 | 2021330 |
| | | 1500 | | PUG15-4 | 2021331 |
| | | 1700 | | PUG17-4 | 2021332 |
| ▪ C4000 Basic<br>▪ C4000 Standard/ Advanced without extension connection<br>▪ C2000 (large housing) | 300 ... 900 | 1200 | ▪ Including mounting kit 2 (2 pieces) | PUG12-4 | 2021330 |
| | 300 ... 1200 | 1500 | | PUG15-4 | 2021331 |
| | 300 ... 1350 | 1700 | | PUG17-4 | 2021332 |
| | 1350 | 1700 | | PUG17-4 | 2021332 |
| ▪ C4000 Micro<br>▪ C2000 Standard | 150 ... 1050 | 1200 | ▪ Including mounting kit 1 (2 pieces) | PUK12-4 | 2021333 |
| | 150 ... 1200 | 1500 | | PUK15-4 | 2021242 |
| | | 1700 | | PUK17-4 | 2021337 |
| ▪ C4000 Standard/ Advanced with extension connection | 300 ... 600 | 1200 | ▪ Including mounting kit 2 (2 pieces) | PUG12-4 | 2021330 |
| | 300 ... 900 | 1500 | | PUG15-4 | 2021331 |
| | 300 ... 1200 | 1700 | | PUG17-4 | 2021332 |
| ▪ C2000 RES/EDM<br>▪ C2000 Cascadable | 150 ... 900 | 1200 | ▪ Including mounting kit 1 (2 pieces) | PUK12-4 | 2021333 |
| | 150 ... 1200 | 1500 | | PUK15-4 | 2021242 |
| | | 1700 | | PUK17-4 | 2021337 |

[1)] Warning, reduction of the scanning range! Each front screen reduces the scanning range by 7.5 %.
Example: C2000 sender and receiver mounted in device columns, two front screens reduce the scanning range: 19 m × 0.85 = 16.1 m

➜ Note on ordering: Device columns for safety light curtains with installation lengths greater than 1700 mm are available upon request

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## Device columns for outdoor use (to –15 °C) for multiple light beam safety devices [1)]

| Description | Suitable for | Number of beams | Beam separation (mm) | Type | Part number |
|---|---|---|---|---|---|
| ▪ With front screen heating, 220 V<br>▪ Including brackets and cable socket (without light beam safety device) | ▪ M4000 Standard M40#-0250#0##0<br>▪ M4000 Standard A/P M40Z-025000#R0<br>▪ M4000 Advanced M40#-0250#3##0<br>▪ M4000 Advanced A/P M40Z-025003##0 | 2 | 500 | PUM12-S02 | 2019654 |
| | ▪ M4000 Standard M40#-0340#0##0<br>▪ M4000 Advanced M40#-0340#3##0 | 3 | 400 | PUM12-S01 | 2020800 |
| | ▪ M20#-02#50A###<br>▪ M20Z-02#50A### | 2 | 500 | PUG12-S02 | 2023707 |
| | ▪ M20#-03#40A### | 3 | 400 | PUG12-S01 | 2025441 |

[1)] Warning, reduction of the scanning range! Each front screen reduces the scanning range by 7.5 %.
Example: M2000 sender and receiver mounted in device columns, two front screens reduce the scanning range: 25 m × 0.85 = 21.25 m

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# Accessories

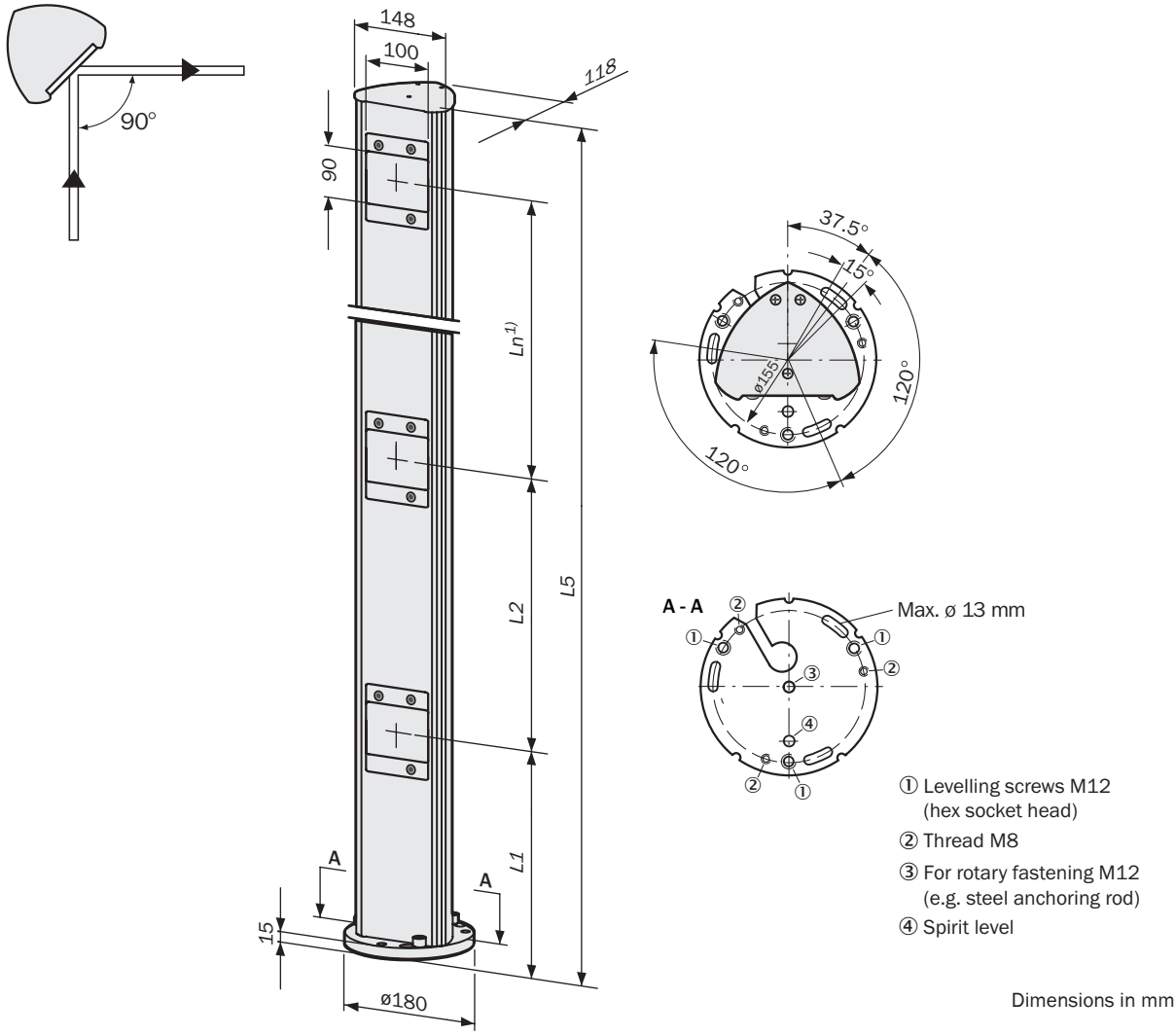
**Mounting accessories**

| Type | Description | Part number |
|---|---|---|
| Adjusting plate | ▪ For floor fastening | 4031053 |
| Steel plug | | 5308961 |
| Mounting bracket UE403 | ▪ For fastening to base plate<br>▪ Incl. screws | 2032035 |


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# Dimensional drawings

## Mirror column with horizontal deflection for multiple light beam safety devices




Dimensions in mm

1) Ln in the illustration corresponds to the values L3 and L4 in the table depending on the mirror column

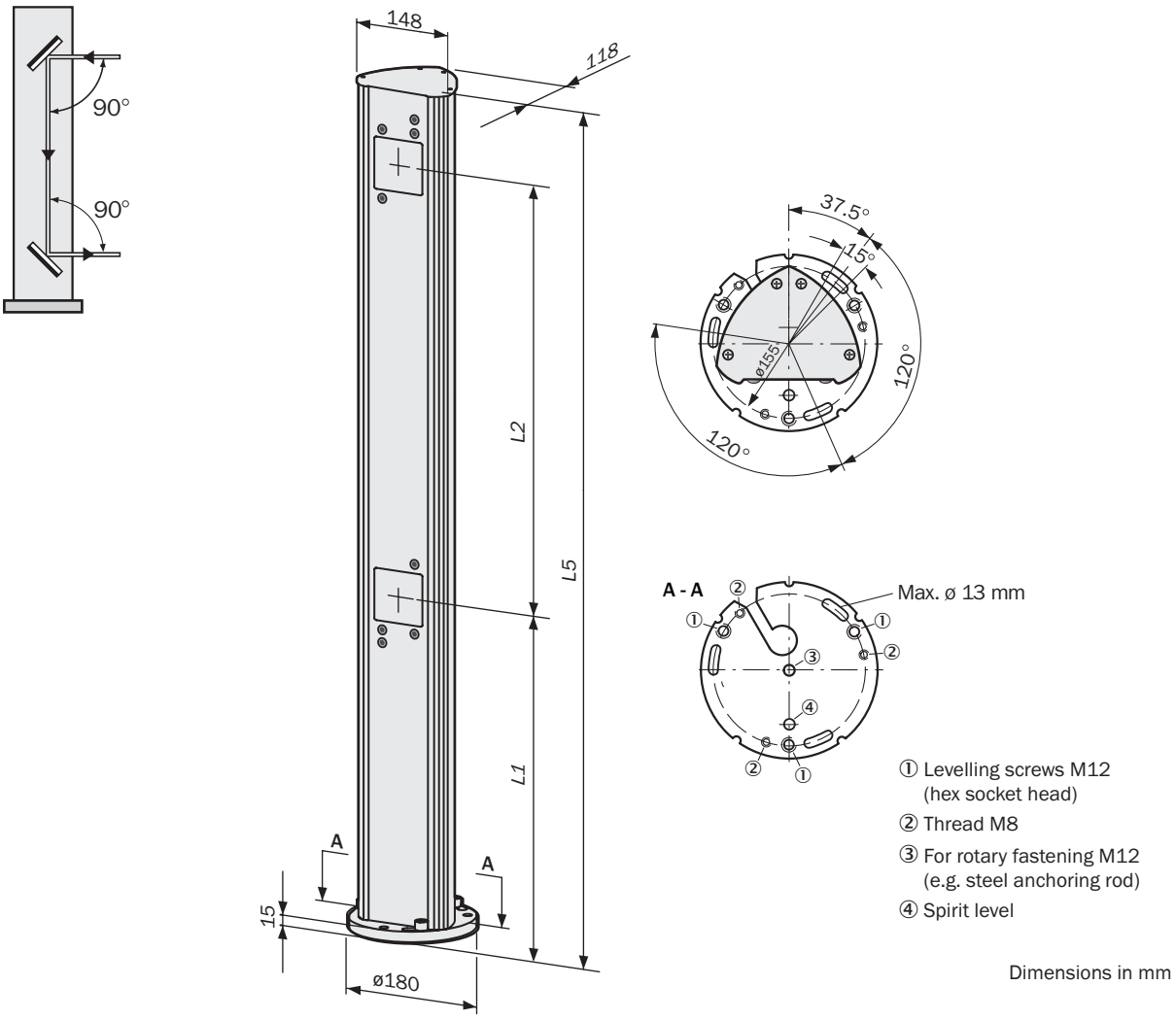
| Number of beams | L1 | L2 | L3 | L4 | L5 | Part number |
|---|---|---|---|---|---|---|
| 2 | 400 | 500 | – | – | 985 | 1040619 |
| 2 | 400 | 500 | – | – | 985 | 1040622 |
| 3 | 300 | 400 | 400 | – | 1185 | 1040625 |
| 4 | 300 | 300 | 300 | 300 | 1285 | 1040626 |
| 2 | 300 | 600 | – | – | 985 | 1040620 |
| 3 | 300 | 450 | 450 | – | 1285 | 1040624 |

Dimensions in mm

➜ Note on mounting: The mirrors can be quickly and straightforwardly adjusted using adjusting screws


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## Mirror column with vertical deflection for multiple light beam safety devices




Dimensions in mm

| Number of beams | L1 | L2 | L5 | Part number |
|---|---|---|---|---|
| **2** | 400 | 500 | 985 | 1027265 |

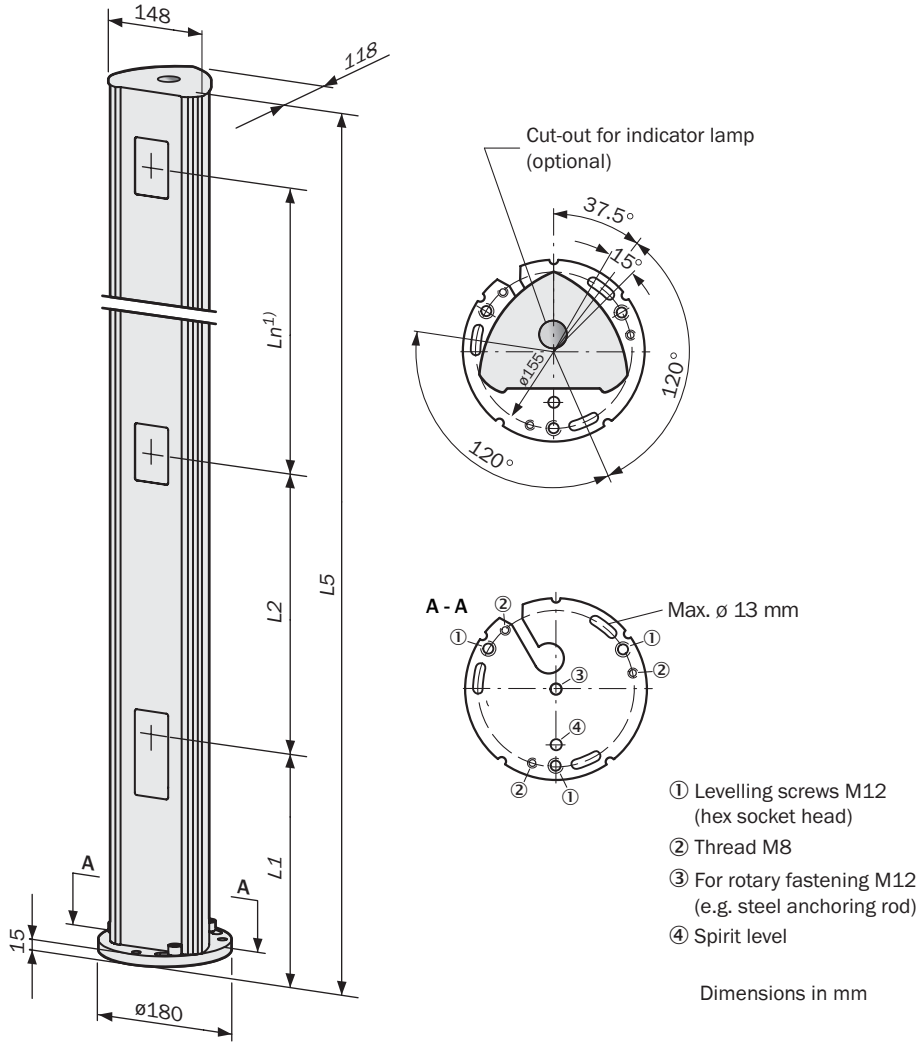
Dimensions in mm

➜ Note on mounting: The mirrors can be quickly and straightforwardly adjusted using adjusting screws in the front plate

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## Device column with front plate for multiple light beam safety devices



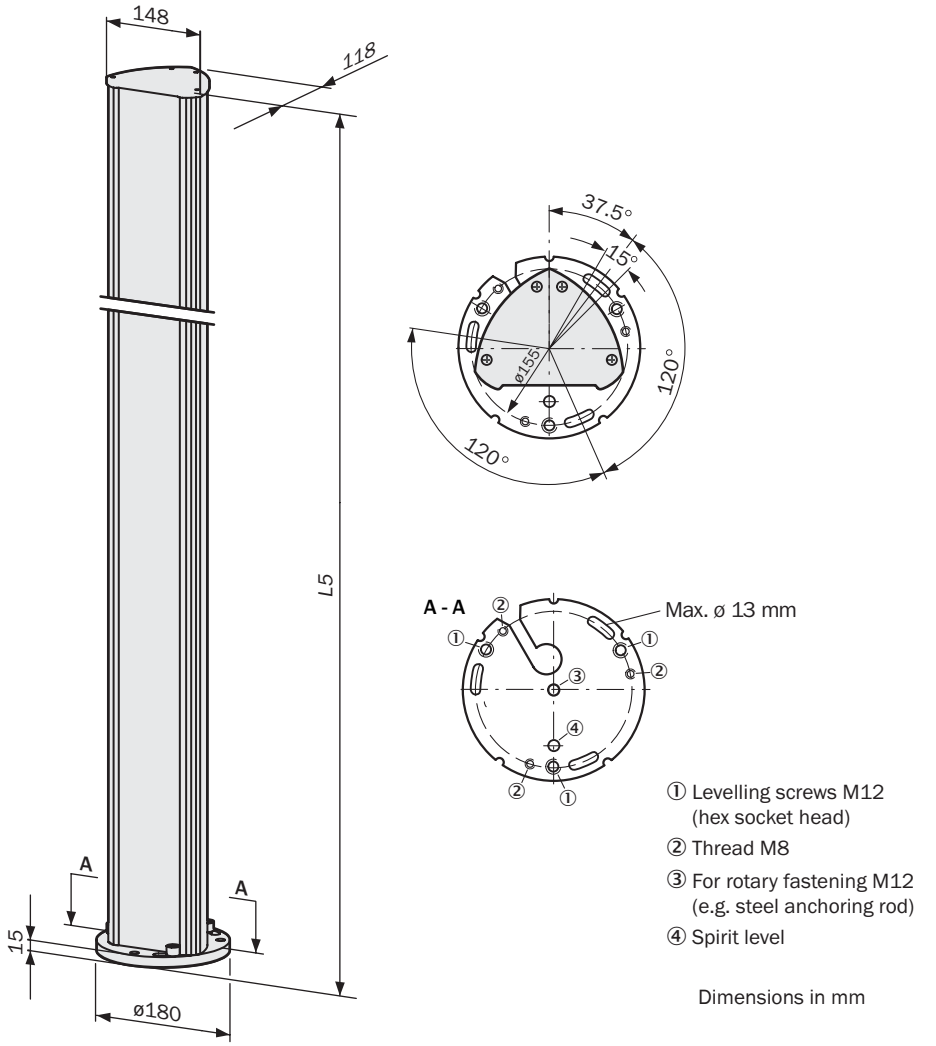

[1] Ln in the illustration corresponds to the values L3 and L4 in the table depending on the device column

| Number of beams | L1 | L2 | L3 | L4 | L5 | Part number |
|---|---|---|---|---|---|---|
| 2 | 400 | 500 | – | – | 985 | 2031438 |
| 3 | 300 | 400 | 400 | – | 1185 | 2032465 |
| 4 | 300 | 300 | 300 | 300 | 1285 | 2032466 |
| 2 | 300 | 600 | – | – | 985 | 2032969 |
| 3 | 300 | 450 | 450 | – | 1285 | 2032971 |
| 2 | 400 | 500 | – | – | 985 | 2032467 |
| 3 | 300 | 400 | 400 | – | 1185 | 2032468 |
| 4 | 300 | 300 | 300 | 300 | 1285 | 2032469 |
| 2 | 300 | 600 | – | – | 985 | 2032970 |
| 3 | 300 | 450 | 450 | – | 1285 | 2032972 |
| 2 | 400 | 500 | – | – | 985 | 2032039 |
| 2 | 400 | 500 | – | – | 1220 | 2021328 |
| 3 | 300 | 400 | 400 | – | 1185 | 2032040 |
| 3 | 300 | 400 | 400 | – | 1220 | 2021329 |

Dimensions in mm


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## Device column with front screen for multiple light beam safety devices and safety light curtains




Dimensions in mm

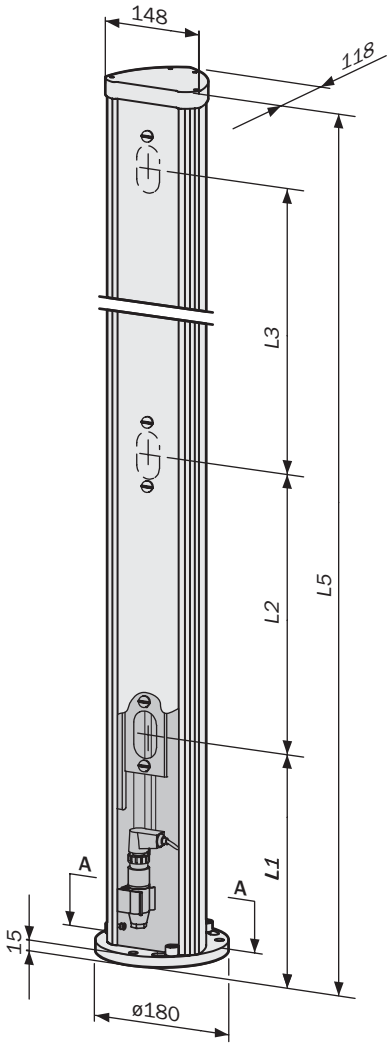
| L5 | Part number |
|---|---|
| 1220 | 2018608 |
| 1720 | 2018767 |
| 1220 | 2021333 |
| 1520 | 2021242 |
| 1720 | 2021337 |
| 1220 | 2021330 |
| 1520 | 2021331 |
| 1720 | 2021332 |

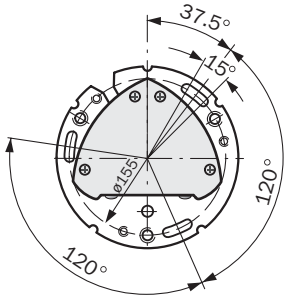
Dimensions in mm

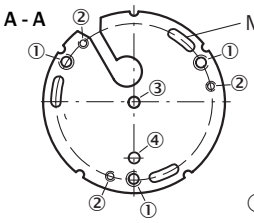

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## Device column for outdoor use for multiple light beam safety devices, with heating




① Levelling screws M12 (hex socket head)
② Thread M8
③ For rotary fastening M12 (e.g. steel anchoring rod)
④ Spirit level

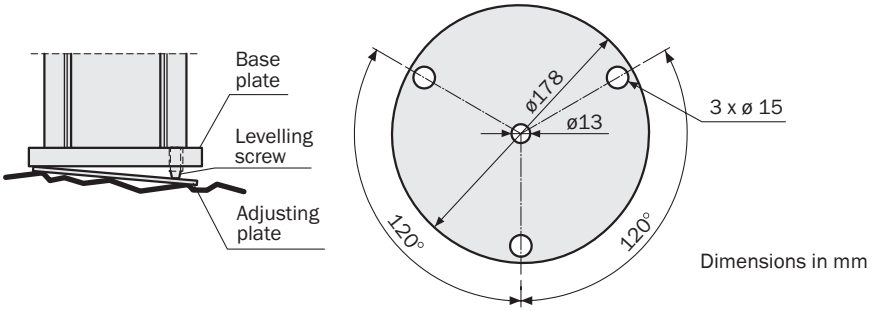
Dimensions in mm

| Number of beams | L1 | L2 | L3 | L5 | Part number |
|---|---|---|---|---|---|
| **2** | 400 | 500 | – | 1223 | 2019654 |
| **2** | 400 | 500 | – | 1223 | 2023707 |
| **3** | 300 | 400 | 400 | 1223 | 2020800 |
| **3** | 300 | 400 | 400 | 1223 | 2025441 |

Dimensions in mm


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## Adjusting plate

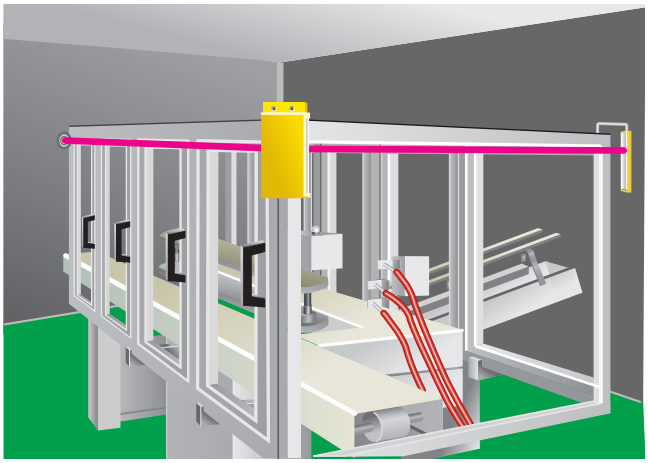



Dimensions in mm

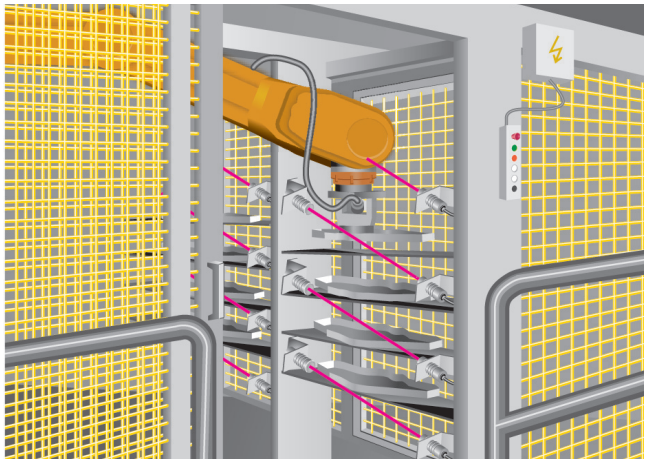
F


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# Electrosensitive access protection of hazardous areas with type 2 and type 4 single-beam photoelectric safety switches



Door monitoring on a packaging machine



Monitoring robot presence at a loading station

SICK's single-beam photoelectric safety switches consist either of testable senders and receivers, or of testable senders and receivers combined with an evaluation unit. These devices impress both with their large scanning range and the variety of shapes and sizes available. They also offer maximum safety performance as they comply with type 2 or type 4 in accordance with EN 61496.

The possible applications are very wide-ranging: Whether on robots, processing machines, machining centres, palletising systems, high-bay warehouses or transfer lines – with products from SICK you will profit from a customer-friendly solution of the highest quality.

**Double benefit for low stock-keeping costs**

You profit twice with SICK devices, as you can also use the photoelectric safety switches for your automation applications. You only need to keep one type of through-beam photoelectric switch in stock and can thus reduce your costs.

**Also safe in extreme situations**

All single-beam photoelectric safety switches from SICK have an IP 67 enclosure rating and are therefore very well equipped to withstand extreme conditions such as heat (up to +60 °C), cold (to –40 °C) or humidity. SICK also provides solutions for changing ambient conditions and the outdoor area.

**Flexible technology that adapts as required**

SICK photoelectric safety switches offer you more flexibility than ever before. You will profit from the very wide range of shapes, sizes and types and will have a very large choice of housing materials. Whether rectangular or cylindrical photoelectric switches, at SICK you will always find the right solution for your application.

**Impressive performance, optimum price**

You will also profit from an optimum price-performance ratio. SICK products are optimally matched to one another.

## Safety services

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A



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# Single-beam photoelectric safety switches



G

| Safety application | Type according to IEC/EN 61496 | Number of sensors | Scanning range (m) | Ambient operating temperature (°C) | Type | Construction size (mm), (H x W x D or Ø x L) | Functions: Muting | Functions: Restart interlock | Functions: External device monitoring | Product | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Type 4 | 8 [1] | 0 ... 5<br>0 ... 10<br>0 ... 60 | –20 ... +55 | Cylindrical | M18 x 108<br>M18 x 98<br>M30 x100 | – | ✔ [1] | ✔ [1] | L4000/L400 | G-2 |
| | | 1 | 0.5 ... 18<br>15 ... 70 | –25 ... +55 | Rectangular | 156 x 50 x 116 | – | ✔ [4] | ✔ [4] | WSU/WEU26/2 | G-11 |
| | Type 2 | 6 [2] | 0 ... 12/18 [3] | –25 ... +60 | Rectangular | 75.5 x 17.6 x 33.5 | ✔ [2] | ✔ [2] | ✔ [2] | WS/WE18-3 | G-17 |
| | | | 0 ... 25/35 [3] | –40 ... +60 | Rectangular | 80 x 24 x 53.5 | ✔ [2] | ✔ [2] | ✔ [2] | WS/WE27-2 | G-22 |
| | | | 0 ... 16/22 [3] | –40 ... +60 | Cylindrical | M18 x 80 | ✔ [2] | ✔ [2] | ✔ [2] | VS/VE18-2 | G-27 |

[1] With UE401

[2] With LE20 / LE20 Muting / UE410 Flexi

[3] Typical / maximum

[4] With LCU-X



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- Restart interlock (RES)
- External device monitoring (EDM)
- Maximum 8 sensor pairs
- Simple alignment
- Simple diagnostics and service

G

## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0 m ... 10 m / 0 m ... 5 m / 0 m ... 60 m |
| **Construction size (depending on type)** | M18 x 107.7 mm / M18 x 97.7 mm / M30 x 100 mm |
| **Enclosure rating** | IP 67 |
| **Ambient operating temperature from ... to** | –20 °C ... +55 °C |
| **Type** | Type 4 (IEC 61496), only in conjunction with UE401 |

## Product description

The L4000 photoelectric safety switch system comprises the UE401 safety evaluation unit, to which up to 4 L4000/L400 sensors (sender/receiver combinations) can be connected as single pairs or up to 8 sensors can be connected in cascade. The UE401 safety evaluation device is the connecting link between sensors and machine controller.
Colour LEDs provide in-situ information on operational status. The indication of status and error messages on the 7-segment display of the UE401 safety evaluation unit allows rapid diagnostics. The possibility of connecting 4 individual sensor pairs or 8 sensors, the range of versions providing the right scanning range for the specific application, the suitability for outdoor applications, and the use of deflector mirrors also allow for the solution of complex protection tasks.

## In-system added value

- Supports integration with multiple safety control solutions

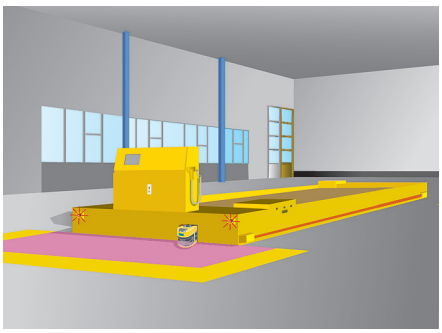
| Combination with | Number of enable current paths | Number of signalling current paths | Further information |
|---|---|---|---|
| **UE10-3OS** | 3 | 1 | N-3 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

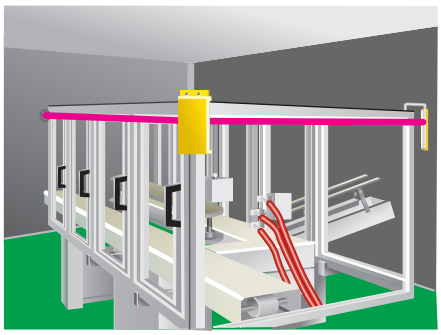
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Robots
- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Lateral protection on an automated guided vehicle



Door monitoring on a packaging machine


| Further information | Page |
|---|---|
| → Technical specifications | G-4 |
| → Dimensional drawings | G-7 |
| → Connection diagrams | G-8 |
| → Accessories | G-9 |
| → Services | A-2 |




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# Ordering information

## Evaluation unit UE401

| Type | Part number |
|---|---|
| UE401-A0010 | 6027343 |

## Single-beam photoelectric safety switch L4000

- Construction size M30 x 100 mm
- Plug M12 x 4, angled

| Scanning range | Optical axis | Housing material | System part | Type | Part number |
|---|---|---|---|---|---|
| 0 m ... 60 m | Axial | Metal | Sender | L40S-33MA2A | 6027335 |
| | | | Receiver | L40E-33MA2A | 6027336 |

## Single-beam photoelectric safety switch L400

- Plug M12 x 4, straight

| Scanning range | Optical axis | Construction size | Housing material | System part | Type | Part number |
|---|---|---|---|---|---|---|
| 0 m ... 5 m | Radial | M18 x 107.7 mm | Metal | Sender | L40S-11MA1A | 6027341 |
| | | | | Receiver | L40E-11MA1A | 6027342 |
| 0 m ... 10 m | Axial | M18 x 97.7 mm | Plastic | Sender | L40S-21KA1A | 6027337 |
| | | | | Receiver | L40E-21KA1A | 6027338 |
| | | | Metal | Sender | L40S-21MA1A | 6027339 |
| | | | | Receiver | L40E-21MA1A | 6027340 |

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# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## Evaluation unit UE401

### General data

| | |
|---|---|
| **Number of single-beam photoelectric safety switches from ... to** | Sensor pairs 1 ... 8 |
| **Maximum response time** | 30 ms |
| **Protection class** | III |
| **Enclosure rating** | IP 20 |
| **Type** | Type 4 (IEC 61496) |
| **Ambient operating temperature from ... to** | –20 °C ... +55 °C |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing |
| **Storage temperature from ... to** | –25 °C ... +75 °C |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) |
| **Weight** | 160 g |
| **Mounting** | Snap-on mounting on mounting rail acc. to EN 50022 |

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### Electrical data

| | |
|---|---|
| **Connector technology** | Interchangeable, coded screw-type terminals |
| **Cable length** | 100 m |
| **Conductor cross-section** | 0.25 mm² ... 2.5 mm² |
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC) |
| **Safety outputs** | 2 PNP semiconductors, short-circuit protected, cross-circuit monitored |
| **Power consumption** | < 3.6 W |
| **Switching voltage HIGH** | 24 V DC (17.5 V DC ... 28.8 V DC) |
| **Maximum switching voltage LOW** | 1.3 V DC |
| **Switching current** | 0.5 A |


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## Single-beam photoelectric safety switch L4000

### General data

| | L40S-33MA2A | L40E-33MA2A |
|---|---|---|
| System part | Sender | Receiver |
| Scanning range | 0 m ... 60 m | |
| Number of beams | 1 | |
| Optical axis | Axial | |
| Light beam diameter | 26 mm | |
| Aperture angle/receive angle | ±2.5°/±2.5° | |
| Light sender/type of light | LED (visible red light) | – |
| Wave length | 660 nm | – |
| Protection class | III | |
| Enclosure rating | IP 67 | |
| Type | Type 4 (IEC 61496), only in conjunction with UE401 | |
| Ambient operating temperature from ... to | –20 °C ... +55 °C | |
| Storage temperature from ... to | –25 °C ... +75 °C | |
| Air humidity from ... to | 15 % ... 95 %, non-dewing | |
| Vibration resistance | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) | |
| Shock resistance | 10 g, 16 ms (IEC 60068-2-29) | |
| Design | Cylindrical | |
| Dimensions (diameter x length) | M30 x 100 mm | |
| Housing material | Brass nickel-plated | |
| Lens material | Glass | |
| Weight | 212 g | |

### Electrical data

| | L40S-33MA2A | L40E-33MA2A |
|---|---|---|
| System part | Sender | Receiver |
| Connection type | Plug M12 x 4, angled | |
| Supply voltage $V_S$ | 24 V DC (19.2 V DC ... 28.8 V DC) | |
| Maximum power consumption | 60 mA | 30 mA |




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## Single-beam photoelectric safety switch L400

### General data

| | L40S-11MA1A | L40E-11MA1A | L40S-21KA1A | L40E-21KA1A | L40S-21MA1A | L40E-21MA1A |
|---|---|---|---|---|---|---|
| **System part** | Sender | Receiver | Sender | Receiver | Sender | Receiver |
| **Scanning range** | 0 m ... 5 m | | 0 m ... 10 m | | | |
| **Number of beams** | 1 | | | | | |
| **Optical axis** | Radial | | Axial | | | |
| **Light beam diameter** | 12 mm | | | | | |
| **Aperture angle/receive angle** | ±2.5°/±2.5° | | | | | |
| **Light sender/type of light** | LED (visible red light) | – | LED (visible red light) | – | LED (visible red light) | – |
| **Wave length** | 660 nm | – | 660 nm | – | 660 nm | – |
| **Protection class** | III | | | | | |
| **Enclosure rating** | IP 67 | | | | | |
| **Type** | Type 4 (IEC 61496), only in conjunction with UE401 | | | | | |
| **Ambient operating temperature from ... to** | –20 °C ... +55 °C | | | | | |
| **Storage temperature from ... to** | –25 °C ... +75 °C | | | | | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | | | | | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) | | | | | |
| **Shock resistance** | 10 g, 16 ms (IEC 60068-2-29) | | | | | |
| **Design** | Cylindrical | | | | | |
| **Dimensions (diameter x length)** | M18 x 107.7 mm | | M18 x 97.7 mm | | | |
| **Housing material** | Brass nickel-plated | | Plastic | | Brass nickel-plated | |
| **Lens material** | Glass | | | | | |
| **Weight** | 67 g | | 30 g | | 67 g | |

### Electrical data

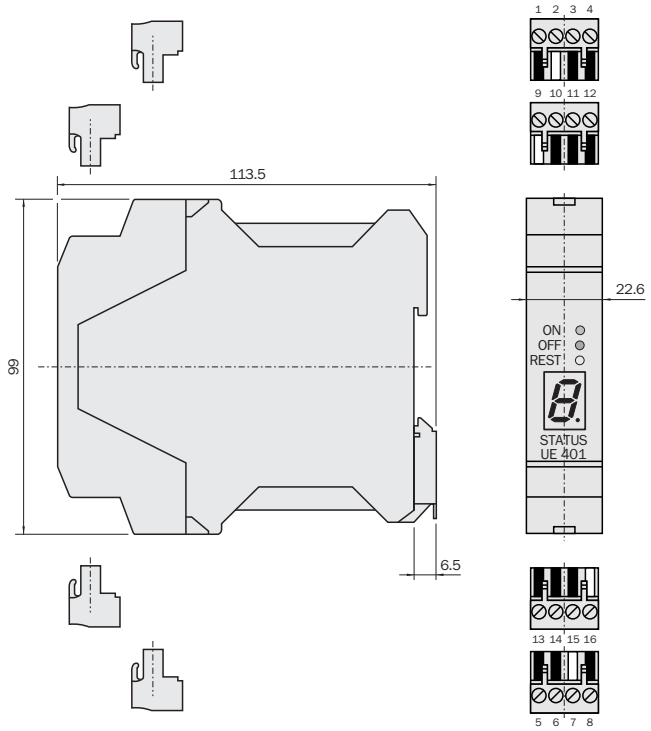
| | L40S-11MA1A | L40E-11MA1A | L40S-21KA1A | L40E-21KA1A | L40S-21MA1A | L40E-21MA1A |
|---|---|---|---|---|---|---|
| **System part** | Sender | Receiver | Sender | Receiver | Sender | Receiver |
| **Connection type** | Plug M12 x 4, straight | | | | | |
| **Supply voltage $V_S$** | 24 V DC (19.2 V DC ... 28.8 V DC) | | | | | |
| **Maximum power consumption** | 60 mA | 30 mA | 60 mA | 30 mA | 60 mA | 30 mA |

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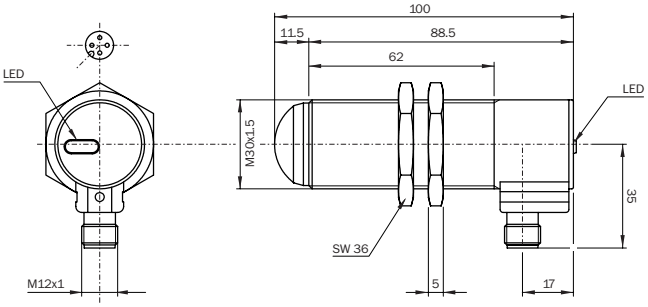

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# Dimensional drawings

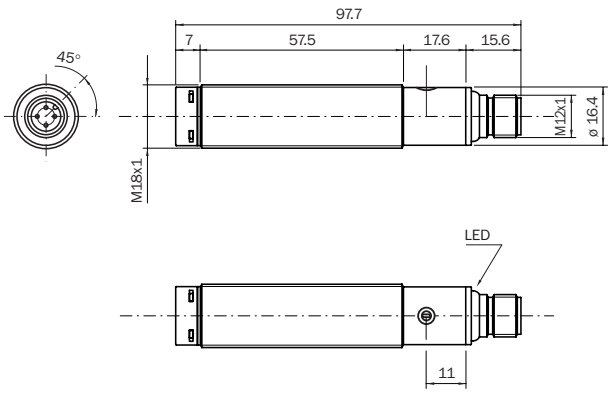
**Evaluation unit UE401**



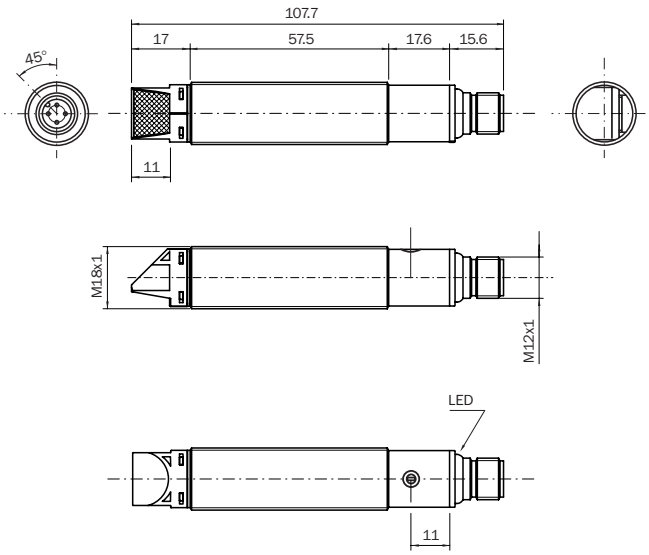

**L4000**




**L400, axial**




**L400, radial**




Dimensions in mm

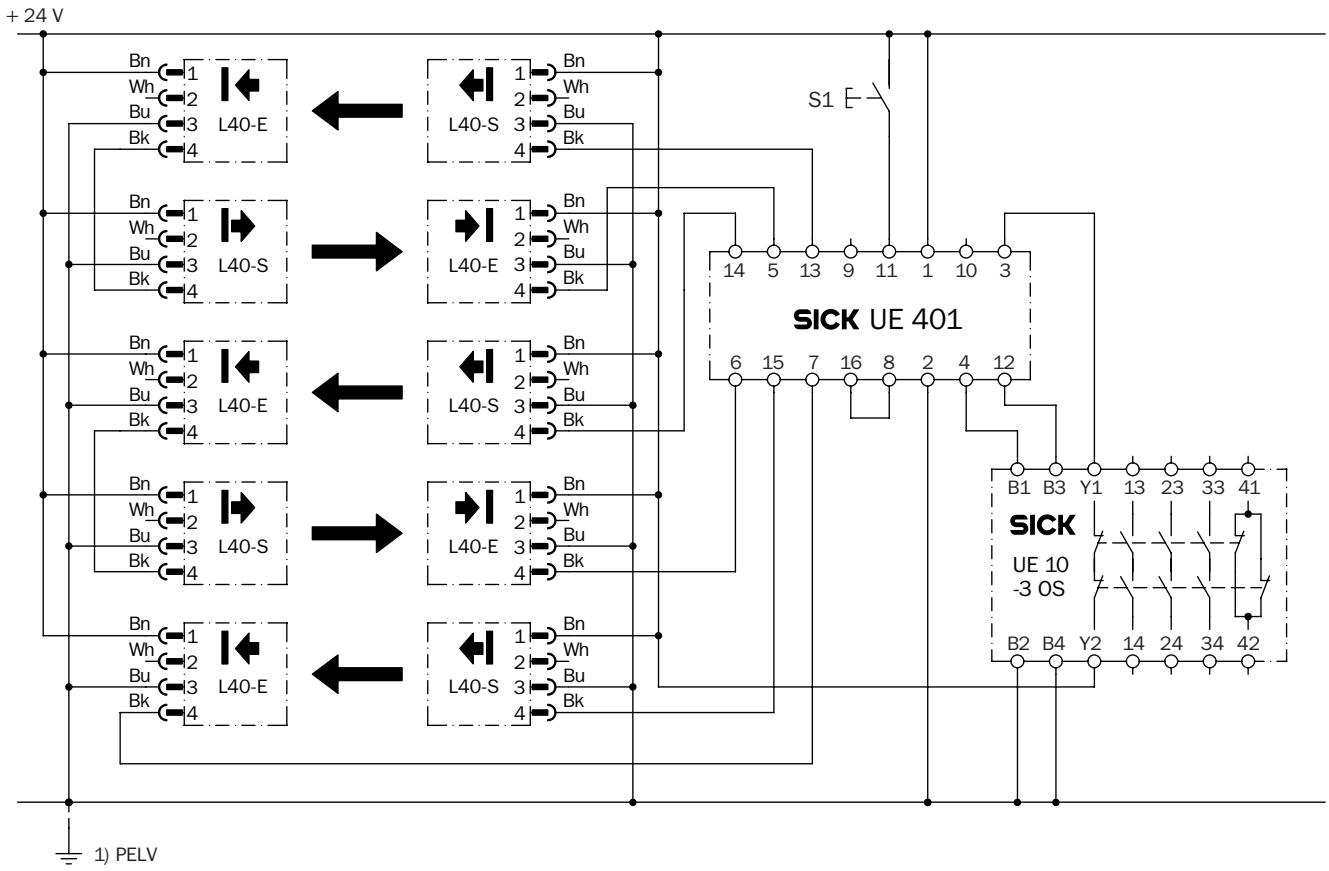
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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## 5 x L4000 (two pairs cascaded) on UE401 with UE10-3OS




**Task**

Integration of five single-beam photoelectric safety switches L400/L4000 (2 pairs cascaded) with safety evaluation device UE401 and safety relay UE10-3OS. Operating mode with restart interlock and external device monitoring.

**Function**

When the light path is clear and the UE10 is de-energised and functioning correctly, the yellow LED on the UE401 flashes. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10 is switched on. On the interruption of one of the light beams, the UE10 is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

**Comments**

1)PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed!


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

| Description | Construction size | Mounting | Property | Type | Part number |
|---|---|---|---|---|---|
| Mounting bracket | M18 | With fixing holes 4 mm | Adjustable | BEF-HA-M18-R | 5313513 |
| | M30 | With tapering thread M6 | | BEF-HA-M30-A | 5311527 |
| | | With fixing holes for M4 | | BEF-HA-M30-R | 5311528 |
| | M18 | – | – | BEF-WN-M18 | 5308446 |
| | M30 | – | – | BEF-WN-M30 | 5308445 |

### Connectors

| Description | Connection type | Cable alignment | Cable length | Cable material | Type | Part number |
|---|---|---|---|---|---|---|
| Cable socket | M12 x 4 | Straight | 2 m | PVC | DOL-1204-G02M | 6009382 |
| | | | 5 m | PVC | DOL-1204-G05M | 6009866 |
| | | | | PUR halogen free | DOL-1204-G05MC | 6025901 |
| | | | 10 m | PVC | DOL-1204-G10M | 6010543 |
| | | Angled | 2 m | PVC | DOL-1204-W02M | 6009383 |
| | | | 5 m | PVC | DOL-1204-W05M | 6009867 |
| | | | | PUR halogen free | DOL-1204-W05MC | 6025904 |
| | | | 10 m | PVC | DOL-1204-W10M | 6010541 |
| | | Straight | Can be preformed | – | DOS-1204-G | 6007302 |
| | | Angled | | – | DOS-1204-W | 6007303 |
| Cable plug | M12 x 4 | Straight | | – | STE-1204-G | 6009932 |


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### Deflector mirrors

| Description | Usage | Mirror surface | Delivery | Type | Part number |
|---|---|---|---|---|---|
| Deflector mirrors [1] | – | 105 mm x 160 mm | – | PNS105-1 | 1004076 |
| | – | 75 mm x 80 mm | Including mounting adapter (two pieces swivel mount) | PNS75-008 | 1026647 |
| | – | 96 mm x 124 mm | – | PSK1 | 1005229 |
| | For 90° deflection | – | Incl. mounting set, not suitable for column mounting | PSK45 | 5306053 |
| Mounting bracket | For PSK 1 | – | – | BEF-GH | 2009292 |
| Spring fastening | | | | – | 2012473 |

[1] Reduction of the scanning range

### Laser alignment aid

| Type | Part number |
|---|---|
| Laser alignment aid AR60 | 1015741 |
| AR60 adapter for L4000 | 5311529 |
| AR60 adapter for L400 | 5313533 |

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## Overview of technical specifications

| | |
|---|---|
| **Scanning range (depending on type)** | 0.5 m ... 18 m / 15 m ... 70 m |
| **Construction size** | 156 mm x 50 mm x 116 mm |
| **Supply voltage (depending on type)** | 24 V DC / 115 V AC / 230 V AC |
| **Enclosure rating (depending on type)** | IP 65 / IP 67 |
| **Ambient operating temperature from ... to** | –25 °C ... +55 °C |
| **Type** | Type 4 (EN 61496 part 1 and EN 50100 part 2) |

## Product description

The photoelectric safety switch WSU/WEU26/2 is used for access protection of hazardous areas on machines or plants.

The devices are permanently mounted in the access area with the necessary safety distance from the nearest hazardous point and send a shutdown signal to the machine or system when the light beam is interrupted.

## In-system added value

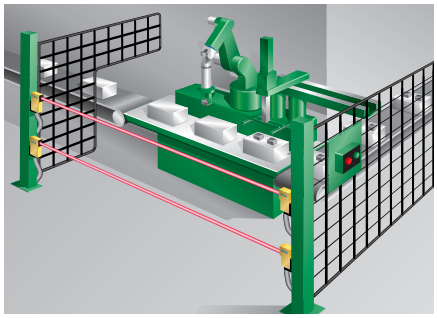
- Supports integration with multiple safety control solutions

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

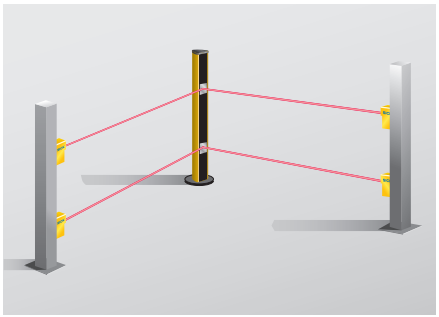
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Robots
- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a machining centre



Access protection with mirror deflection






- Universal in application
- Relay outputs
- Universal power supply
- Robust design
- Large scanning range
- Front screen heating

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| Further information | Page |
|---|---|
| → Ordering information | G-12 |
| → Technical specifications | G-13 |
| → Dimensional drawings | G-14 |
| → Connection diagrams | G-15 |
| → Accessories | G-15 |
| → Services | A-2 |



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# Ordering information

| Scanning range | Supply voltage | Connection type | Enclosure rating | Sender | | Receiver | |
|---|---|---|---|---|---|---|---|
| | | | | Type | Part number | Type | Part number |
| 0.5 m ... 18 m | 230 V AC | PG gland | IP 67 | WSU26/2-110 | 1015615 | WEU26/2-110 | 1015616 |
| | | Plug 6 + PE | IP 65 | WSU26/2-111 | 1015712 | WEU26/2-111 | 1015713 |
| | | Plug 6 + PE [1] | | WSU26/2-113 | 1015716 | WEU26/2-112 | 1015714 |
| | | Plug 6 + PE [1] | | WSU26/2-113 | 1015716 | WEU26/2-113 | 1015715 |
| | | Plug 15 + PE | IP 65 | WSU26/2-114 | 1015834 | WEU26/2-114 | 1015835 |
| 15 m ... 70 m | 230 V AC | PG gland | IP 67 | WSU26/2-210 | 1015731 | WEU26/2-210 | 1015743 |
| | | Plug 6 + PE | IP 65 | WSU26/2-211 | 1015733 | WEU26/2-211 | 1015744 |
| | | Plug 6 + PE [1] | | WSU26/2-213 | 1015736 | WEU26/2-212 | 1015746 |
| | | Plug 6 + PE [1] | | WSU26/2-213 | 1015736 | WEU26/2-213 | 1015748 |
| | | Plug 15 + PE | IP 65 | WSU26/2-214 | 1015840 | WEU26/2-214 | 1015841 |
| 0.5 m ... 18 m | 115 V AC | PG gland | IP 67 | WSU26/2-120 | 1015717 | WEU26/2-120 | 1015718 |
| | | Plug 6 + PE | IP 65 | WSU26/2-121 | 1015719 | WEU26/2-121 | 1015720 |
| | | Plug 6 + PE [1] | | WSU26/2-123 | 1015723 | WEU26/2-122 | 1015721 |
| | | Plug 6 + PE [1] | | WSU26/2-123 | 1015723 | WEU26/2-123 | 1015722 |
| | | Plug 15 + PE | IP 65 | WSU26/2-124 | 1015836 | WEU26/2-124 | 1015837 |
| 15 m ... 70 m | 115 V AC | PG gland | IP 67 | WSU26/2-220 | 1015738 | WEU26/2-220 | 1015749 |
| | | Plug 6 + PE | IP 65 | WSU26/2-221 | 1015740 | WEU26/2-221 | 1015750 |
| | | Plug 6 + PE [1] | | WSU26/2-223 | 1015737 | WEU26/2-222 | 1015751 |
| | | Plug 6 + PE [1] | | WSU26/2-223 | 1015737 | WEU26/2-223 | 1015505 |
| | | Plug 15 + PE | IP 65 | WSU26/2-224 | 1015842 | WEU26/2-224 | 1015843 |
| 0.5 m ... 18 m | 24 V DC | PG gland | IP 67 | WSU26/2-130 | 1015724 | WEU26/2-130 | 1015725 |
| | | Plug 6 + PE | IP 65 | WSU26/2-131 | 1015726 | WEU26/2-131 | 1015727 |
| | | Plug 6 + PE [1] | | WSU26/2-133 | 1015730 | WEU26/2-132 | 1015728 |
| | | Plug 6 + PE [1] | | WSU26/2-133 | 1015730 | WEU26/2-133 | 1015729 |
| | | Plug 15 + PE | IP 65 | WSU26/2-134 | 1015838 | WEU26/2-134 | 1015839 |
| 15 m ... 70 m | 24 V DC | PG gland | IP 67 | WSU26/2-230 | 1015745 | WEU26/2-230 | 1015504 |
| | | Plug 6 + PE | IP 65 | WSU26/2-231 | 1015747 | WEU26/2-231 | 1015753 |
| | | Plug 6 + PE [1] | | WSU26/2-233 | 1015739 | WEU26/2-232 | 1015754 |
| | | Plug 6 + PE [1] | | WSU26/2-233 | 1015739 | WEU26/2-233 | 1015755 |
| | | Plug 15 + PE | IP 65 | WSU26/2-234 | 1015844 | WEU26/2-234 | 1015845 |

[1] Alternative internal wiring of the normally closed and normally open contacts (see technical description)

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# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | Sender | Receiver |
|---|---|---|
| **Scanning range (depending on type)** | 0.5 m ... 18 m / 15 m ... 70 m | |
| **Number of beams** | 1 | |
| **Synchronisation** | Optical, without separate synchronisation cable | |
| **Light beam diameter** | 23 mm | |
| **Aperture angle/receive angle** | 4°/ 4° | |
| **Wave length** | 950 nm | – |
| **Protection class** | I | |
| **Enclosure rating (depending on type)** | IP 67 / IP 65 | |
| **Type** | Type 4 (EN 61496 part 1 and EN 50100 part 2) | |
| **Dimensions (W x H x D)** | 156 mm x 50 mm x 116 mm | |
| **Housing material** | Zinc die-cast | |
| **Ambient operating temperature from ... to** | –25 °C ... +55 °C | |
| **Storage temperature from ... to** | –25 °C ... +70 °C | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | |
| **Vibration resistance** | 5 g, 10 Hz ... 55 Hz (IEC 60068-2-6) | |
| **Shock resistance** | 10 g, 16 ms (IEC 68-2-29) | |
| **Weight (depending on type)** | 1.00 kg ... 1.35 kg | 1.47 kg ... 1.87 |

## Electrical data

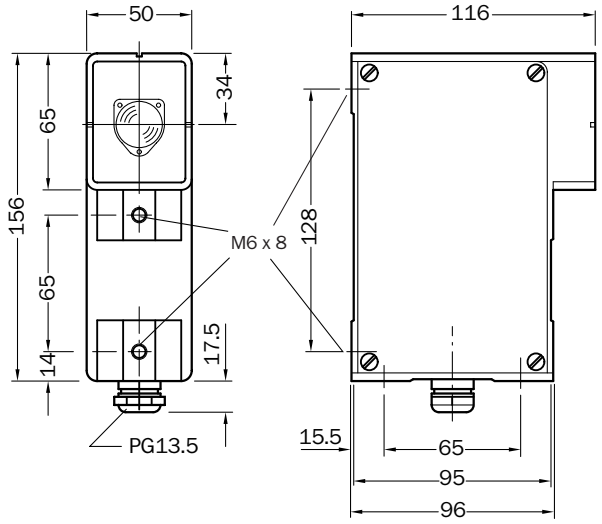
| | Sender | Receiver |
|---|---|---|
| **Connection type (depending on type)** | PG13.5 PG gland /<br>Plug 6 + PE /<br>Plug 15 + PE | |
| **Supply voltage $V_S$ (depending on type)** | 230 V AC (195.5 V AC ... 253 V AC) /<br>115 V AC (97.8 V AC ... 126 V AC) /<br>24 V DC (19.2 V DC ... 28.8 V DC) | |
| **Supply frequency** | 48 Hz | |
| **Power consumption (depending on type)** | 7 VA / 4 W | 10 VA / 6 W |
| **Switching outputs** | – | Relay |
| **Maximum response time** | – | 22 ms |
| **Switching current** | – | 0.02 A ... 2 A |
| **Switching voltage min ... max** | – | 24 V DC ... 250 V AC |
| **Maximum switching power AC/DC** | – | 1380 VA / 144 W |
| **Mechanical life (relay contacts)** | – | 1 x $10^7$ switching cycles |
| **Electrical life (relay contacts) (depending on type)** | | |
| **DC version** | – | 5 x $10^4$ switching cycles, with 2 A switching current / |
| **AC version** | – | 8 x $10^4$ switching cycles, with 2 A switching current |
| **Test input** | Volt-free switch | – |

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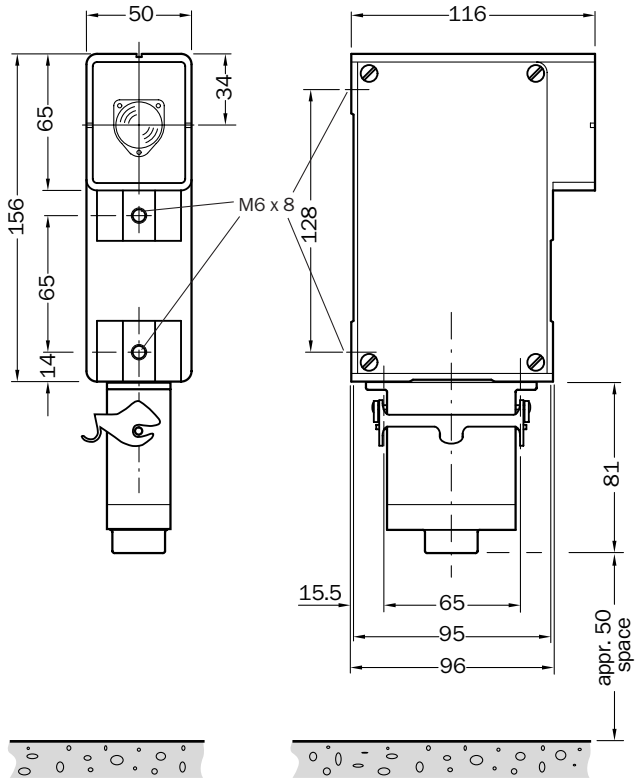
# Dimensional drawings

**PG gland**

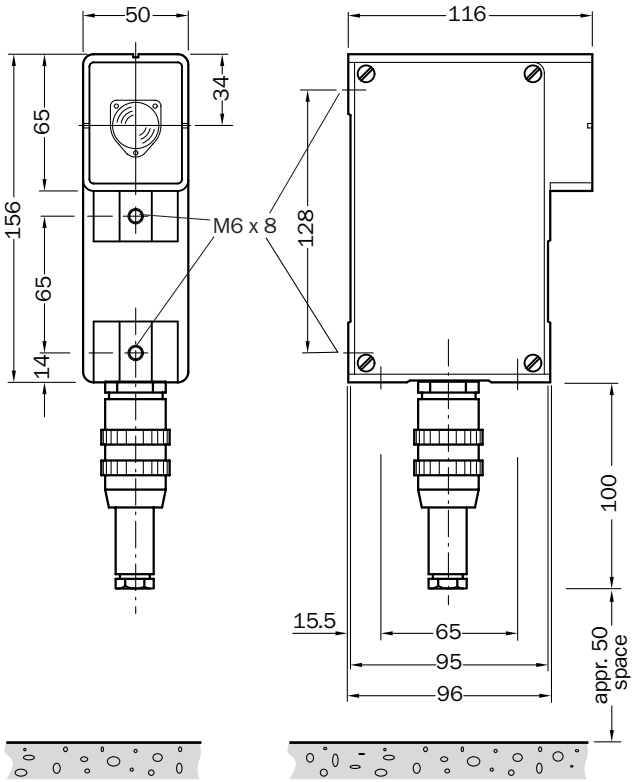



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**Plug 15 + PE**




**Plug 6 + PE**




Dimensions in mm


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## Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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## Accessories

### Mounting systems

| Property | Description | Part number |
|---|---|---|
| Mounting bracket | For WSU/WEU26/2 | 2007900 |

### Deflector mirrors

| Description | Usage | Mirror surface | Remark | Type | Part number |
|---|---|---|---|---|---|
| Deflector mirrors [1] | – | 105 mm x 160 mm | – | PNS105-1 | 1004076 |
| | – | 75 mm x 80 mm | Including mounting adapter (two pieces swivel mount) | PNS75-008 | 1026647 |
| | – | 96 mm x 124 mm | – | PSK1 | 1005229 |
| | For 90° deflection | – | Incl. mounting set, not suitable for column mounting | PSK45 | 5306053 |
| Mounting bracket | For PSK 1 | – | – | BEF-GH | 2009292 |
| Spring fastening | | | | – | 2012473 |

[1] Reduction of the scanning range


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### Cable receptacles

| Description | Construction size | Cable alignment | Part number |
|---|---|---|---|
| Hirschmann cable receptacle | 6-pin + PE | Straight | 6006612 |
| | | Angled | 6006613 |
| Cable receptacles | PG13.5 | Straight | 2019075 |
| | PG16 | Lateral | 2019076 |

### PG expansion

| Description | Construction size | Type | Part number |
|---|---|---|---|
| PG expansion | PG13/21 | – | 5307052 |
| | PG21 | Two-way splitter | 5305978 |

### Device protection

| Description | Part number |
|---|---|
| Snow protection tube | 1003619 |
| Dust protection tube | 1003556 |

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### Arc-suppressor

| Description | Type | Part number |
|---|---|---|
| 0.22 µF/220 Ohm for 110 V AC ... 220 V AC | RC-A | 6001224 |
| 2.2 µF/100 Ohm for 24 V AC/DC ... 48 V AC/DC | RC-AD | 6001225 |

### Laser alignment aid

| Description | Part number |
|---|---|
| Laser alignment aid AR60 | 1015741 |
| Adapter AR60 WSU/WEU26/2 | 4031156 |


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range (typical/maximum)** | 0 m... 12 m / 0 ... 18 m |
| **Light sender/type of light** | LED/visible red light |
| **Construction size** | 75.5 mm x 17.6 mm x 33.5 mm |
| **Enclosure rating** | IP 67 |
| **Ambient operating temperature from ... to** | –40 °C ... +60 °C |
| **Type** | Type 2 (EN 61496), only in conjunction with suitable testing device |

## Product description

The SICK single-beam photoelectric safety switch WS/WE18-3 consists of a testable sender and receiver combined with an evaluation unit.

## In-system added value

- Supports integration with multiple safety control solutions

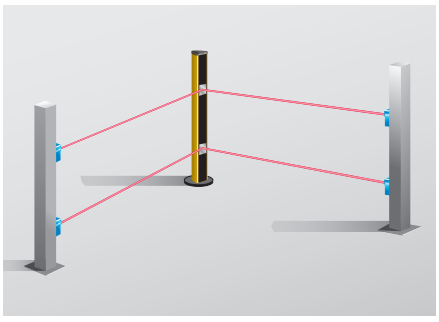
| Combination with | Type of output | Number of sensors | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|---|---|
| **LE20** | PNP, monitored and short-circuit protected | 6 | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | | 6 | ✔ | ✔ | ✔ | N-64 |
| **UE10-3OS** | Relay contacts | – | – | – | – | N-3 |
| **UE410 Flexi** | PNP semiconductors, short-circuit protected, cross-circuit monitored | 4 | ✔ | ✔ | ✔ | O-2 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

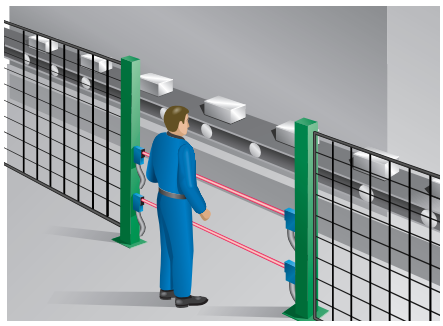
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection with mirror deflection



Access protection on a conveyor system






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- Compact design
- Red light
- Plastic housing, ABS

| Further information | Page |
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| → Ordering information | G-18 |
| → Technical specifications | G-18 |
| → Dimensional drawings | G-19 |
| → Connection diagrams | G-20 |
| → Accessories | G-21 |
| → Services | A-2 |



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# Ordering information

| Scanning range | Connection type | Type of output | System part | Type | Part number |
|---|---|---|---|---|---|
| 12 m | Plug M12 x 4 | PNP, Q and $\overline{Q}$ | Sender/receiver | WS/WE18-3P460 | 1026751 |
| | | | Sender | WS18-3D460 | 2031731 |
| | | | Receiver | WE18-3P460 | 2031732 |

# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | WS18-3D460 | WE18-3P460 |
|---|---|---|
| **System part** | Sender | Receiver |
| **Scanning range (typical/maximum)** | 0 m ... 12 m / 0 m ... 18 m | |
| **Number of beams** | 1 | |
| **Light spot diameter (distance)** | 300 mm/10 m | |
| **Aperture angle/receive angle** | ±1.5°/±5° | |
| **Light sender/type of light** | LED/visible red light | |
| **Wave length** | 660 nm | |
| **Average service life ($T_A$)** | 100000 h (+25 °C) | |
| **Protection class** | II | |
| **Enclosure rating** | IP 67 | |
| **Type** | Type 2 (EN 61496), only in conjunction with suitable testing device | |
| **Design** | Rectangular | |
| **Dimensions (W x H x D)** | 75.5 mm x 17.6 mm x 33.5 mm | |
| **Housing material** | ABS | |
| **Ambient operating temperature from ... to** | –40 °C ... +60 °C | |
| **Storage temperature from ... to** | –40 °C ... +75 °C | |
| **Weight** | 40 g | |

## Electrical data

| | WS18-3D460 | WE18-3P460 |
|---|---|---|
| **System part** | Sender | Receiver |
| **Connection type** | Plug M12 x 4 | |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) [1] | |
| **Maximum power consumption** | 35 mA | 20 mA |
| **Test input voltage** | $V_S$ or not connected (sender on)<br>0 V DC (sender off) | – |
| **Test duration** | 2 ms [2] | – |
| **Switching outputs** | – | PNP, Q and $\overline{Q}$ [3] |
| **Maximum response time** | – | 500 µS |
| **Maximum switching sequence** | – | 1000 Hz |
| **Maximum switching current** | – | 100 mA |
| **Diagnosis display** | LED | |

[1] Reverse polarity protected

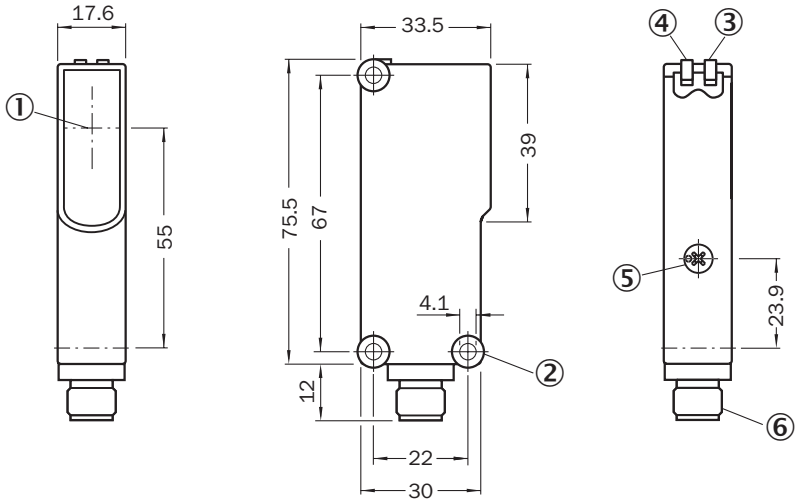
[2] Signal propagation time for Ohmic load, for test signal application (sender) and output signal reaction (receiver)

[3] Short-circuit protected interference suppression



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## Dimensional drawings




① Centre of optical axis
② Fastening hole
③ LED, yellow; light reception status
④ LED, green; operating voltage active
⑤ Sensitivity adjuster on WE
⑥ Device plug M12, 4-pin

Dimensions in mm

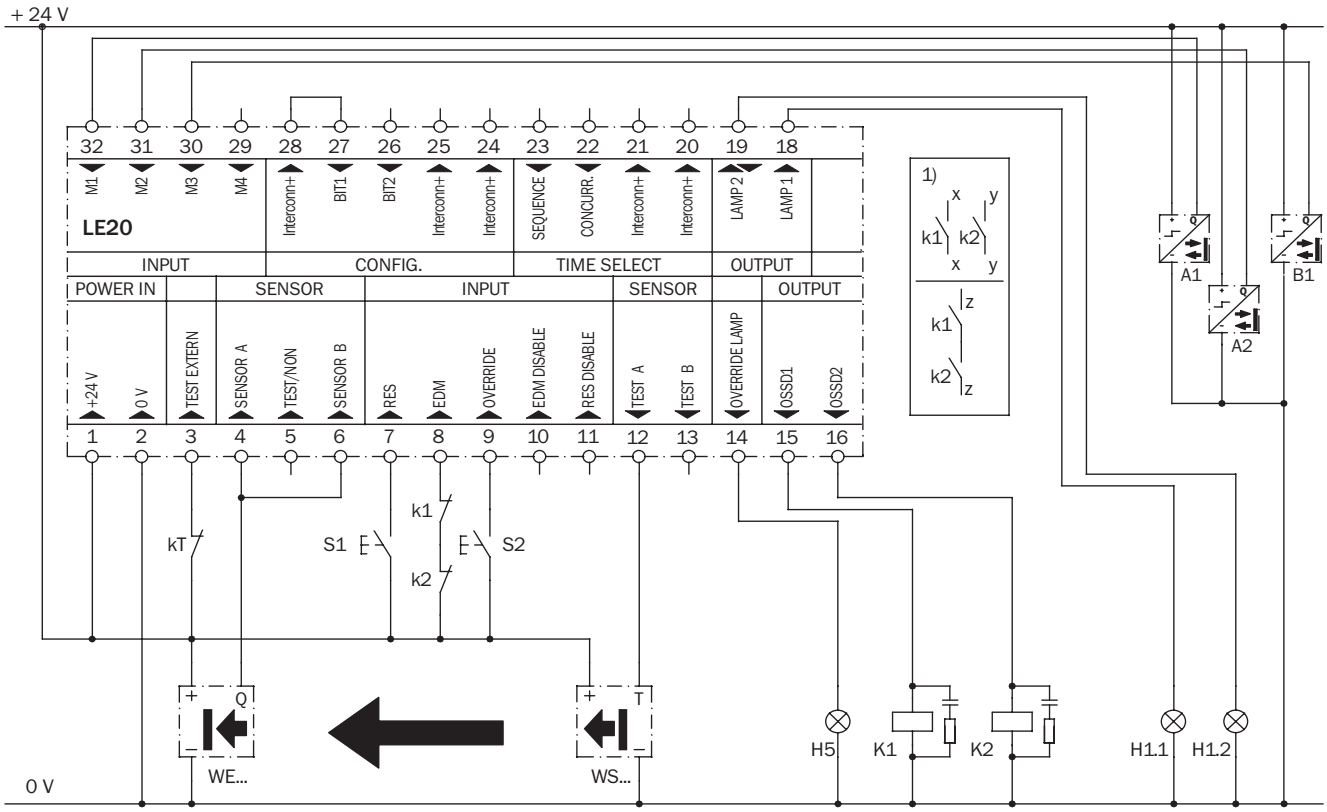
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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## WS/WE18-3 on LE20 Muting safety evaluation unit




**Task**

Integration of the single-beam photoelectric safety switch in a control via an LE20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors, operating mode with restart interlock and external device monitoring.

**Function**

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

**Muting**

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

**Override**

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if both muting signals (A1 and A2) are present at the LE20. This situation is indicated by illumination of the override lamp H5.

**Possible faults**

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

| Description | Usage | Type | Part number |
|---|---|---|---|
| Mounting bracket | For WS/WE12-2 | BEF-WN-W18 | 2009317 |

### Connectors

| Description | Connection type | Cable alignment | Cable length | Cable material | Type | Part number |
|---|---|---|---|---|---|---|
| Cable socket | M12 x 4 | Straight | 2 m | PVC | DOL-1204-G02M | 6009382 |
| | | | Can be preformed | – | DOS-1204-G | 6007302 |

### Deflector mirrors

| Description | Usage | Mirror surface | Remark | Type | Part number |
|---|---|---|---|---|---|
| Deflector mirrors [1] | – | 105 mm x 160 mm | – | PNS105-1 | 1004076 |
| | – | 75 mm x 80 mm | Including mounting adapter (two pieces swivel mount) | PNS75-008 | 1026647 |
| | – | 96 mm x 124 mm | – | PSK1 | 1005229 |
| | For 90° deflection | – | Incl. mounting set, not suitable for column mounting | PSK45 | 5306053 |
| Mounting bracket | For PSK 1 | – | – | BEF-GH | 2009292 |
| Spring fastening | | | | – | 2012473 |

[1] Reduction of the scanning range


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- Integrated heating
- High scanning range
- Plastic housing, ABS
- Compact design
- Red light

## Overview of technical specifications

| | |
|---|---|
| **Scanning range (typical/maximum)** | 0 m ... 25 m / 0 m ... 35 m |
| **Light sender/type of light** | LED/visible red light |
| **Construction size** | 80 mm x 24 mm x 53.5 mm |
| **Enclosure rating** | IP 67 |
| **Ambient operating temperature from ... to** | –40 °C ... +60 °C |
| **Type** | Type 2, EN 61496, only in conjunction with suitable testing device |

## Product description

The SICK single-beam photoelectric safety switch WS/WE27-2 consists of a testable sender and receiver combined with an evaluation unit.

## In-system added value

- Supports integration with multiple safety control solutions

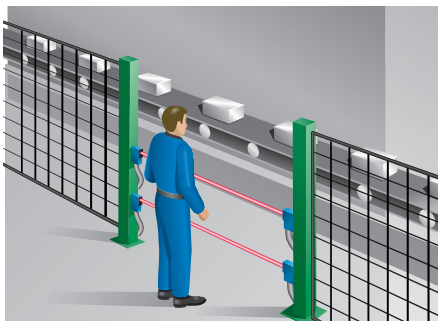
| Combination with | Type of output | Number of sensors | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|---|---|
| **LE20** | PNP, monitored and short-circuit protected | 6 | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | | 6 | ✔ | ✔ | ✔ | N-64 |
| **UE10-3OS** | Relay contacts | – | – | – | – | N-3 |
| **UE410 Flexi** | PNP semiconductors, short-circuit protected, cross-circuit monitored | 4 | ✔ | ✔ | ✔ | O-2 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

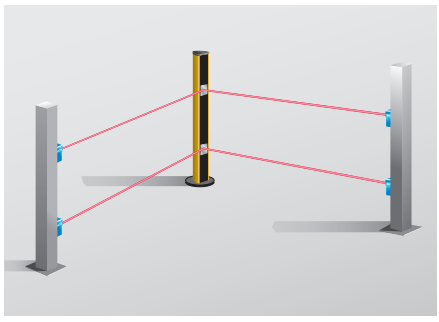
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a conveyor system



Access protection with mirror deflection


| Further information | Page |
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| → Connection diagrams | G-25 |
| → Accessories | G-26 |
| → Services | A-2 |




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## Ordering information

| Scanning range | Connection type | System part | Front screen heating | Type | Part number |
|---|---|---|---|---|---|
| 0 m ... 25 m | Plug M12 x 4 | Sender/receiver | ✔ | WS/WE27-2F450S05 | 1016025 |
| | | | – | WS/WE27-2F460 | 1019561 |
| | Plug 7-pin | | – | WS/WE27-2F730 | 1015124 |
| | | | ✔ | WS/WE27-2F750 | 1015752 |
| | Plug M12 x 4 | Sender | ✔ | WS27-2D450S05 | 2018932 |
| | | Receiver | ✔ | WE27-2F450S05 | 2018933 |
| | | Sender | – | WS27-2D460 | 2021365 |
| | | Receiver | – | WE27-2F460 | 2021708 |
| | Plug, 7-pin | Sender | – | WS27-2D730 | 2017894 |
| | | Receiver | – | WE27-2F730 | 2017895 |
| | | Sender | ✔ | WS27-2D750 | 2018618 |
| | | Receiver | ✔ | WE27-2F750 | 2018619 |

## Detailed technical specifications

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➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

### General data

| | Sender | Receiver |
|---|---|---|
| **Scanning range (typical/maximum)** | 0 m ... 25 m / 0 m ... 35 m | |
| **Light spot diameter (distance)** | 1200 mm (25 m) | |
| **Aperture angle/receive angle** | ±4°/±5° | |
| **Light sender/type of light** | LED/visible red light | |
| **Wave length** | 660 nm | |
| **Average service life ($T_A$)** | 100000 h (+25 °C) | |
| **Protection class** | II | |
| **Enclosure rating** | IP 67 | |
| **Type** | Type 2 (EN 61496), only in conjunction with suitable testing device | |
| **Design** | Rectangular | |
| **Dimensions (W x H x D)** | 80 mm x 24 mm x 53.5 mm | |
| **Housing material** | ABS | |
| **Ambient operating temperature from ... to** | –40 °C ... +60 °C | |
| **Storage temperature from ... to** | –40 °C ... +75 °C | |
| **Weight** | 100 g | |


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### Electrical data

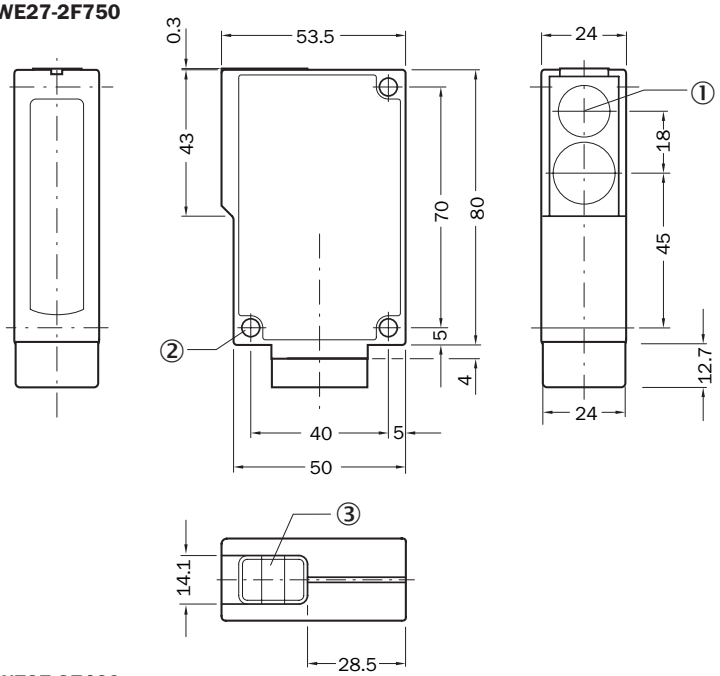
| | | |
|---|---|---|
| **Connection type (depending on type)** | Plug M12 x 4 / Plug, 7-pin | |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) [1] | |
| **Maximum power consumption (depending on type)** | 50 mA / 35 mA | 45 mA / 35 mA |
| **Test input voltage** | $V_S$ (sender on), 0 V DC (sender off) | – |
| **Switching outputs** | – | PNP, Q and $\overline{Q}$ [2] |
| **Maximum response time** | – | 500 µS |
| **Maximum switching sequence** | – | 1000 Hz |
| **Diagnosis display** | LED | |

[1] Reverse polarity protected

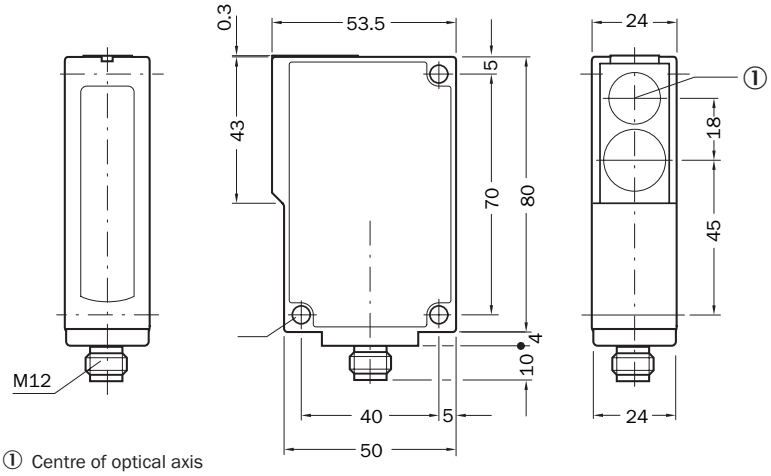
[2] Short-circuit protected interference suppression

## Dimensional drawings

**WS/WE27-2F730**
**WS/WE27-2F750**




**WS/WE27-2F460**
**WS/WE27-2F450S05**




① Centre of optical axis
② Fastening hole Ø 5.2 mm
③ LED

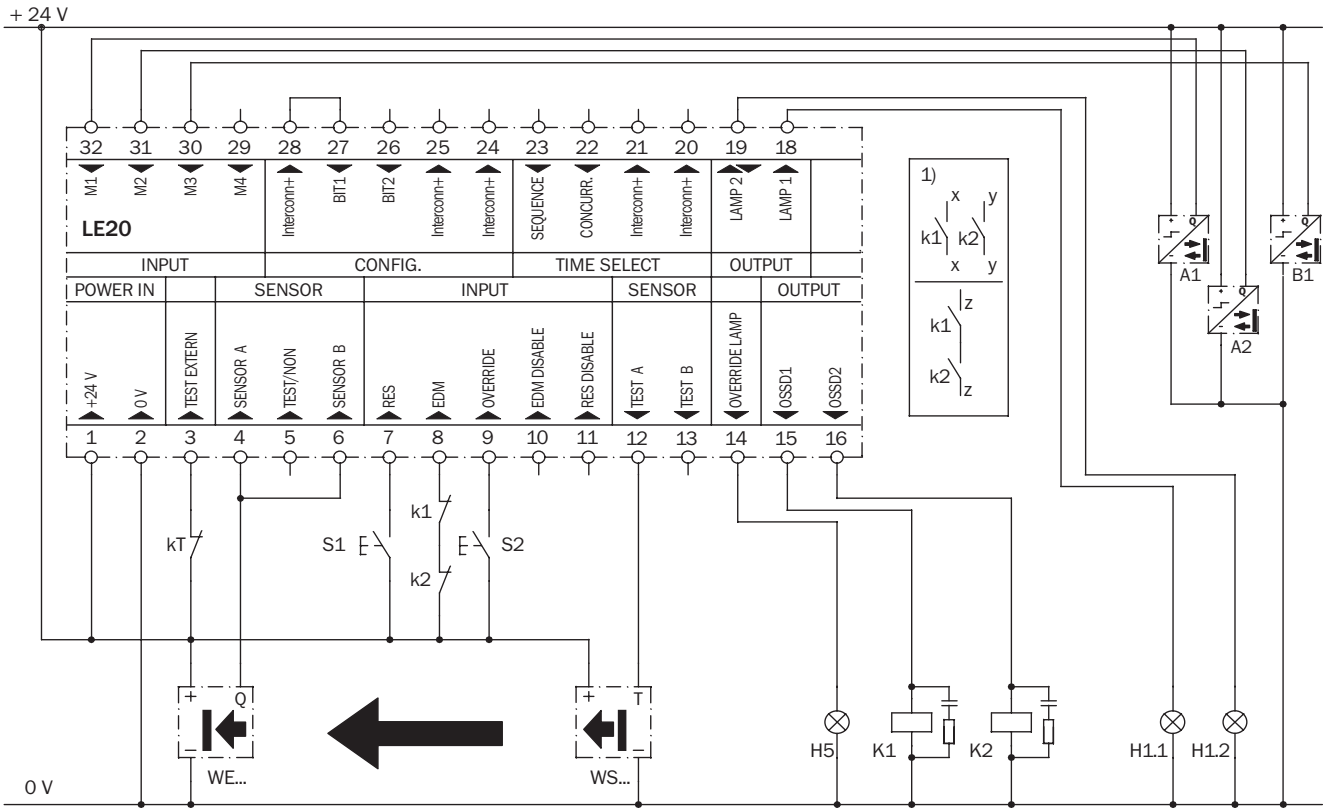
Dimensions in mm


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# Connection diagrams

You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## WS/WE27-2 on LE20 Muting safety evaluation unit




**Task**

Integration of the single-beam photoelectric safety switch in a control via an LE20. Muting using 3 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors A1-A2, operating mode with restart interlock and external device monitoring.

**Function**

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

**Muting**

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. If photoelectric proximity switch pair A is not activated within 3 seconds, the muting is prevented. The muting inputs must remain activated without interruption for the duration of the muting, also on switching from B1 to A1 & A2.

**Override**

If, after a power failure or a muting error, the object to be muted is in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if a valid combination of muting signals is present at the LE20. This situation is indicated by illumination of the override lamp H5.

**Possible faults**

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

| Description | Usage | Type | Part number |
|---|---|---|---|
| Mounting bracket | For WS/WE27-2 | BEF-WN-W27 | 2009122 |

### Connectors

| Description | Connection type | Cable alignment | Cable length | Cable material | Remark | Type | Part number |
|---|---|---|---|---|---|---|---|
| Cable socket | M12 x 4 | Straight | 2 m | PVC | – | DOL-1204-G02M | 6009382 |
| | | | – | – | – | DOS-1204-G | 6007302 |
| | Q7, 7-pin, DC | Angled | – | – | With coding for DC | DOS-2107-W | 6006823 |

### Deflector mirrors

| Description | Usage | Mirror surface | Delivery | Type | Part number |
|---|---|---|---|---|---|
| Deflector mirrors [1] | – | 105 mm x 160 mm | – | PNS105-1 | 1004076 |
| | – | 75 mm x 80 mm | Including mounting adapter (two pieces swivel mount) | PNS75-008 | 1026647 |
| | – | 96 mm x 124 mm | – | PSK1 | 1005229 |
| | For 90° deflection | – | Incl. mounting set, not suitable for column mounting | PSK45 | 5306053 |
| Mounting bracket | For PSK 1 | – | – | BEF-GH | 2009292 |
| Spring fastening | | | | – | 2012473 |

[1] Reduction of the scanning range

### Laser alignment aid

| Type | Part number |
|---|---|
| Laser alignment aid AR60 | 1015741 |
| AR60 adapter for WS/WE27-2 | 4032828 |


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## Overview of technical specifications

| | |
|---|---|
| **Scanning range (typical/maximum)** | 0 m ... 16 m / 0 m ... 22 m |
| **Light sender/type of light** | LED/visible red light |
| **Construction size (depending on type)** | M18 x 85.3 mm / M18 x 97.7 mm |
| **Enclosure rating** | IP 67 |
| **Ambient operating temperature from ... to** | –25 °C ... +70 °C |
| **Type** | Type 2 (EN 61496), only in conjunction with LE20 |

## Product description

The SICK single-beam photoelectric safety switch VS/VE18-2 consists of a testable sender and receiver combined with an evaluation unit.

## In-system added value

- Supports integration with multiple safety control solutions

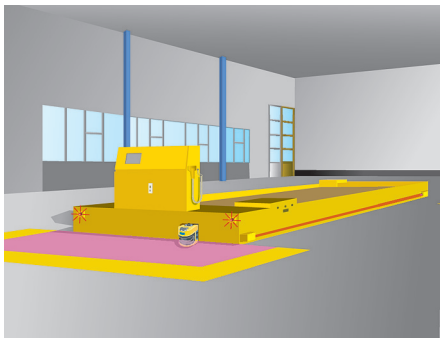
| Combination with | Type of output | Number of sensors | Restart interlock | External device monitoring | Muting | Further information |
|---|---|---|---|---|---|---|
| **LE20** | PNP, monitored and short-circuit protected | 6 | ✔ | ✔ | – | N-57 |
| **LE20 Muting** | | 6 | ✔ | ✔ | ✔ | N-64 |
| **UE10-3OS** | Relay contacts | – | – | – | – | N-3 |
| **UE410 Flexi** | PNP semiconductors, short-circuit protected, cross-circuit monitored | 4 | ✔ | ✔ | ✔ | 0-2 |

→ For safety system combinations, see appendix "Sensor systems and safe control solutions from SICK"

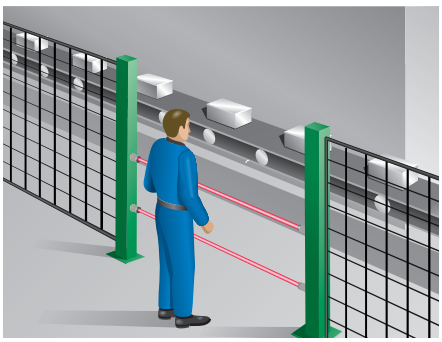
## Applications

→ You can find more applications using the application finder at www.sickusa.com/applications

- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Hazardous area protection using the VS/VE18 and the LE20 on an automated guided vehicle (AGV)



Access protection on a conveyor system





- Metal housing
- High scanning range
- Cylindrical design
- Red light

G


| Further information | Page |
|---|---|
| → Ordering information | G-28 |
| → Technical specifications | G-28 |
| → Dimensional drawings | G-29 |
| → Connection diagrams | G-30 |
| → Accessories | G-31 |
| → Services | A-2 |




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# Ordering information

| Scanning range | System part | Connection type | Type | Part number |
|---|---|---|---|---|
| 0 m ... 16 m | Sender/receiver | Plug M12 x 4, angled | VS/VE18-204550 | 6011845 |
| | | Plug M12 x 4, straight | VS/VE18-204450 | 6011846 |
| | Sender | Plug M12 x 4, angled | VS18-2D5550 | 6011847 |
| | | Plug M12 x 4, straight | VS18-2D5450 | 6011849 |
| | Receiver | Plug M12 x 4, angled | VE18-204550 | 6011850 |
| | | Plug M12 x 4, straight | VE18-204450 | 6011848 |

# Detailed technical specifications

➜ Additional technical information is described in operating instructions, which are available to download at www.sickusa.com/literature

## General data

| | VS18-2D5450 | VE18-204450 | VS18-2D5550 | VE18-204550 |
|---|---|---|---|---|
| **System part** | Sender | Receiver | Sender | Receiver |
| **Scanning range (typical/maximum)** | 0 m ... 16 m / 0 m ... 22 m | | | |
| **Number of beams** | 1 | | | |
| **Light spot diameter (distance)** | 1200 mm (25 m) | | | |
| **Aperture angle/receive angle** | ±4°/±5° | | | |
| **Light sender/type of light** | LED/visible red light | | | |
| **Wave length** | 660 nm | | | |
| **Average service life ($T_A$)** | 100000 h (+25 °C) | | | |
| **Protection class** | III | | | |
| **Enclosure rating** | IP 67 | | | |
| **Type** | Type 2 (EN 61496), only in conjunction with LE20 | | | |
| **Design** | Cylindrical | | | |
| **Dimensions (diameter x length)** | M18 x 97.7 mm | | M18 x 85.3 mm | |
| **Housing material** | Brass nickel-plated | | | |
| **Ambient operating temperature from ... to** | –25 °C ... +70 °C | | | |
| **Weight** | 250 g | | | |

## Electrical data

| | VS18-2D5450 | VE18-204450 | VS18-2D5550 | VE18-204550 |
|---|---|---|---|---|
| **System part** | Sender | Receiver | Sender | Receiver |
| **Connection type** | Plug M12 x 4, straight | | Plug M12 x 4, angled | |
| **Supply voltage $V_S$** | 24 V DC (16.8 V DC ... 28.8 V DC) [1] | | | |
| **Maximum power consumption** | 35 mA | 25 mA | 35 mA | 25 mA |
| **Switching outputs** | – | PNP, Q and $\overline{Q}$ [2] | – | PNP, Q and $\overline{Q}$ [2] |
| **Maximum response time** | – | 2 ms | – | 2 ms |
| **Maximum switching sequence** | – | 250 Hz | – | 250 Hz |
| **Maximum switching current** | – | 100 mA | – | 100 mA |
| **Diagnosis display** | LED | | | |

[1] Reverse polarity protected

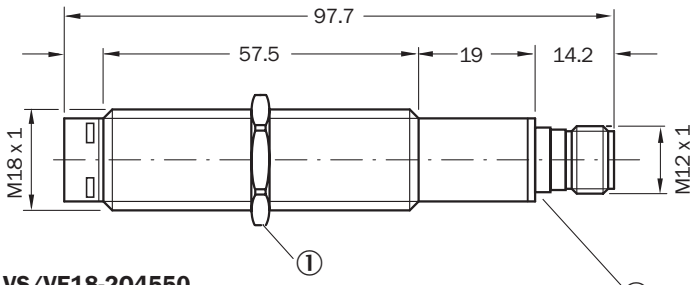
[2] Short-circuit protected, interference suppression



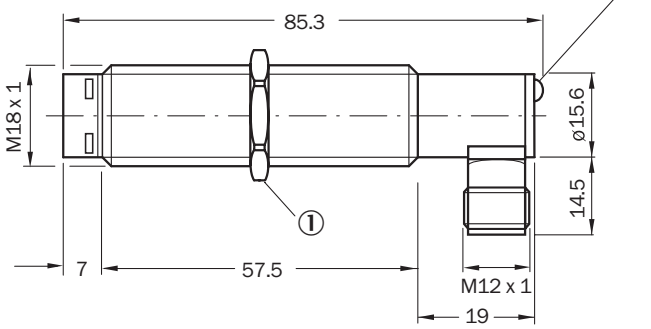
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# Dimensional drawings

**VS/VE18-204450**




**VS/VE18-204550**




Dimensions in mm

① Mounting nut M18
② LED

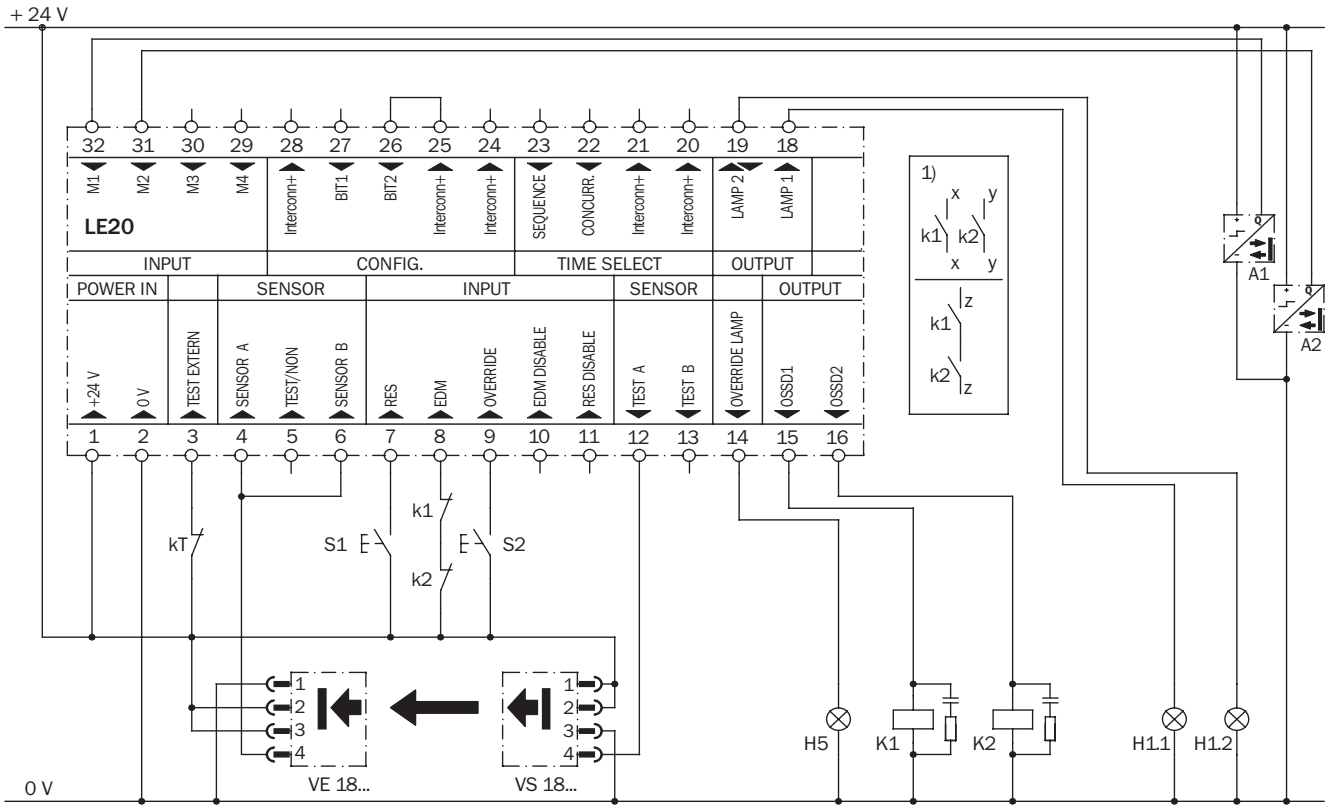
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# Connection diagrams

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagrams

## VS/VE18-2 on LE20 Muting safety evaluation unit




**Task**

Integration of the VS/VE18-204450 or VS/VE18-204550 single-beam photoelectric safety switch in a control via an LE20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors. Operating mode with restart interlock and external device monitoring.

**Function**

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

**Muting**

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

**Override**

If, after a power failure or a muting error, the object to be muted is in the light beam, the object can be moved out of the protective field by operating the button S2. This is only possible if both muting signals (A1 and A2) are present at the LE20. This situation is indicated by illumination of the override lamp H5.

**Possible faults**

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.


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# Safe control solutions

| | Product group | Applications | Further information |
|---|---|---|---|
|  | Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
|  | Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
|  | Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

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# Accessories

### Mounting systems

| Description | Construction size | Mounting | Property | Type | Part number |
|---|---|---|---|---|---|
| Mounting bracket | M18 | With fixing holes 4 mm | Adjustable | BEF-HA-M18-R | 5313513 |
| | | – | – | BEF-WN-M18 | 5308446 |

### Connectors

| Description | Connection type | Cable alignment | Cable length | Cable material | Type | Part number |
|---|---|---|---|---|---|---|
| Cable socket | M12 x 4 | Straight | 2 m | PVC | DOL-1204-G02M | 6009382 |
| | | | Can be preformed | – | DOS-1204-G | 6007302 |

### Deflector mirrors

| Description | Usage | Mirror surface | Delivery | Type | Part number |
|---|---|---|---|---|---|
| Deflector mirrors [1] | – | 105 mm x 160 mm | – | PNS105-1 | 1004076 |
| | – | 75 mm x 80 mm | Including mounting adapter (two pieces swivel mount) | PNS75-008 | 1026647 |
| | – | 96 mm x 124 mm | – | PSK1 | 1005229 |
| | For 90° deflection | – | Incl. mounting set, not suitable for column mounting | PSK45 | 5306053 |
| Mounting bracket | For PSK 1 | – | – | BEF-GH | 2009292 |
| Spring fastening | | | | – | 2012473 |

[1] Reduction of the scanning range

### Laser alignment aid

| Type | Part number |
|---|---|
| Laser alignment aid AR60 | 1015741 |
| AR60 adapter for VS/VE18-2 (M18) | 5313533 |


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# Explanations of features

**Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

**Housing material**

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

**Number of actuation directions**

Safety switches can be actuated in different axes. The setting of the actuating direction is facilitated by the head, which can be rotated through 90 or 180 degrees. Up to 5 actuation directions can be implemented, depending on the type.

**Type of actuator**

The majority of safety switches have appropriately coded tongue-operated actuators that prevent simple manipulation of the switch.

The i1000 series has an additional handle-operated actuator with coded spindle. It is not actuated by applying a force but by applying a torque.



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# Safety switches with separate actuator



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| Safety application | Number of positive action normally closed contacts/normally open contacts [1] | Housing material [1] | Number x size of cable gland | Locking force | Type of actuator [1] | Product | Page |
|---|---|---|---|---|---|---|---|
|  | 1 / 1<br>2 / 0 | Plastic | 1 x M20 | 10 N | Tongue operated | i10 | H-2 |
| | 1 / 0<br>2 / 1 | | 1 x M16 or 3 x M16 | 10 N | | i11S | H-7 |
| | 1 / 1<br>2 / 0<br>2 / 1 | | 1 x M16 | – | | i12S | H-12 |
| | 1 / 1<br>2 / 0 | | 3 x M20 | 30 N | | i16S | H-17 |
| | 2 / 1 | | 3 x M20 | – | | i17S | H-21 |
| | 3 / 1 | Metal | 1 x M20 | 10 N | Tongue operated | i100S | H-25 |
| | 3 / 1<br>2 / 2 | | 1 x M20 | 5 N | | i110S | H-31 |
| | 2 / 1 | | 1 x PG13.5 | – | Handle operated | i1001 | H-35 |
| | 2 / 1 | | 1 x PG13.5 | – | Tongue operated | i1002 | H-41 |

[1] Explanation see page H-0



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H

- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M20
- Enclosure rating IP 67



## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Plastic |
| **Number of cable entries** | 1 |
| **Size of the cable gland** | M20 |
| **Locking force** | 10 N |

## Product description

- Safety switches with remote multi-coded actuator
- 2-pole contact element
- Various actuator versions available

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 1 | 1 | i10-A113 | 6022530 |
| 2 | 0 | i10-A203 | 6022529 |

Please order actuator separately

| Further information | Page |
|---|---|
| → Actuators | H-4 |
| → Lockout bar | H-6 |
| → Other accessories | H-6 |
| → Services | A-2 |



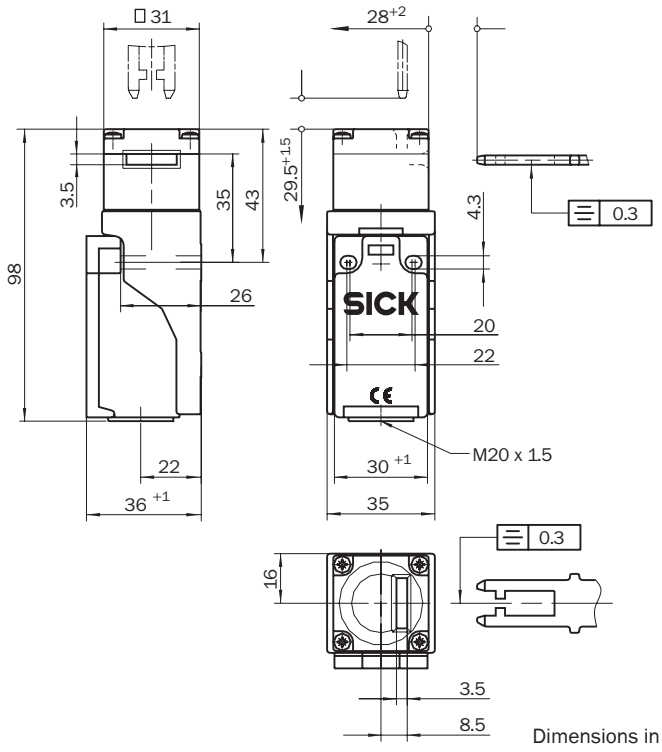
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# Detailed technical specifications

| Type | i10-A113 | i10-A203 |
|---|---|---|
| Housing material | Glass-fibre reinforced thermoplastic | |
| Enclosure rating | IP 67 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –20 °C ... +80 °C | |
| Maximum approach speed | 333 mm/s | |
| Locking force | 10 N | |
| Actuation frequency | Max. 1.94 Hz | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 1 | 2 |
| Number of normally open contacts | 1 | 0 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 4 A (230 V AC), 4 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 24 V DC | |
| Minimum switching current (switching voltage) | 30 mA (24 V DC) | |
| Contact material | Silver alloy, gold flashed | |
| Connection type | Cable gland | |
| Maximum connection cable cross-section | 1.5 mm² | |
| Short-circuit protection | 4A gG | |
| Weight | 0.15 kg | 0.14 kg |

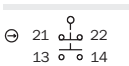
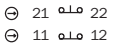
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## Dimensional drawings




Dimensions in mm

## Switching elements

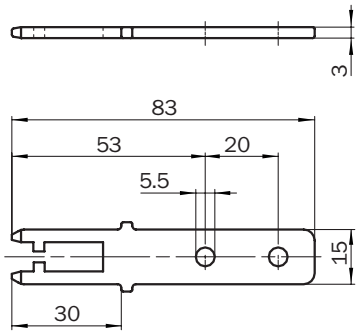
| Actuator inserted | Actuator removed | |
|---|---|---|
|  |  | 11, 1 positive action N/C contact + 2 N/O contacts |
|  |  | 20, 2 positive action N/C contacts |


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# Actuators

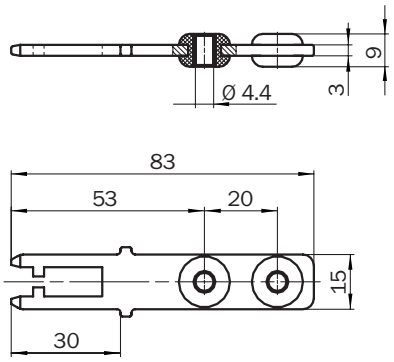
| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 1000 mm | iE10-S1 | 5306527 |
| | Rubber-mounted | Min. 1000 mm | iE10-S2 | 5306530 |
| Angled | Rigid | Min. 1000 mm | iE10-A1 | 5306535 |
| Radius | Semi flexible | Min. 90 mm | iE10-R1 | 5306528 |
| | | Min. 100 mm | iE10-R2 | 5306529 |

## iE10-S1



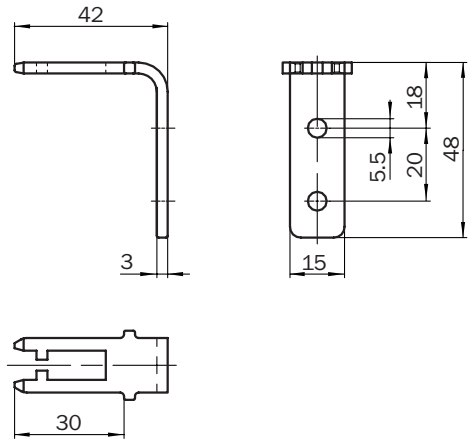

2 safety screws included.
Min. door radius 1000 mm.

## iE10-S2




2 safety screws included.
Min. door radius 1000 mm.

## iE10-A1

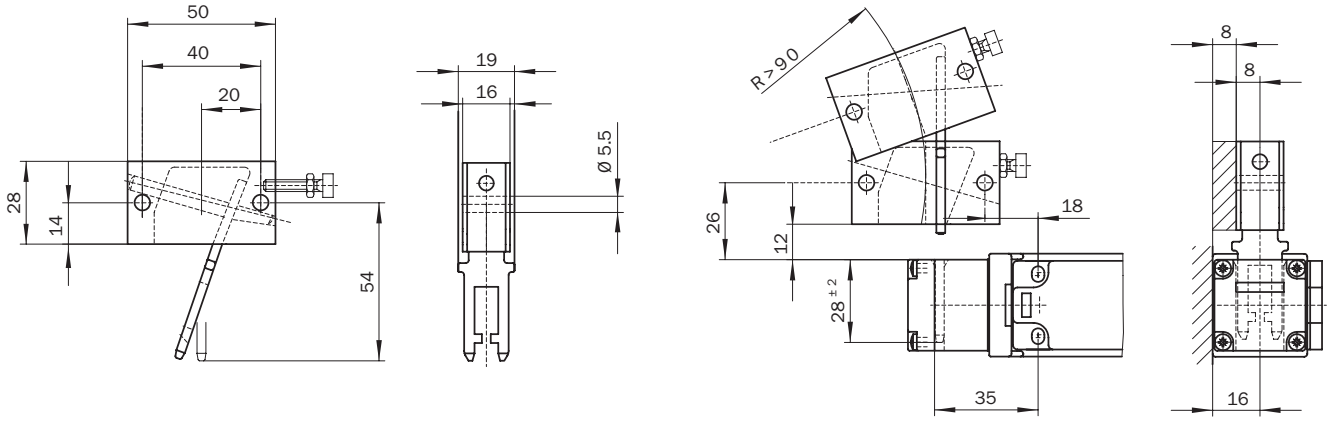



2 safety screws included.
Min. door radius 1000 mm.

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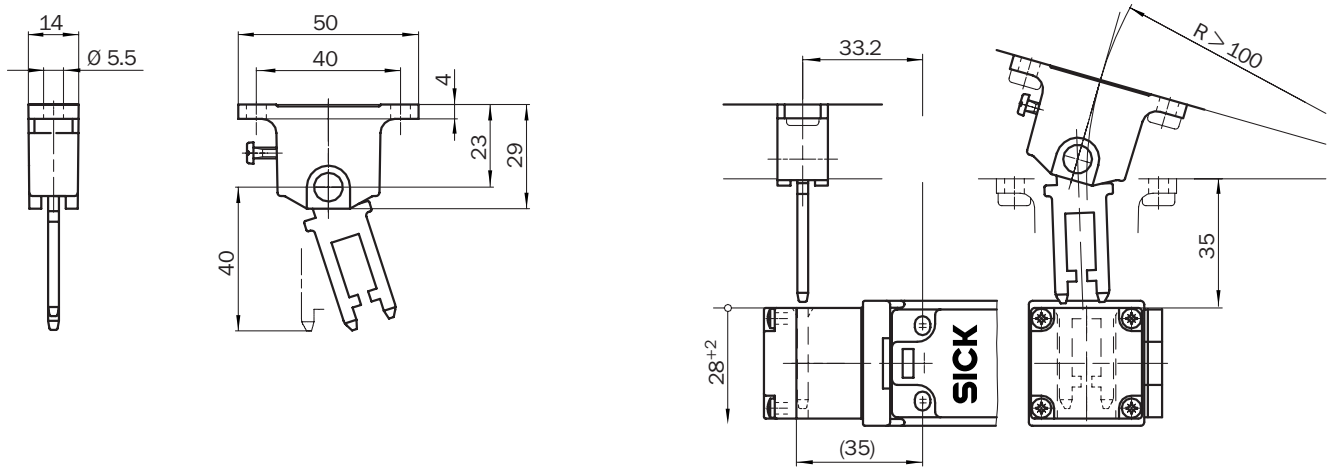

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## iE10-R1




2 safety screws included.
Min. door radius 90 mm.

## iE10-R2




2 safety screws included.
Min. door radius 100 mm.

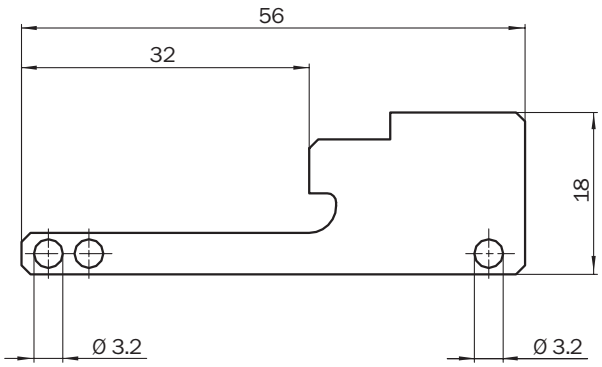
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# Lockout bar

| Type | Part number |
|---|---|
| iE10-S3 | 5306536 |

## iE10-S3




The locking bar can be inserted into the safety switch in place of the actuator when the safety guard is in the open condition and can be secured to prevent its removal by standard commercially available padlocks (max. 2 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

# Other accessories

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**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Plastic |
| **Number of cable entries (depending on type)** | 1 / 3 |
| **Size of the cable gland** | M16 |
| **Locking force** | 10 N |

## Product description

- Safety switches with remote multi-coded actuator
- 1- or 3-pole contact element
- Miniature design – ideal for direct mounting on framework

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 1 | 0 | i11-S103 | 6022584 |
| 2 | 1 | i11-S213 | 6022583 |

Please order actuator separately






- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M16
- Enclosure rating IP 67

H

| Further information | Page |
|---|---|
| → Technical specifications | H-8 |
| → Dimensional drawings | H-9 |
| → Switching elements | H-9 |
| → Actuators | H-10 |
| → Other accessories | H-11 |
| → Services | A-2 |



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# Detailed technical specifications

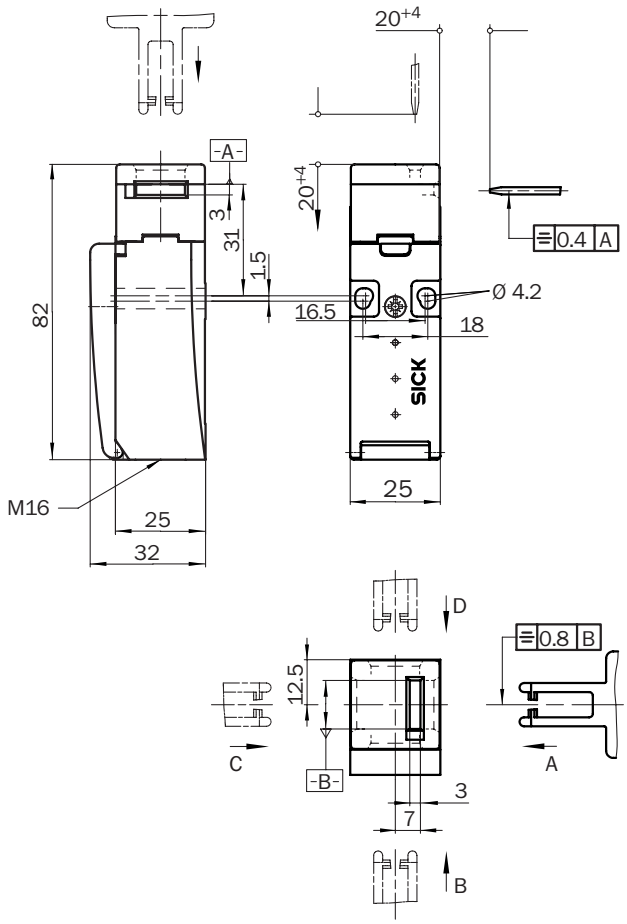
| Type | i11-S103 | i11-S213 |
|---|---|---|
| Housing material | Glass-fibre reinforced thermoplastic | |
| Enclosure rating | IP 67 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –20 °C ... +80 °C | |
| Maximum approach speed | 333 mm/s | |
| Actuation force | Min. 6 N | |
| Locking force | 10 N | |
| Actuation frequency | Max. 1.94 Hz | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 1 | 2 |
| Number of normally open contacts | 0 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 4 A (230 V AC), 4 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 12 V DC | |
| Minimum switching current (switching voltage) | 1 mA (24 V DC) | |
| Contact material | Silver alloy, gold flashed | |
| Connection type | Cable gland | |
| Maximum connection cable cross-section | 1.5 mm² | |
| Short-circuit protection | 4A gG | |
| Weight | 0.1 kg | |

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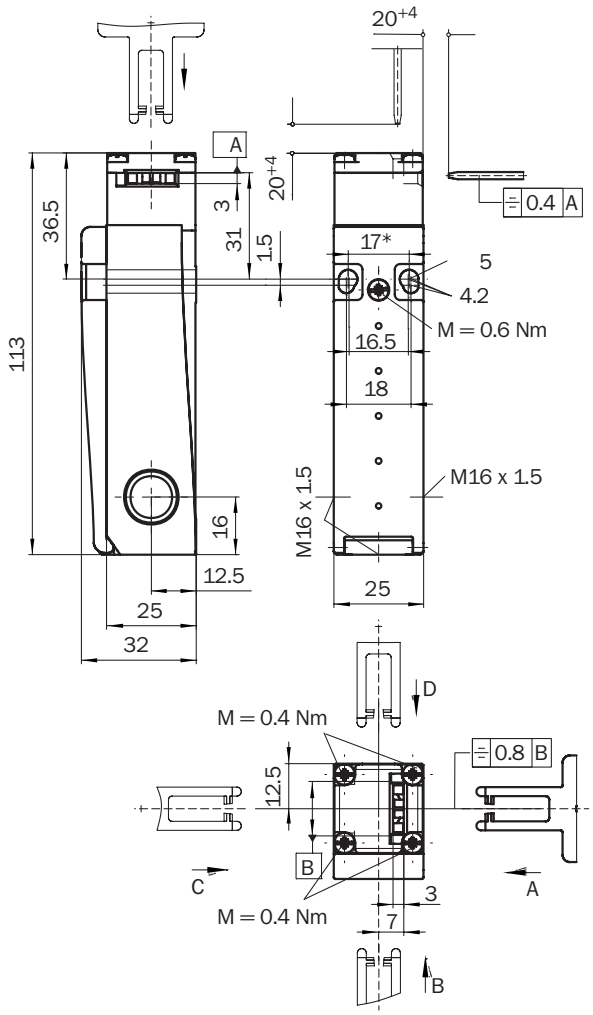

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## Dimensional drawings

**i11-S103**



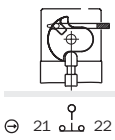
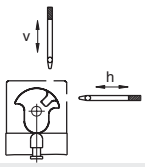

**i11-S213**




Dimensions in mm

H

## Switching elements

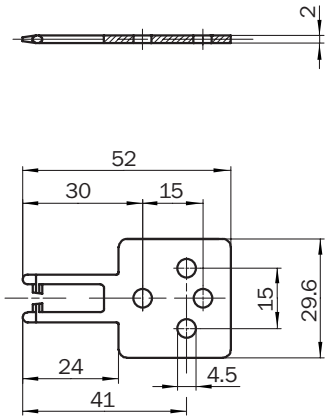
| Actuator inserted | Actuator removed | |
|---|---|---|
|  |  | |
| 21 22 | 21 22 | 10, 1 positive action N/C contact |
| 31 32<br>21 22<br>13 14 | 31 32<br>21 22<br>13 14 | 21, 2 positive action N/C contacts + 1 N/O contact |


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# Actuators

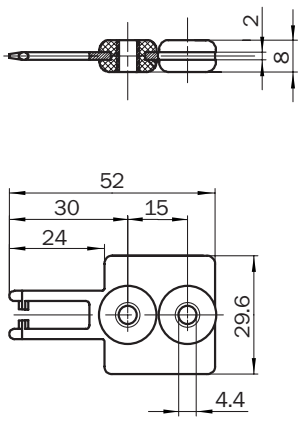
| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 150 mm | iE11-S1 | 5306537 |
| | Rubber-mounted, in line | Min. 150 mm | iE11-S2 | 5306539 |
| | Rubber-mounted, transversal | Min. 150 mm | iE11-S3 | 5306540 |
| | Narrow | Min. 150 mm | iE11-S4 | 5318428 |
| Angled | Rigid | Min. 150 mm | iE11-A1 | 5306538 |
| | Rubber-mounted, transversal | Min. 150 mm | iE11-A2 | 5306541 |

## iE11-S1



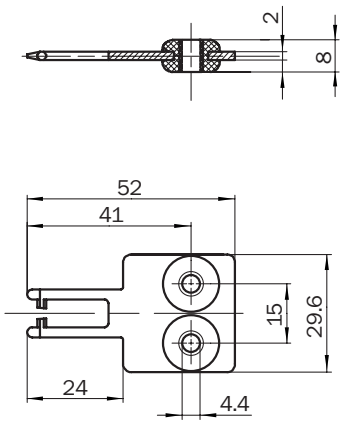

2 safety screws M4 x 14 included

## iE11-S2



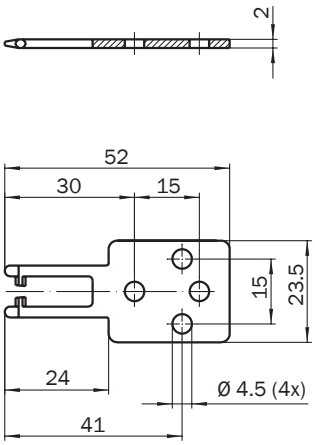

2 safety screws M4 x 14 included

## iE11-S3




2 safety screws M4 x 14 included

## iE11-S4

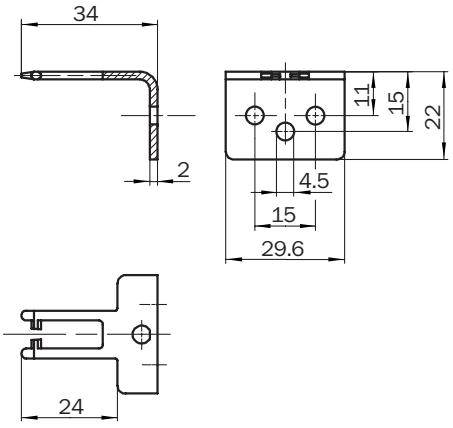



2 safety screws M4 x 14 included

H

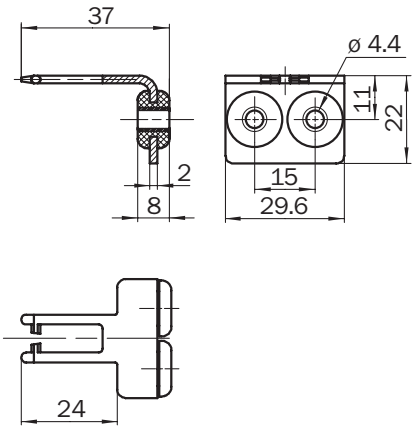

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## iE11-A1




2 safety screws M4 x 14 included

## iE11-A2




2 safety screws M4 x 14 included

# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M16 | 5309163 |
| M16 to 1/2 inch NPT adapter | 5311531 |

H


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- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M16
- Two designs: Miniature housing and design according to EN 50047
- Enclosure rating IP 67



H

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Plastic |
| **Number of cable entries** | 1 |
| **Size of the cable gland** | M16 |

## Product description

- Safety switches with remote multi-coded actuator
- 2- or 3-pole contact element
- One version as miniature design – ideal for direct mounting on framework
- Suitable for very small door radius (60 mm), with appropriate actuator.

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 1 | 1 | i12-SA113 | 6025057 |
| 2 | 0 | i12-SA203 | 6025100 |
| | 1 | i12-SB213 | 6025059 |

Please order actuator separately


| Further information | Page |
|---|---|
| → Dimensional drawings | H-14 |
| → Switching elements | H-15 |
| → Actuator travel diagram | H-15 |
| → Actuators | H-16 |
| → Other accessories | H-16 |
| → Services | A-2 |




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# Detailed technical specifications

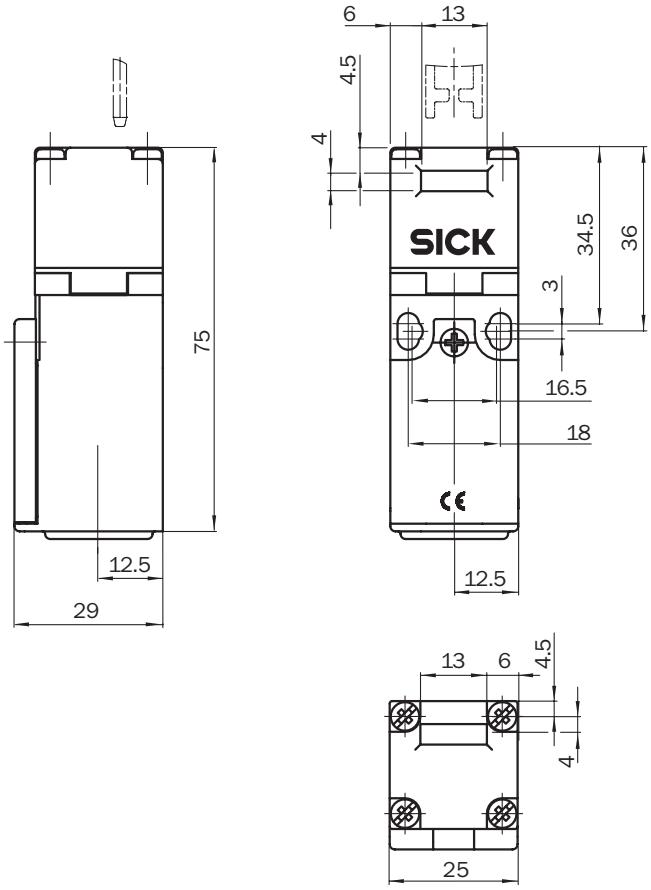
| Type | i12-SA113 | i12-SA203 | i12-SB213 |
|---|---|---|---|
| Housing material | Glass-fibre reinforced thermoplastic | | |
| Enclosure rating | IP 67 | | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | | |
| Ambient operating temperature from ... to | –20 °C ... +80 °C | | |
| Maximum approach speed | 160 mm/s | | |
| Actuation force | Min. 6 N | | Min. 15 N |
| Actuation frequency | Max. 2 Hz | | |
| Switching principle | Slow-action switch | | |
| Number of positive action normally closed contacts | 1 | 2 | |
| Number of normally open contacts | 1 | 0 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | | |
| Rated operating current (voltage) | 3 A (240 V AC), 3 A (24 V DC) | | |
| Rated insulation voltage $U_i$ | 240 V | | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | | |
| Minimum switching voltage | 5 V DC | | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | | |
| Connection type | Cable gland | | |
| Maximum connection cable cross-section | 1.5 mm² | | |
| Short-circuit protection | 3A gG | | |
| Weight | 0.08 kg | | 0.11 kg |

H

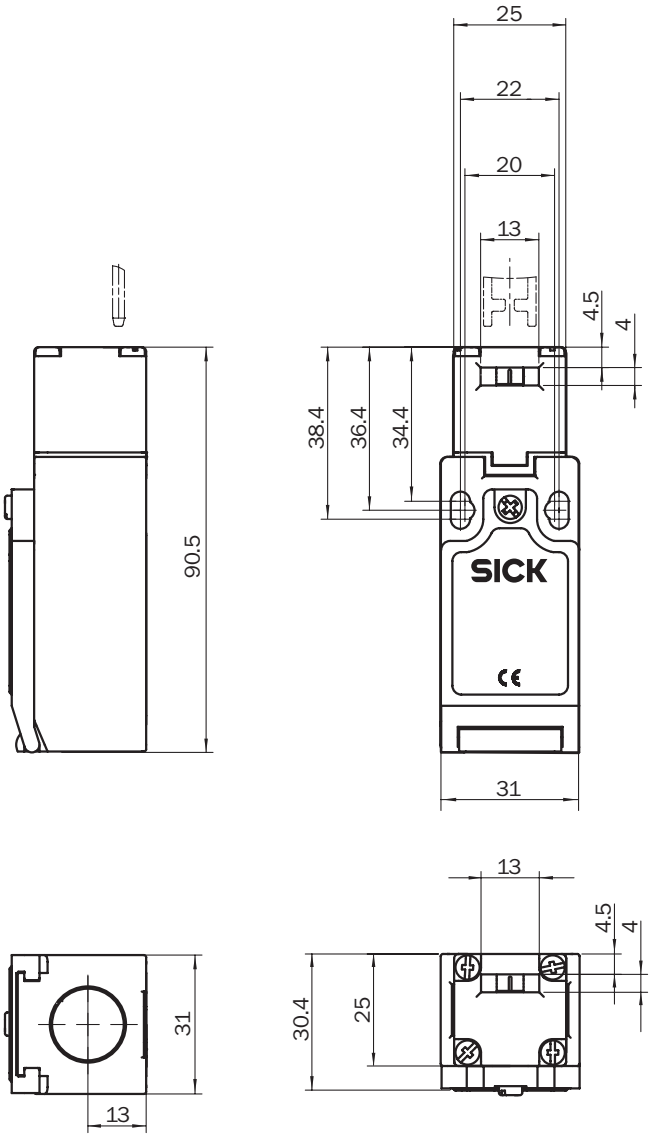

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# Dimensional drawings

**i12-SA113, i12-SA203**




**i12-SB213**

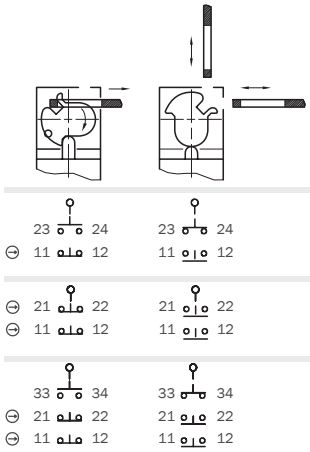



Dimensions in mm

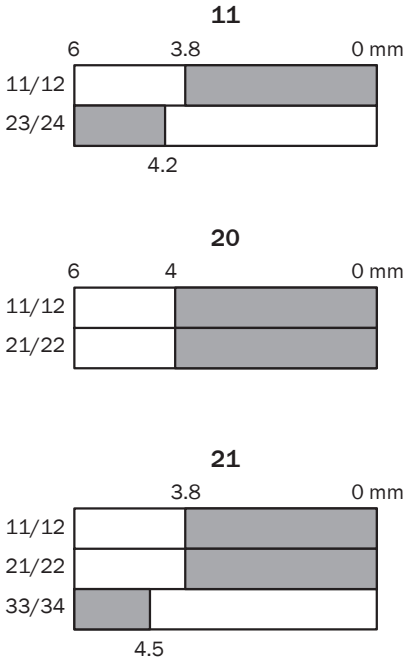
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## Switching elements

| Actuator inserted | Acutator removed | |
|---|---|---|
|  | | |
|  |  | 11, 1 positive action N/C contact + 1 N/O contact |
|  |  | 20, 2 positive action N/C contacts |
|  |  | 21, 2 positive action N/C contacts + 1 N/O contact |

## Actuator travel diagram




Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)

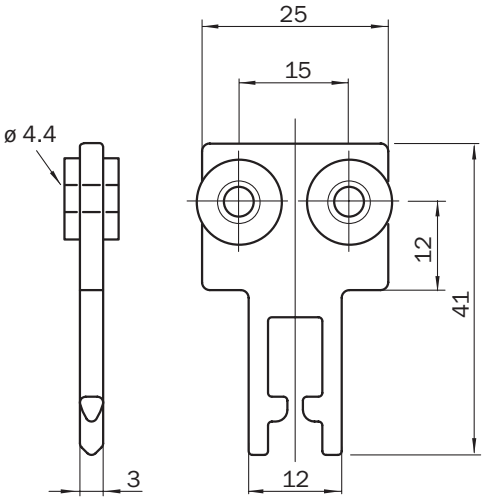
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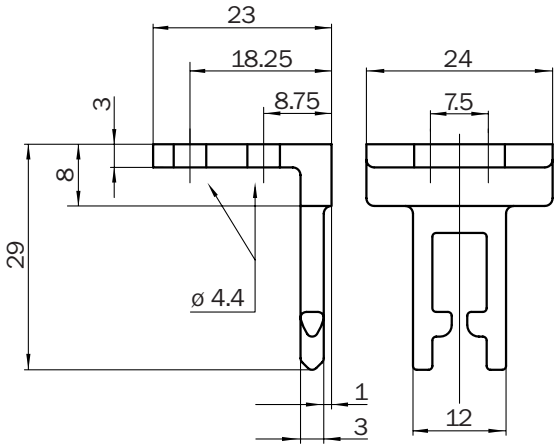
# Actuators

| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 150 mm | iE12-S1 | 5311131 |
| Angled | Rigid | Min. 150 mm | iE12-A1 | 5311132 |
| Radius | Semi flexible | Min. 60 mm | iE12-F1 | 5308842 |

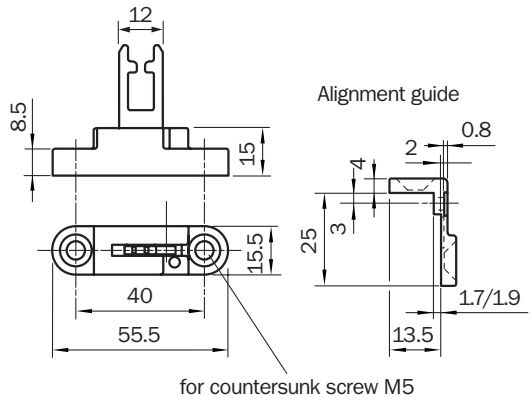
## iE12-S1




## iE12-A1




## iE12-F1




# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M16 | 5309163 |
| M16 to 1/2 inch NPT adapter | 5311531 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Plastic |
| **Number of cable entries** | 3 |
| **Size of the cable gland** | M20 |
| **Locking force** | 30 N |

## Product description

- Safety switches with remote multi-coded actuator
- 2-pole contact element
- Easy conversion of actuating direction through rotatable head

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

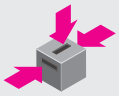
| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 1 | 1 | i16-SA113 | 6025065 |
| 2 | 0 | i16-SA203 | 6025063 |

Please order actuator separately






- Housing material glass-fibre reinforced thermoplastic
- Three actuating directions
- 30 N locking force
- Cable gland 3 x M20
- Enclosure rating IP 67



H

| Further information | Page |
|---|---|
| → Technical specifications | H-18 |
| → Dimensional drawings | H-19 |
| → Switching elements | H-19 |
| → Actuator travel diagram | H-19 |
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| → Catch and retainer kit | H-20 |
| → Other accessories | H-20 |
| → Services | A-2 |



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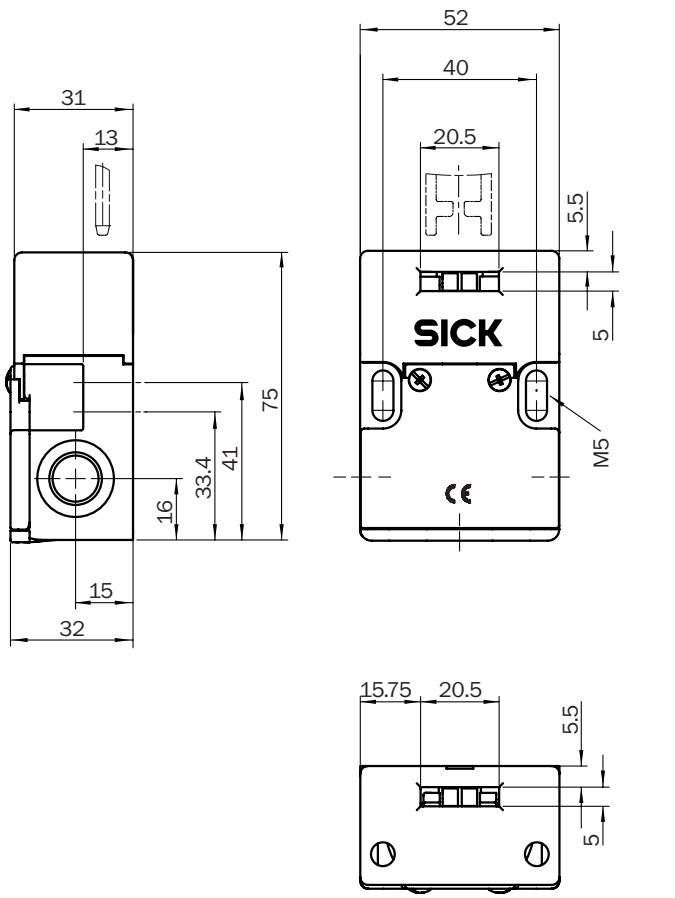
# Detailed technical specifications

| Type | i16-SA113 | i16-SA203 |
|---|---|---|
| Housing material | Glassfibre reinforced polybutylene terephthalate (PBT) | |
| Enclosure rating | IP 67 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –20 °C ... +80 °C | |
| Maximum approach speed | 160 mm/s | |
| Actuation force | Min. 30 N | |
| Locking force | 30 N | |
| Actuation frequency | Max. 2 Hz | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 1 | 2 |
| Number of normally open contacts | 1 | 0 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 2 A (250 V AC), 2 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 5 V DC | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | |
| Contact material | Silver, nickel | |
| Connection type | Cable gland | |
| Maximum connection cable cross-section | 1.5 mm² | |
| Short-circuit protection | 2A gG | |
| Weight | 0.14 kg | |

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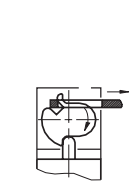
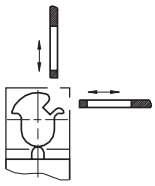
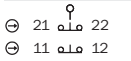
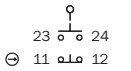

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## Dimensional drawings



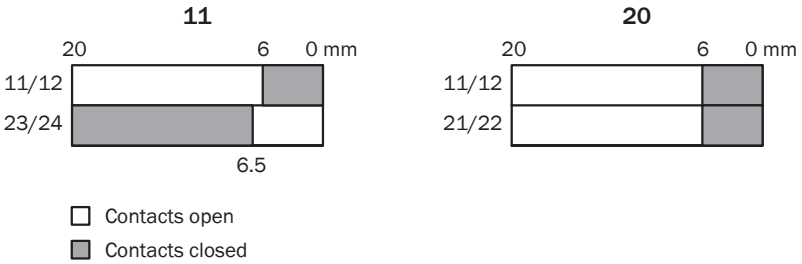

Dimensions in mm

## Switching elements

| Actuator inserted | Actuator removed | |
|---|---|---|
|  |  | 20, 2 positive action N/C contacts |
|  |  | 11, 1 positive action N/C contact + 1 N/O |
|  |  | |



## Actuator travel diagram



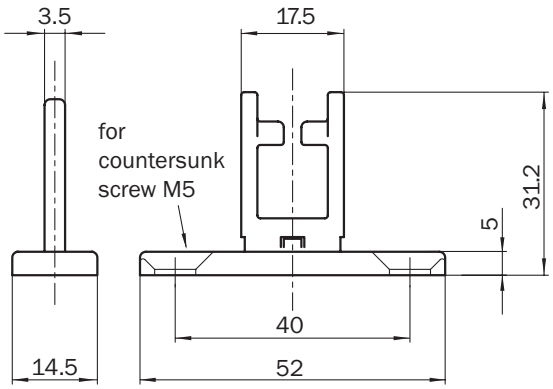

Contact action over the entire actuator withdrawal distance
(full insertion = 0 mm)

## Actuators

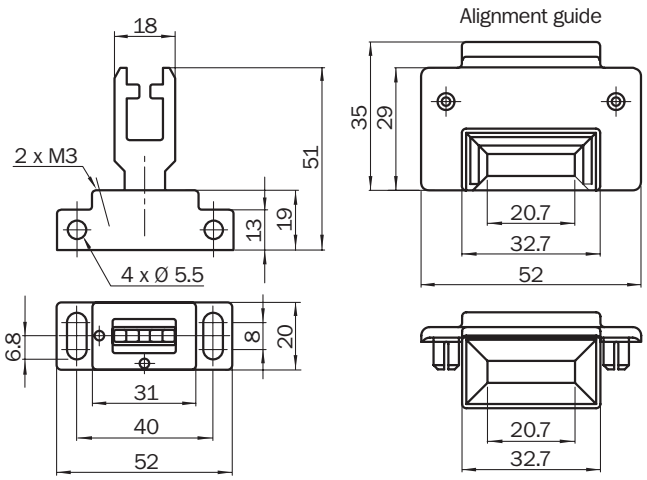
| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 175 mm | iE16-S1 | 5311128 |
| | Fully flexible | Min. 60 mm | iE16-F1 | 5311129 |
| Radius | Semi flexible | Min. 60 mm | iE16-F2 | 5311278 |


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## iE16-S1

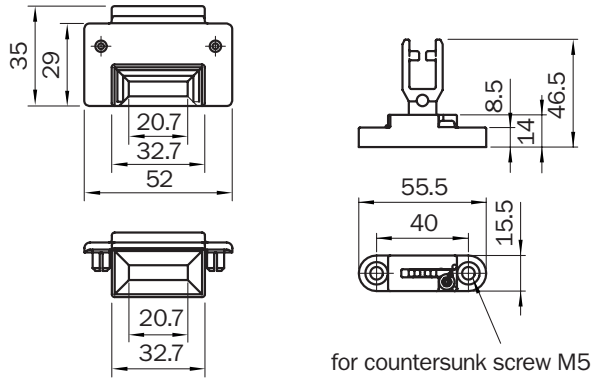



## iE16-F1




The actuator facilitates movement in both horizontal and vertical planes.

## iE16-F2



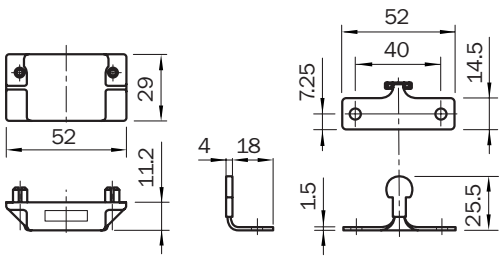

The actuator facilitates movement in the horizontal plane only.

H

# Catch and retainer kit

| Type | Part number |
|---|---|
| iE16-SCR | 5310780 |

## iE16-SCR




- An increase in the locking force by 50 N.
- Only in connection with rigid actuators.

# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Plastic |
| **Number of cable entries** | 3 |
| **Size of the cable gland** | M20 |

## Product description

- Safety switch with remote multi-coded actuator
- 3-pole contact element
- Easy conversion of actuating direction through rotatable head

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

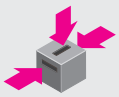
| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 2 | 1 | i17-SA213 | 6025067 |

Please order actuator separately





- Housing material glass-fibre reinforced thermoplastic
- Three actuating directions
- Cable gland 3 x M20
- Enclosure rating IP 67



H

| Further information | Page |
|---|---|
| → Technical specifications | H-22 |
| → Dimensional drawings | H-23 |
| → Switching elements | H-23 |
| → Actuator travel diagram | H-23 |
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| → Catch and retainer kit | H-24 |
| → Other accessories | H-24 |
| → Services | A-2 |



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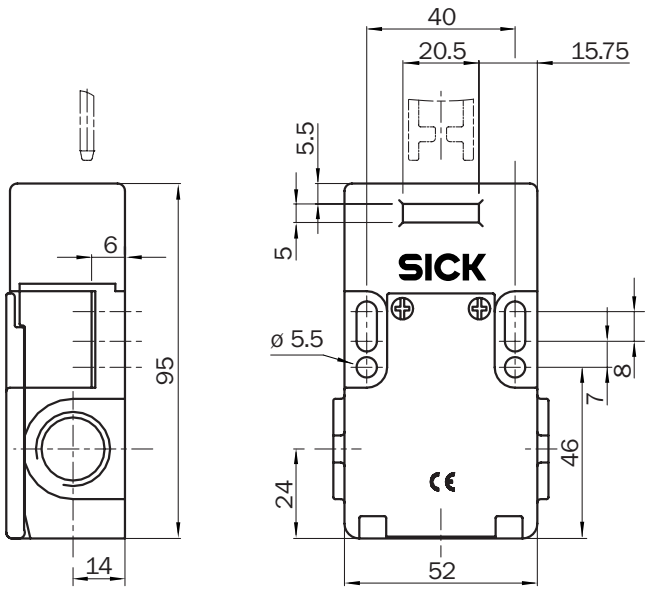
# Detailed technical specifications

| | |
|---|---|
| **Housing material** | Glass-fibre reinforced thermoplastic |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –20 °C ... +80 °C |
| **Maximum approach speed** | 1000 mm/s |
| **Actuation force** | Min. 12 N |
| **Actuation frequency** | Max. 2 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 2 A (250 V AC), 2 A (24 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 5 V DC |
| **Minimum switching current (switching voltage)** | 5 mA (5 V DC) |
| **Contact material** | Silver, nickel |
| **Connection type** | Cable gland |
| **Maximum connection cable cross-section** | 1.5 mm² |
| **Short-circuit protection** | 2A gG |
| **Weight** | 0.16 kg |

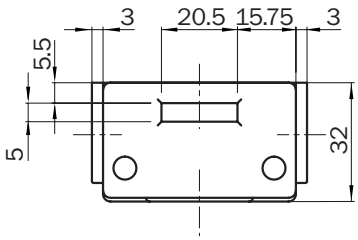



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## Dimensional drawings

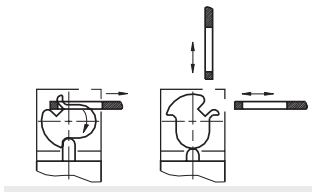



Dimensions in mm



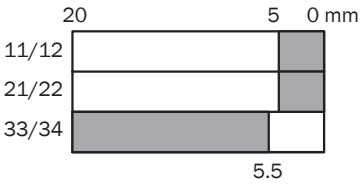

## Switching elements

| Actuator inserted | Actuator removed |
|---|---|




21, 2 positive action N/C contact + 1 N/O

## Actuator travel diagram




Contacts open
Contacts closed

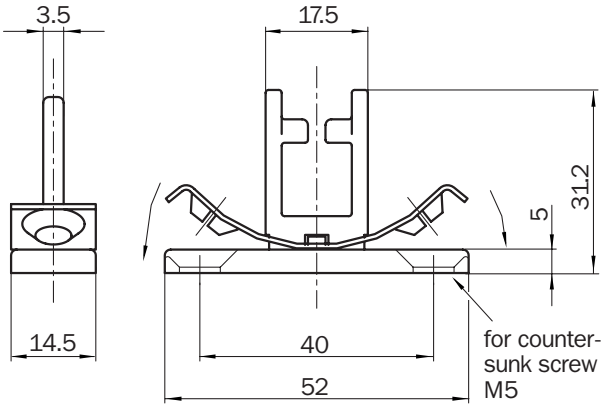
Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)

## Actuators

| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 175 mm | iE17-S1 | 5311130 |
| | Fully flexible | Min. 60 mm | iE16-F1 | 5311129 |
| Radius | Semi flexible | Min. 60 mm | iE16-F2 | 5311278 |

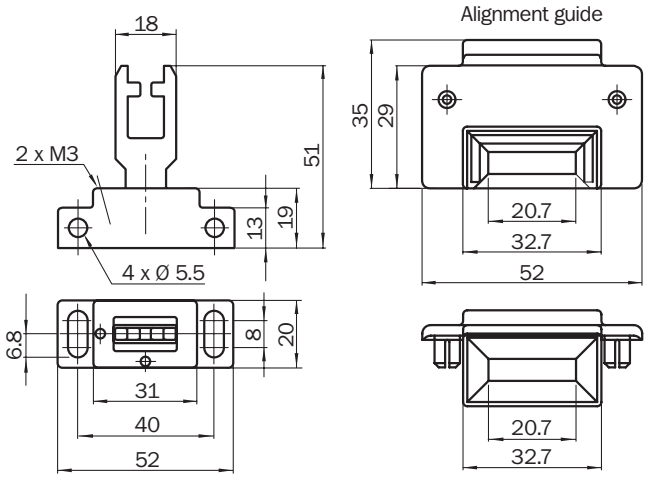

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## iE17-S1



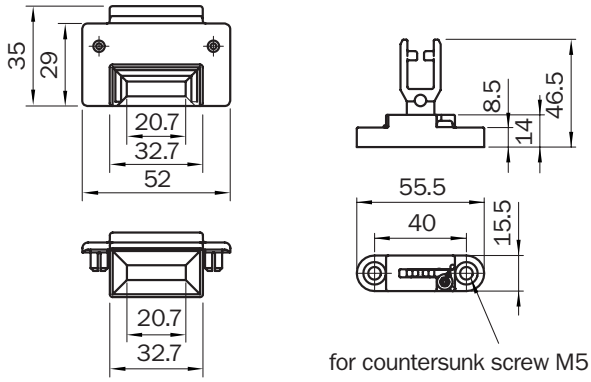

The actuator facilitates movement in the horizontal plane only.

## iE16-F1




The actuator facilitates movement in both horizontal and vertical planes.

## iE16-F2



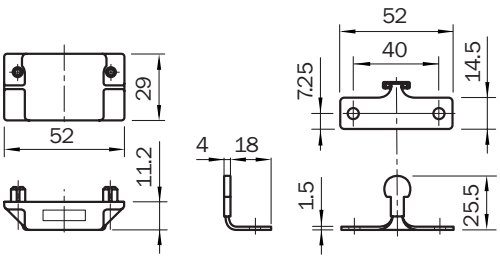

The actuator facilitates movement in the horizontal plane only.

H

# Catch and retainer kit

| Type | Part number |
|---|---|
| iE16-SCR | 5310780 |

## iE16-SCR




- An increase in the locking force by 50 N.
- Only in connection with rigid actuators.

# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 3 |
| **Number of normally open contacts** | 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Metal |
| **Number of cable entries** | 1 |
| **Size of the cable gland** | M20 |
| **Locking force** | 10 N |

## Product description

- Safety switches with remote multi-coded actuator
- 4-pole contact element
- Self-cleaning head element – elimination of contamination through actuator movement

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 3 | 1 | i100-S313 | 6022590 |

Please order actuator separately






- Housing material die-cast light alloy
- Four actuating directions
- Cable gland M20
- Enclosure rating IP 67
- Three-dimensional coded actuator
- Design according to EN 50041



H

| Further information | Page |
|---|---|
| → Technical specifications | H-26 |
| → Dimensional drawings | H-26 |
| → Switching elements | H-26 |
| → Actuators | H-27 |
| → Lockout bar | H-30 |
| → Other accessories | H-30 |
| → Services | A-2 |



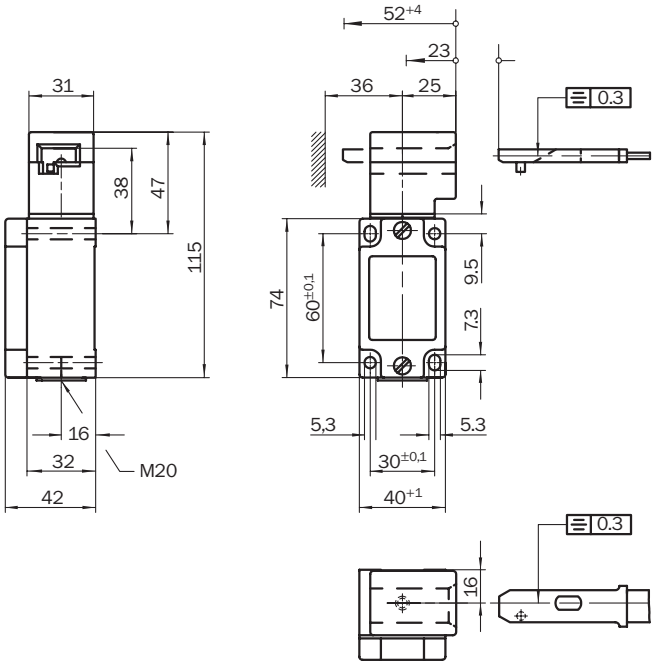
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# Detailed technical specifications

| | |
|---|---|
| **Housing material** | Die-cast light alloy |
| **Surface treatment** | Anodized |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 2 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –25 °C ... +80 °C |
| **Maximum approach speed** | 333 mm/s |
| **Actuation force** | Min. 35 N |
| **Locking force** | 10 N |
| **Actuation frequency** | Max. 1.94 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 3 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 4 A (230 V AC), 4 A (24 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 12 V DC |
| **Minimum switching current (switching voltage)** | 1 mA (24 V DC) |
| **Contact material** | Silver alloy, gold flashed |
| **Connection type** | Cable gland |
| **Maximum connection cable cross-section** | 1.5 mm² |
| **Short-circuit protection** | 4A gG |
| **Weight** | 0.37 kg |

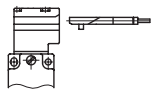
H

## Dimensional drawings




Dimensions in mm

## Switching elements

| Actuator removed | Actuator inserted |
|---|---|
|  |  |
| 41 42<br>33 34<br>21 22<br>11 12 | 41 42<br>33 34<br>21 22<br>11 12 |

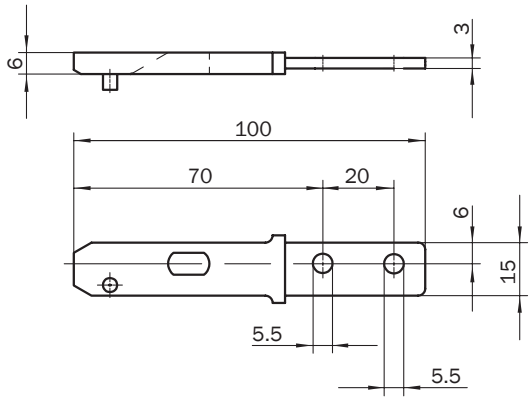
31, 3 positive action N/C contacts + 1 N/O contact

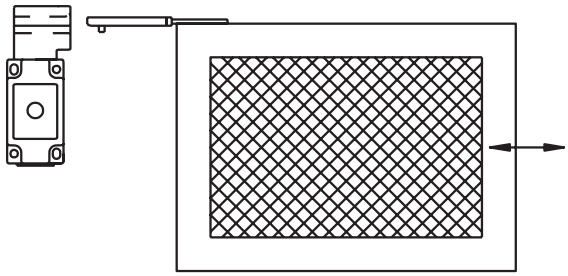

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# Actuators

| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 1000 mm | iE100-S1 | 5306497 |
| Radius, door hinged on left | Semi flexible | Min. 400 mm | iE100-R1 | 5306498 |
| Radius, door hinged on right | Semi flexible | Min. 400 mm | iE100-R2 | 5306499 |
| Radius, safety flap hinged at bottom | Semi flexible | Min. 165 mm | iE100-R3 | 5306500 |
| Radius, safety flap hinged at top | Semi flexible | Min. 165 mm | iE100-R4 | 5306526 |

## iE100-S1 straight



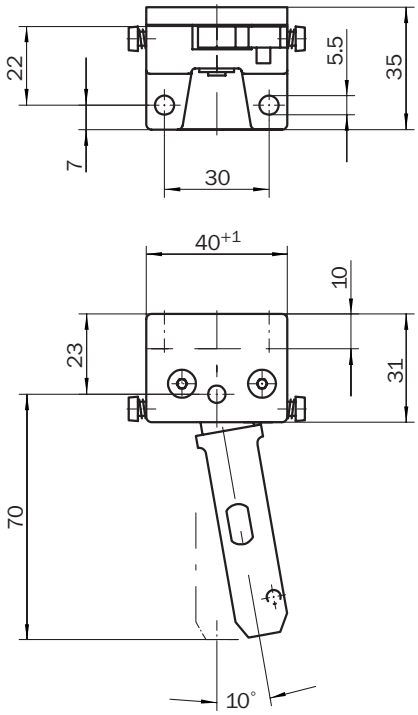



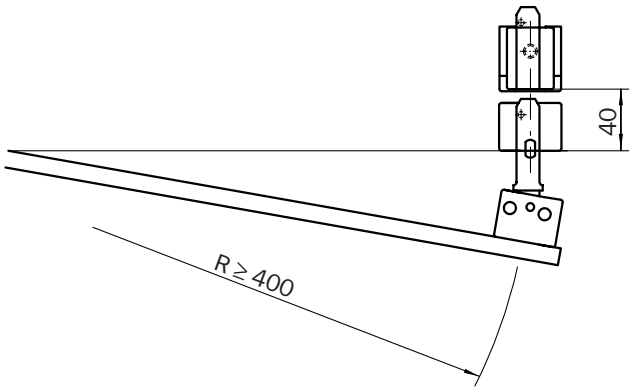
Min. door radius 1000 mm.
With two safety screws for each actuator.

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## iE100-R1 radius, door hinged on left

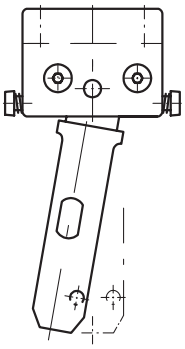


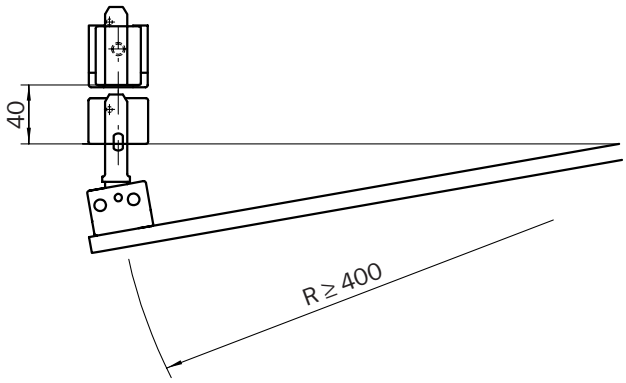




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2 safety screws included.
Min. door radius 400 mm.

## iE100-R2 radius, door hinged on right

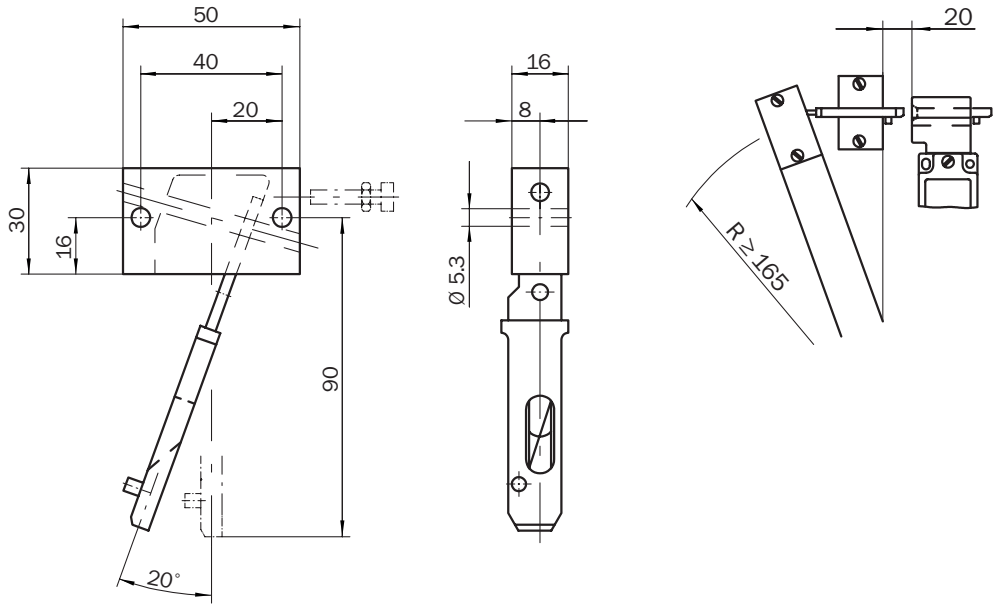





2 safety screws included.
Min. door radius 400 mm.


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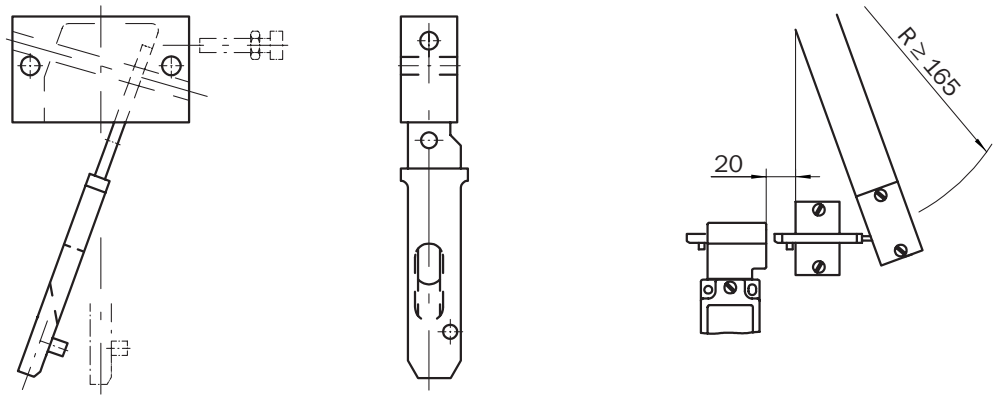
## iE100-R3 radius, safety flap hinged at bottom




2 safety screws included.
Min. door radius 165 mm.

H

## iE100-R4 radius, safety flap hinged at top




2 safety screws included.
Min. door radius 165 mm.

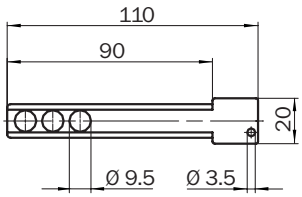

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# Lockout bar

| Type | Part number |
|---|---|
| iE100-S2 | 5306534 |

## iE100-S2






The lockout bar can be inserted in the safety switch instead of the actuator when the safety guard is in open condition and can then be secured to prevent removal by standard commercially available padlocks (max. 3 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

# Other accessories

H

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 2 / 3 |
| **Number of normally open contacts (depending on type)** | 1 / 2 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Metal |
| **Number of cable entries** | 1 |
| **Size of the cable gland** | M20 |
| **Locking force** | 5 N |

## Product description

- Safety switches with remote multi-coded actuator
- 4-pole contact element
- Small door radius (175 mm) possible even with standard actuator

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 2 | 2 | i110-SA223 | 6025074 |
| 3 | 1 | i110-SA313 | 6025073 |

Please order actuator separately






H

- Housing material die-cast zinc
- Five actuating directions
- Cable gland M20
- Enclosure rating IP 67
- Design according to EN 50041



| Further information | Page |
|---|---|
| → Technical specifications | H-32 |
| → Dimensional drawings | H-33 |
| → Switching elements | H-33 |
| → Actuator travel diagram | H-34 |
| → Actuators | H-34 |
| → Other accessories | H-34 |
| → Services | A-2 |


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# Detailed technical specifications

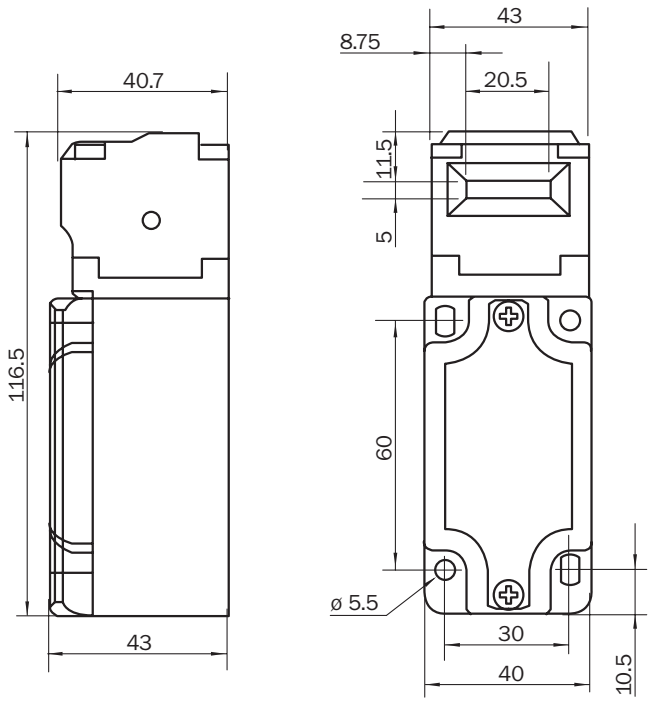
| Type | i110-SA223 | i110-SA313 |
|---|---|---|
| Housing material | Zinc die-cast | |
| Surface treatment | Varnished | |
| Enclosure rating | IP 67 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –20 °C ... +80 °C | |
| Maximum approach speed | 100 mm/s | |
| Actuation force | Min. 12 N | |
| Locking force | 5 N | |
| Actuation frequency | Max. 2 Hz | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 2 | 3 |
| Number of normally open contacts | 2 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 3 A (240 V AC), 3 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 5 V DC | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | |
| Contact material | Silver, nickel | |
| Connection type | Cable gland | |
| Maximum connection cable cross-section | 1.5 mm² | |
| Short-circuit protection | 3A gG | |
| Weight | 0.34 kg | |

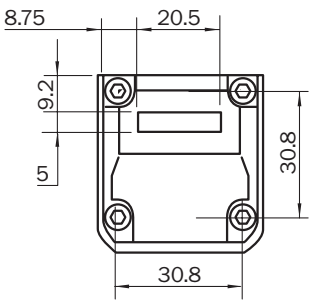
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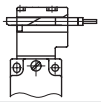
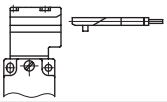
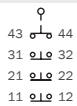
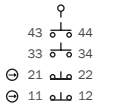
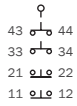
## Dimensional drawings



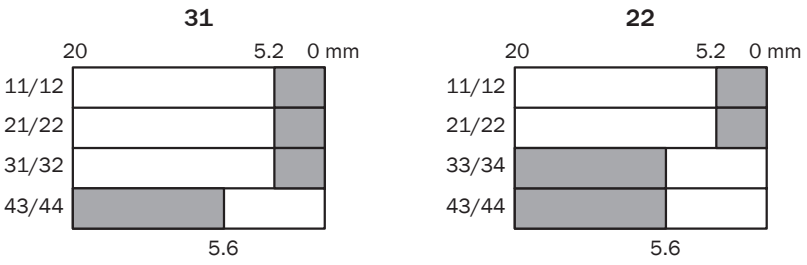

Dimensions in mm

## Switching elements

| Actuator inserted | Actuator removed | | |
|---|---|---|---|
|  |  | | |
|  |  | 31 | 31, 3 positive action N/C contacts + 1 N/O |
|  |  | 22 | 22, 2 positive action N/C contacts + 2 N/O |


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## Actuator travel diagram



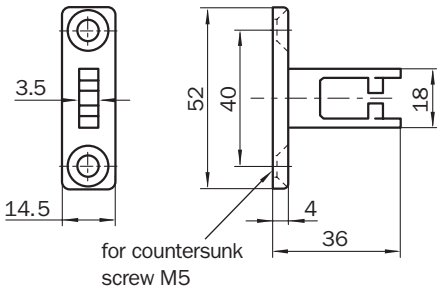

Contact action over the entire actuator withdrawal distance
(full insertion = 0 mm)

## Actuators

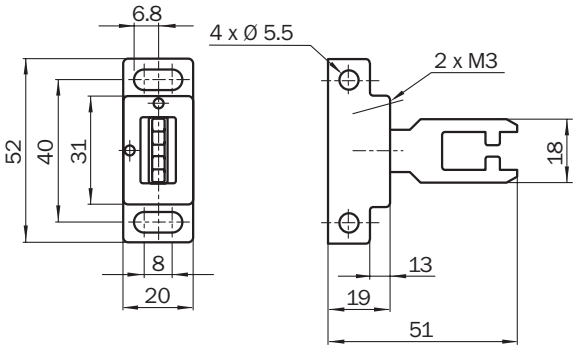
| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 175 mm | iE110-S1 | 5311134 |
| | Fully flexible | Min. 60 mm | iE110-F1 | 5311135 |

H

### iE110-S1




### iE110-F1




## Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Type of actuator** | Handle operated |
| **Housing material** | Metal |
| **Number of cable entries** | 1 |
| **Size of the cable gland** | PG13.5 |

## Product description

- Safety switch with separate handle-operated actuator
- 3-pole contact element
- The system can compensate for any misalignment, such as caused by door drop

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Supply voltage | Type | Part number |
|---|---|---|---|---|
| 2 | 1 | 24 V DC | i1001-24 | 6021016 |

Actuator supplied with delivery





- Housing material powder-coated die-cast zinc
- Cable gland PG13.5
- Four actuating directions
- Enclosure rating IP 67
- LED function indicator
- Handle-operated actuator



H

| Further information | Page |
|---|---|
| → Technical specifications | H-36 |
| → Dimensional drawings | H-36 |
| → Internal circuitry | H-37 |
| → Trapped key systems | H-37 |
| → Actuator | H-39 |
| → Lockout bar | H-40 |
| → Other accessories | H-40 |
| → Services | A-2 |



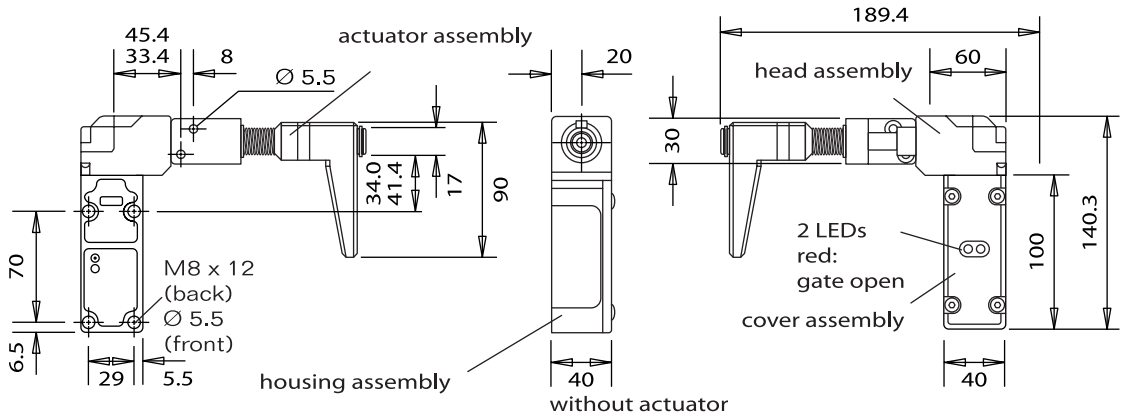
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## Detailed technical specifications

| | |
|---|---|
| **Housing material** | Zinc alloy and stainless steel |
| **Surface treatment** | Varnished |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –5 °C ... +40 °C |
| **Maximum approach speed** | 333 mm/s |
| **Actuation frequency** | Max. 2 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | DC-13 |
| **Rated operating current (voltage)** | 10 A (24 V DC) |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Contact material** | 90 % silver and 10 % nickel |
| **Connection type** | Cable gland |
| **Maximum connection cable cross-section** | 2.5 mm² |
| **Weight** | 1.37 kg |

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## Dimensional drawings

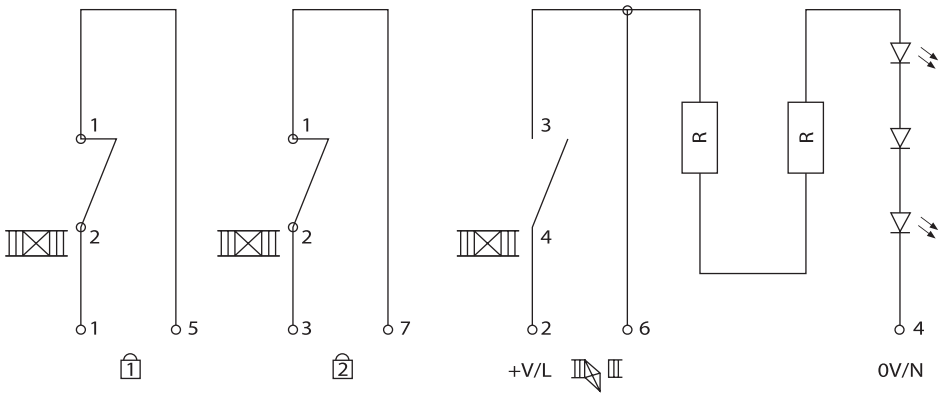



Dimensions in mm



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## Internal circuitry




## Trapped key systems

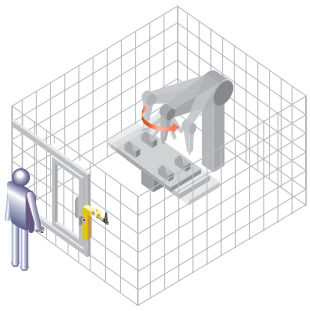
| Accessory type | Coding | Delivery | Type | Part number |
|---|---|---|---|---|
| Access key adapter | 1 | Key supplied with delivery | iE1000-AK1 | 5308302 |
| | 2 | Key supplied with delivery | iE1000-AK2 | 5308303 |
| Safety key adapter | 1 | Key supplied with delivery | iE1000-SK1 | 5308297 |
| | 2 | Key supplied with delivery | iE1000-SK2 | 5308298 |
| Enabling unit | 1 | Key supplied with delivery | iE1000-ES1 | 6021019 |
| | 2 | Key supplied with delivery | iE1000-ES2 | 6021020 |

Additional types on request

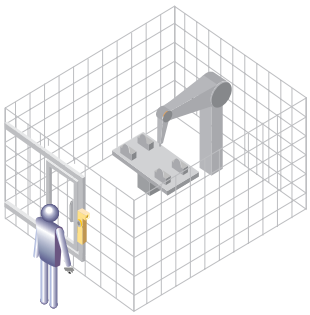
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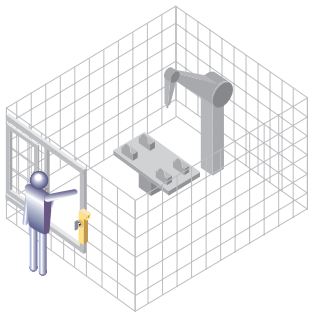
## Access key adapter



Plant in action, no key inserted



Key is inserted, plant comes to a standstill



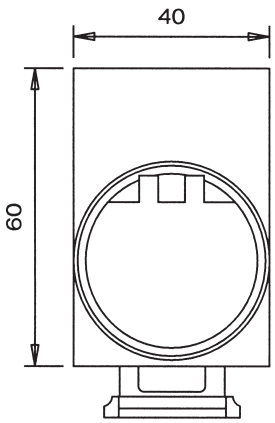
Door can now be opened

**Access function**

■ Application example

Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.

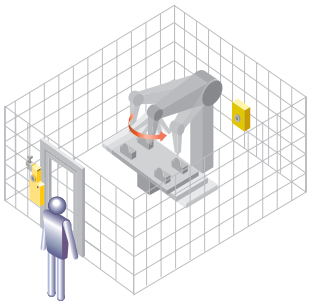


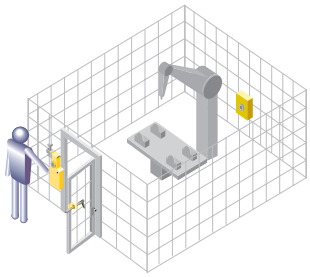

The access key adapter is installed between the head and the housing of the safety switch.
If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

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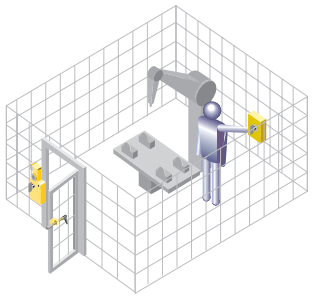
## Safety key adapter



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



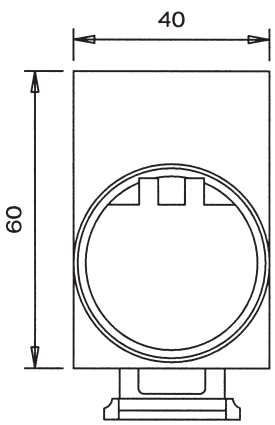
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

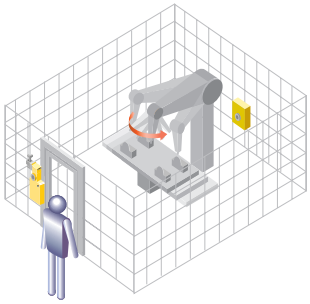


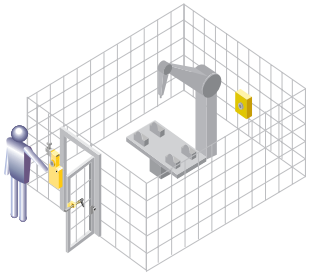

The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.


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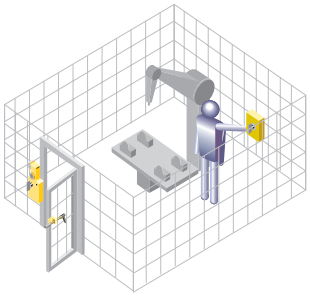
## Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



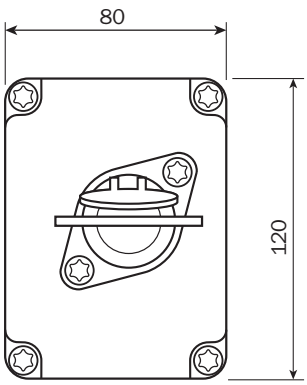
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.




Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.

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## Actuator

| Actuation option | Way of actuation | Type | Part number |
|---|---|---|---|
| Turning lever | Fully flexible | iE1001-R1 | 5308316 |

### iE1001-R1





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## Lockout bar

| Type | Part number |
|---|---|
| iE1002-R1 | 5308313 |

### iE1002-R1



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## Other accessories

**Key**

| Prevention of unintentional machine start | Access function | Enable function | Coding | Type | Part number |
|---|---|---|---|---|---|
| – | ✔ | – | 1 | Key AK1 | 5308686 |
| | | | 2 | Key AK2 | 5308687 |
| ✔ | – | ✔ | 1 | Key SK1 | 5308307 |
| | | | 2 | Key SK2 | 5308308 |

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland PG13.5 | 5305811 |

**Safety screws**

| Type | Part number |
|---|---|
| Safety allen screws | 5308317 |

**Safety switch accessories, miscellaneous**

| Usage | Type | Part number |
|---|---|---|
| For safety allen screws | BIT | 5308319 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Type of actuator** | Tongue operated |
| **Housing material** | Metal |
| **Number of cable entries** | 1 |
| **Size of the cable gland** | PG13.5 |

## Product description

- Safety switch with remote multi-coded actuator
- 3-pole contact element
- The system can compensate for any mis-alignment, such as caused by door drop

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Supply voltage | Type | Part number |
|---|---|---|---|---|
| 2 | 1 | 24 V DC | i1002-24 | 6021010 |

Actuator supplied with delivery






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- Housing material powder-coated die-cast zinc
- Four actuating directions
- Cable gland PG13.5
- Enclosure rating IP 67
- LED function indicator
- Separate actuator



| Further information | Page |
|---|---|
| → Technical specifications | H-42 |
| → Dimensional drawings | H-42 |
| → Internal circuitry | H-43 |
| → Trapped key systems | H-43 |
| → Actuator | H-46 |
| → Lockout bar | H-46 |
| → Other accessories | H-47 |
| → Services | A-2 |



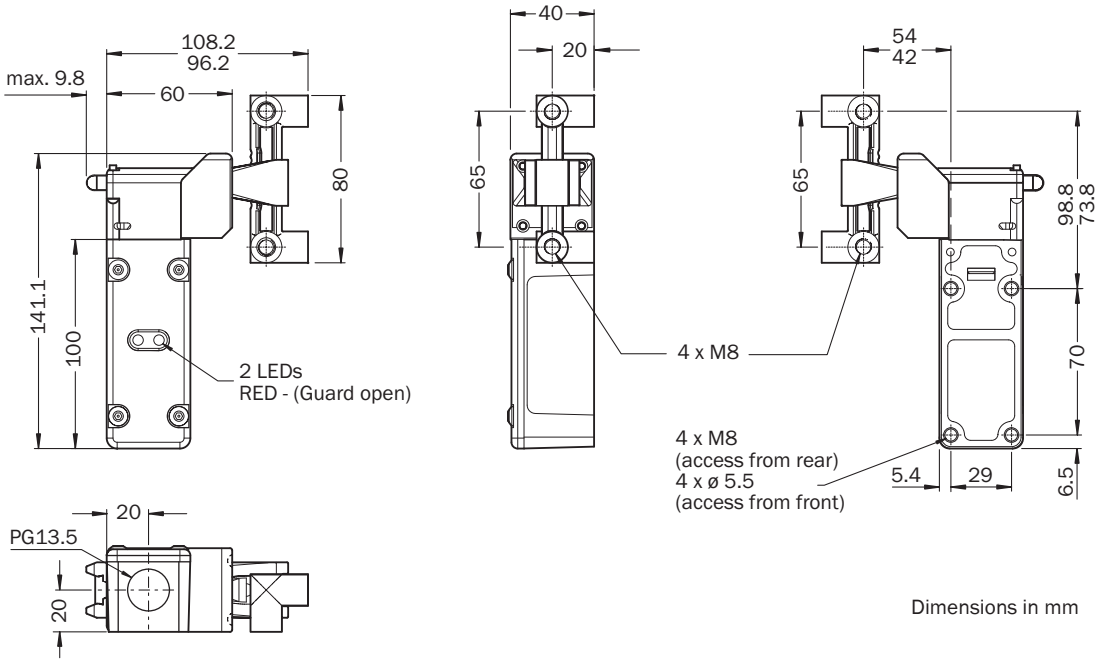
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## Detailed technical specifications

| | |
|---|---|
| **Housing material** | Zinc alloy and stainless steel |
| **Surface treatment** | Varnished |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –5 °C ... +40 °C |
| **Maximum approach speed** | 333 mm/s |
| **Actuation force** | Min. 5 N |
| **Actuation frequency** | Max. 2 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | DC-13 |
| **Rated operating current (voltage)** | 10 A (24 V DC) |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Contact material** | 90 % silver and 10 % nickel |
| **Connection type** | Cable gland |
| **Maximum connection cable cross-section** | 2.5 mm² |
| **Weight** | 1.11 kg |

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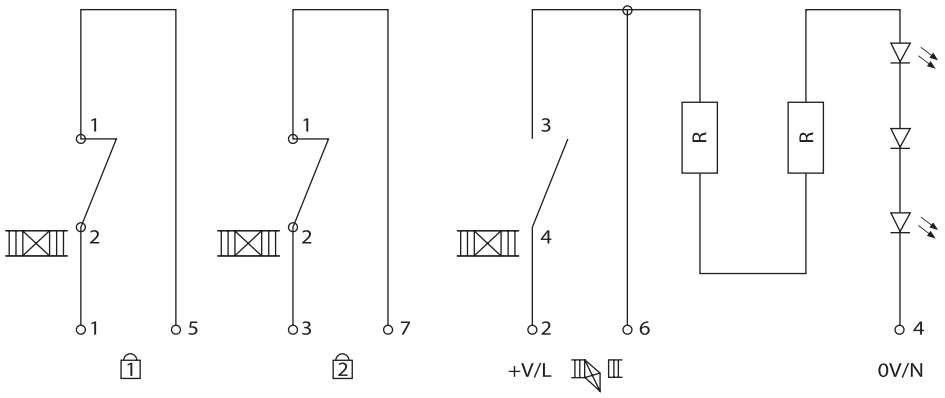
## Dimensional drawings




Dimensions in mm


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## Internal circuitry




## Trapped key systems

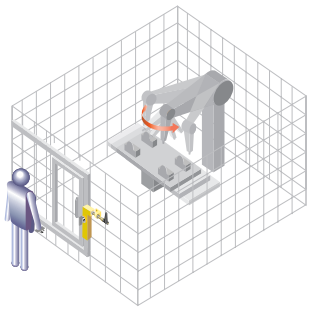
| Accessory type | Coding | Delivery | Type | Part number |
|---|---|---|---|---|
| Access key adapter | 1 | Key supplied with delivery | iE1000-AK1 | 5308302 |
| | 2 | Key supplied with delivery | iE1000-AK2 | 5308303 |
| Safety key adapter | 1 | Key supplied with delivery | iE1000-SK1 | 5308297 |
| | 2 | Key supplied with delivery | iE1000-SK2 | 5308298 |
| Enabling unit | 1 | Key supplied with delivery | iE1000-ES1 | 6021019 |
| | 2 | Key supplied with delivery | iE1000-ES2 | 6021020 |

Additional types on request

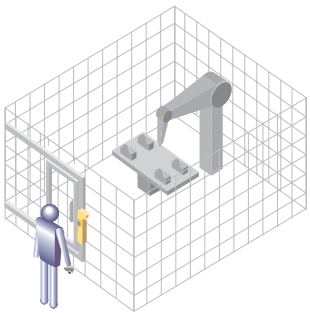
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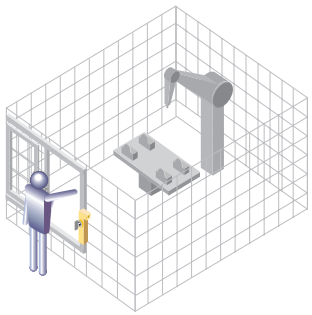
## Access key adapter



Plant in action, no key inserted



Key is inserted, plant comes to a standstill



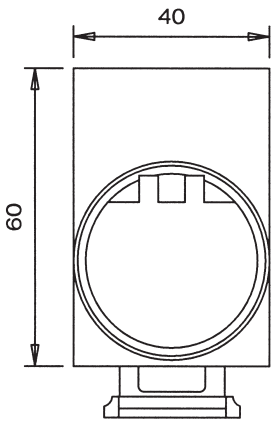
Door can now be opened

**Access function**

■ Application example

Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.

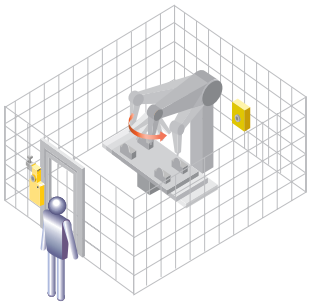


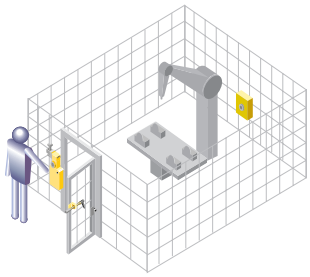

The access key adapter is installed between the head and the housing of the safety switch.
If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

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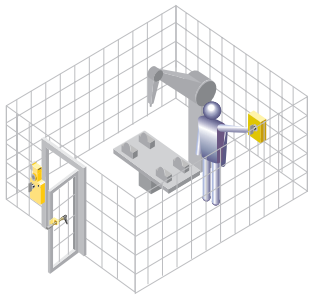
## Safety key adapter



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



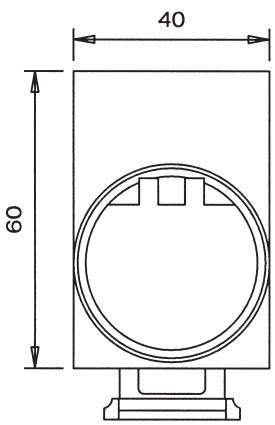
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

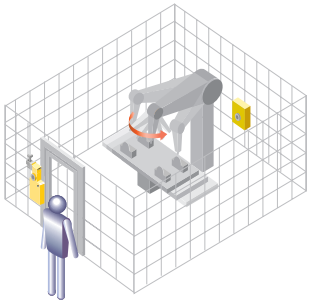


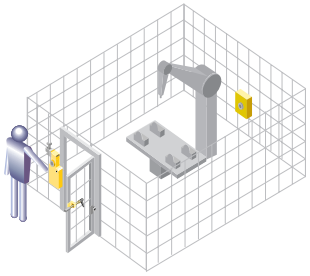

The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.


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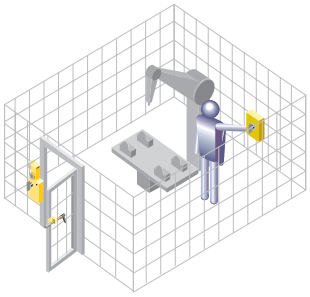
## Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



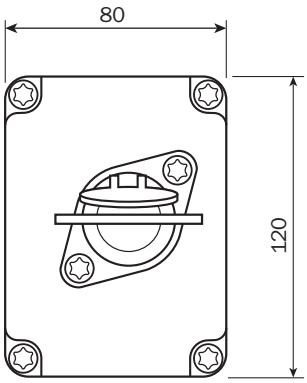
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.




Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.

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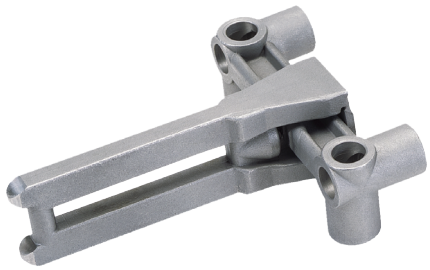


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## Actuator

| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Semi flexible | Min. 300 mm | iE1002-S2 | 5308315 |

### iE1002-S2



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## Lockout bar

| Type | Part number |
|---|---|
| iE1002-S3 | 5308312 |

### iE1002-S3




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# Other accessories

### Key

| Prevention of unintentional machine start | Access function | Enable function | Coding | Type | Part number |
|---|---|---|---|---|---|
| – | ✔ | – | 1 | Key AK1 | 5308686 |
| | | | 2 | Key AK2 | 5308687 |
| ✔ | – | ✔ | 1 | Key SK1 | 5308307 |
| | | | 2 | Key SK2 | 5308308 |

### Cable gland

| Type | Part number |
|---|---|
| Cable gland PG13.5 | 5305811 |

### Safety screws

| Type | Part number |
|---|---|
| Safety allen screws | 5308317 |

### Safety switch accessories, miscellaneous

| Usage | Type | Part number |
|---|---|---|
| For safety allen screws | BIT | 5308319 |

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# Explanations of features

**Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the "positive action" type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

**Door signalling contact**

The three possible states of a safety locking device are "Door locked and closed", "Door unlocked and closed" and "Door unlocked and open". Depending on the version, there is a contact element for the third state, which is activated when the door is opened. Both positive action normally closed contact/normally open contact combinations and normally closed contacts without positive action, are used as door signalling contacts.

**Housing material**

The housing materials used can be separated into two large groups – "metals" and "plastics". The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

**Locking force**

The locking force gives the maximum force which can act on the locking mechanism. Depending on the type, the maximum locking force is only achieved by using additional fixing screws that are included in the supply (e.g. i200-Lock).

**Locking type**

Safety locking devices are equipped either with a mechanical or electric locking device.

For the mechanical locking device, the locking is activated after inserting the actuator. It can be released by applying the voltage to the locking magnet.

For the electric locking device, the voltage must be applied to the locking magnet after inserting the actuating element in order to activate the locking.

**Type of actuator**

The majority of safety switches have appropriately coded tongue-operated actuators that prevent simple manipulation of the switch.

The i1000 series has an additional handle-operated actuator with coded spindle. It is not actuated by applying a force but by applying a torque.

**Mechanical unlocking mechanism**

The locking device can be unlocked, e.g. on a power failure, using the mechanical unlocking mechanism.



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# Safety locking devices




| Safety application | Number of positive action normally closed contacts/normally open contacts [1] | Housing material [1] | Type of actuator [1] | Door signalling contacts [1] | Number x size of cable gland | Locking force [1] | Locking type [1] mechanical (m)/electrical (e) | Product | Page |
|---|---|---|---|---|---|---|---|---|---|
|  | 2 / 1<br>3 / 1<br>4 / 0 | Plastic | Tongue operated | ✔ | 3 x M20 | 1200 N | m / e | i10 Lock | I-2 |
| | 2 / 1<br>3 / 0 | Plastic | Tongue operated | – | 1 x M20 | 1200 N | m | i14 Lock | I-9 |
| | 4 / 1<br>3 / 2 | Plastic | Tongue operated | ✔ | 3 x M20 | 2000 N | m / e | i200 Lock | I-13 |
| | 4 / 2 | Metal | Handle operated | ✔ | 1 x PG13.5 | 2500 N | m | i1001 Lock | I-17 |
| | 4 / 2 | Metal | Tongue operated | ✔ | 1 x PG13.5 | 2500 N | m | i1002 Lock | I-23 |

[1] Explanation see page I-0



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- Housing material glass-fibre reinforced thermoplastic
- Locking force 1200 N
- Five actuating directions
- Cable gland 3 x M20
- Enclosure rating IP 67
- Mechanical unlocking mechanism



| Further information | Page |
|---|---|
| → Dimensional drawings | I-4 |
| → Switching elements | I-5 |
| → Actuators | I-5 |
| → Lockout bar | I-7 |
| → Lock | I-7 |
| → Alignment aid | I-8 |
| → Other accessories | I-8 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Number of positive action normally closed door monitoring contacts (depending on type)** | 0 / 1 / 2 |
| **Number of normally open door monitoring contacts (depending on type)** | 0 / 1 |
| **Number of normally closed door monitoring contacts (depending on type)** | 0 / 1 |
| **Housing material** | Plastic |
| **Locking force** | 1200 N |
| **Locking type (depending on type)** | Electrical / mechanical |

## Product description

- Safety switches with remote multi-coded actuator and tumbler mechanism
- 4-pole contact element
- Small design – ideal for direct mounting on framework
- Various actuator versions available

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Positive action normally closed | Normally open | Door monitoring: Positive action normally closed | Door monitoring: Normally open | Door monitoring: Normally closed | Solenoid operating voltage | Locking type | Type | Part number |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 0 | 0 | 1 | 24 V DC | Electrical | i10-E0233 Lock | 6022585 |
| | 0 | 0 | 1 | 1 | 24 V DC | Electrical | i10-E0253 Lock | 6020536 |
| | | 1 | 1 | 0 | 24 V DC | Electrical | i10-E0313S02 Lock | 6011368 |
| | | 2 | 0 | 0 | 24 V DC | Electrical | i10-E0453 Lock | 6020598 |
| | 1 | 0 | 0 | 1 | 24 V DC | Mechanical | i10-M0233 Lock | 6022580 |
| | 0 | 0 | 0 | 1 | 24 V DC | Mechanical | i10-M0253 Lock | 6027397 |

Please order actuator separately

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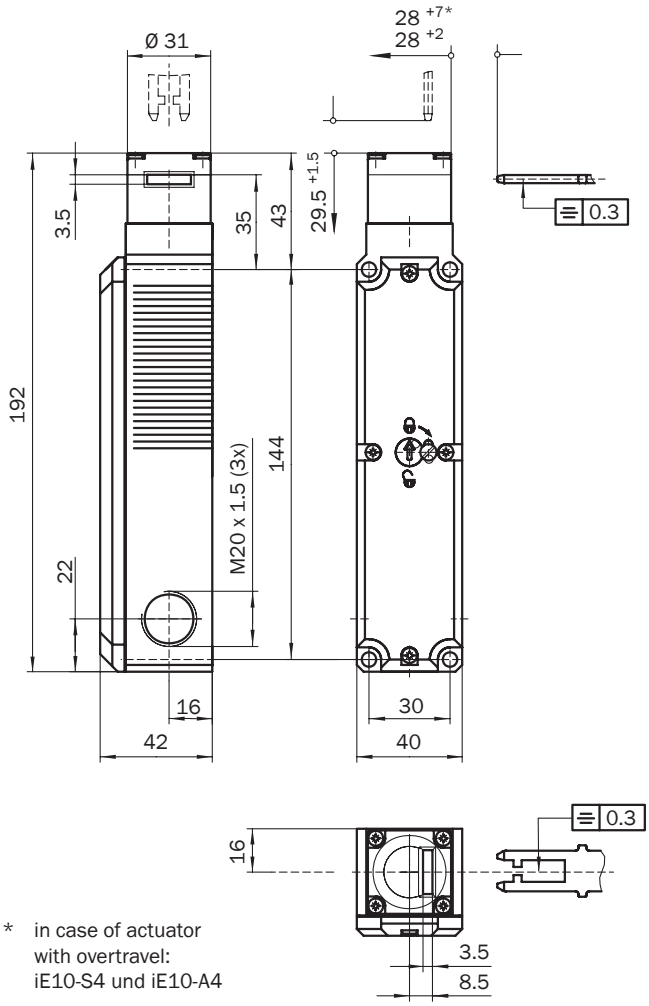
# Detailed technical specifications

| Type | i10-E0233 Lock | i10-E0253 Lock | i10-E0313S02 Lock | i10-E0453 Lock | i10-M0233 Lock | i10-M0253 Lock |
|---|---|---|---|---|---|---|
| **Housing material** | Glass-fibre reinforced thermoplastic | | | | | |
| **Enclosure rating** | IP 67 | | | | | |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles, in case of radius actuator 1 x $10^5$ switching cycles | | | | | |
| **Ambient operating temperature from ... to** | –20 °C ... +55 °C | | | | | |
| **Maximum approach speed** | 333 mm/s | | | | | |
| **Actuation force** | Min. 20 N | | | | | |
| **Locking force** | 1200 N | | | | | |
| **Actuation frequency** | Max. 1.94 Hz | | | | | |
| **Switching principle** | Slow-action switch | | | | | |
| **Number of positive action normally closed contacts** | 2 | | | | | |
| **Number of normally open contacts** | 1 | 0 | | | 1 | 0 |
| **Number of positive action normally closed door monitoring contacts** | 0 | | 1 | 2 | 0 | |
| **Number of normally open door monitoring contacts** | 0 | 1 | | 0 | | 1 |
| **Number of normally closed door monitoring contacts** | 1 | | 0 | | 1 | |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 | | | | | |
| **Rated operating current (voltage)** | 4 A (230 V AC), 4 A (24 V DC) | | | | | |
| **Rated insulation voltage $U_i$** | 250 V | | | | | |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC | | | | | |
| **Minimum switching voltage** | 12 V DC | | | | | |
| **Minimum switching current (switching voltage)** | 1 mA (24 V DC) | | | | | |
| **Solenoid operating voltage** | 24 V (20.4 V ... 26.4 V) DC | | | | | |
| **Power consumption** | Max. 8 W | | | | | |
| **Duty cycle** | 100 % | | | | | |
| **Contact material** | Silver alloy, gold flashed | | | | | |
| **Connection type** | Cable gland | | | | | |
| **Maximum connection wire cross-section** | 1.5 mm² | | | | | |
| **Short-circuit protection** | 4A gG | | | | | |
| **Weight** | 0.46 kg | | | | | |


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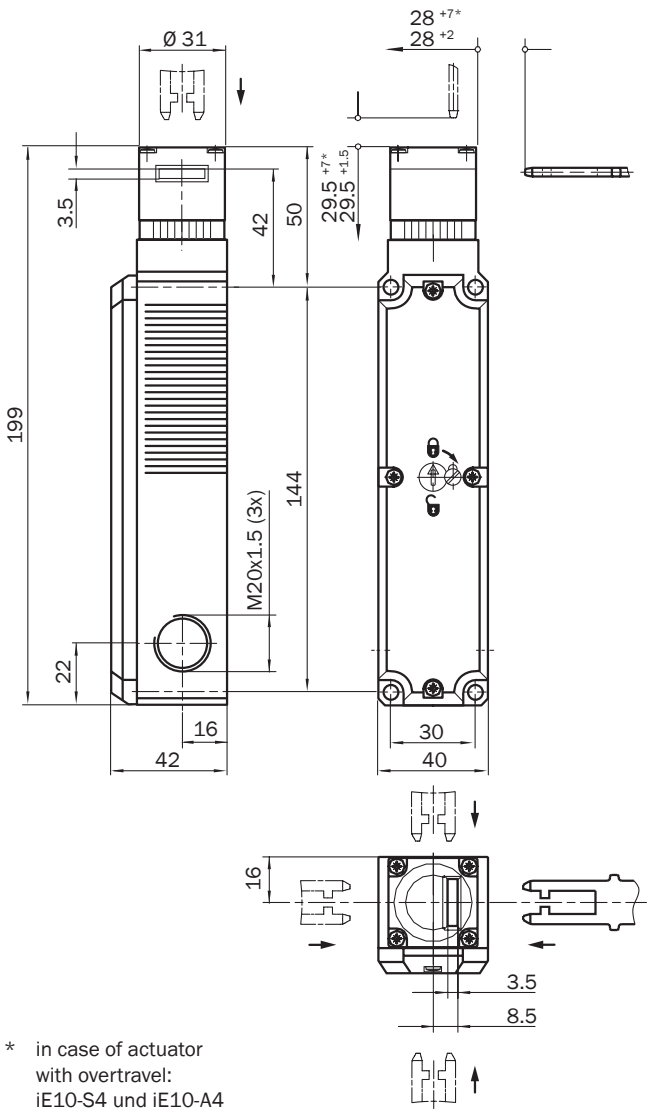
# Dimensional drawings

**i10-E0233 Lock, i10-E0253 Lock, i10-E0453 Lock, i10-M0233 Lock, i10-M0253 Lock**




* in case of actuator with overtravel: iE10-S4 und iE10-A4

**i10-E0313S02 Lock**



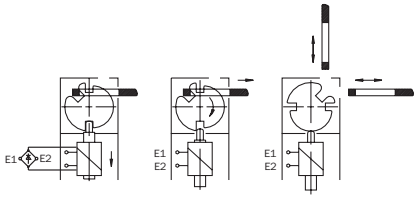

* in case of actuator with overtravel: iE10-S4 und iE10-A4

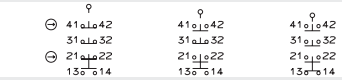
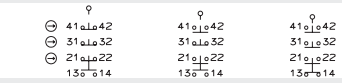
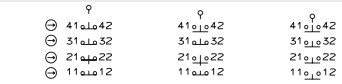
Dimensions in mm


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## Switching elements

| Actuator inserted | | Actuator removed | |
|---|---|---|---|
| locked | unlocked | | |

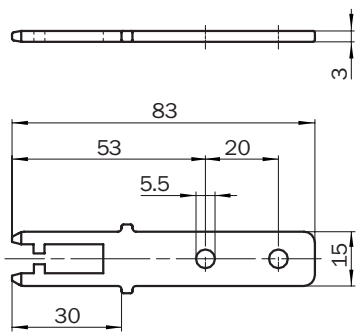



| | |
|---|---|
|  | 23, 2 positive action N/C contacts + 1 N/O contact + 1 N/C as door contact |
|  | 25, 2 positive action N/C contacts + 1 N/O contact as door contact + 1 N/C as door contact |
|  | 31, 2 positive action N/C contacts + 1 N/O contact as door contact + 1 positive action N/C as door contact |
|  | 45, 2 positive action N/C contacts + 2 positive action N/C as door contacts |

## Actuators

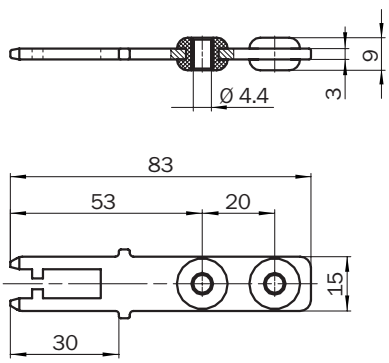
| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 1000 mm | iE10-S1 | 5306527 |
| | Rubber-mounted | Min. 1000 mm | iE10-S2 | 5306530 |
| | Rigid | Min. 1000 mm | iE10-S4 | 5308383 |
| Angled | Rigid | Min. 1000 mm | iE10-A1 | 5306535 |
| | | | iE10-A4 | 5308497 |
| Radius | Semi flexible | Min. 90 mm | iE10-R1 | 5306528 |
| | | Min. 100 mm | iE10-R2 | 5306529 |

### iE10-S1




2 safety screws included.
Min. door radius 1000 mm.

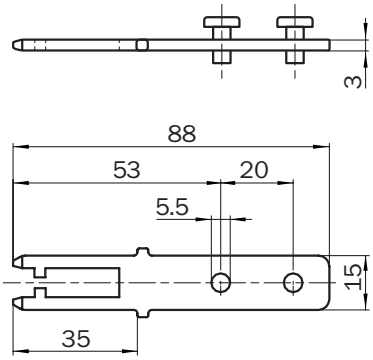
### iE10-S2




2 safety screws included.
Min. door radius 1000 mm.

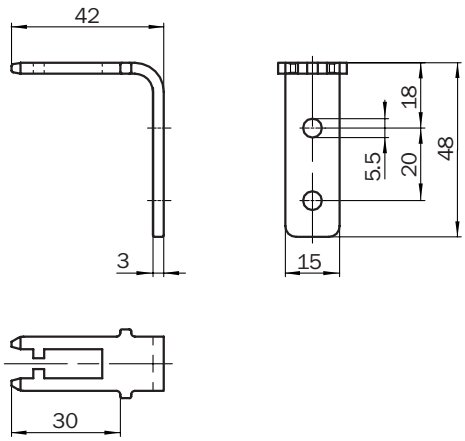

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## iE10-S4



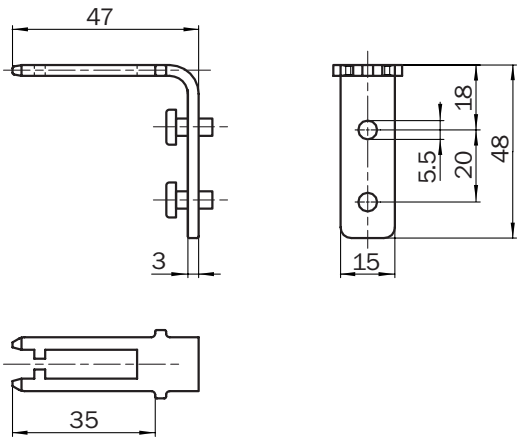

2 safety screws inlcuded
Min. door radius 1000 mm

## iE10-A1



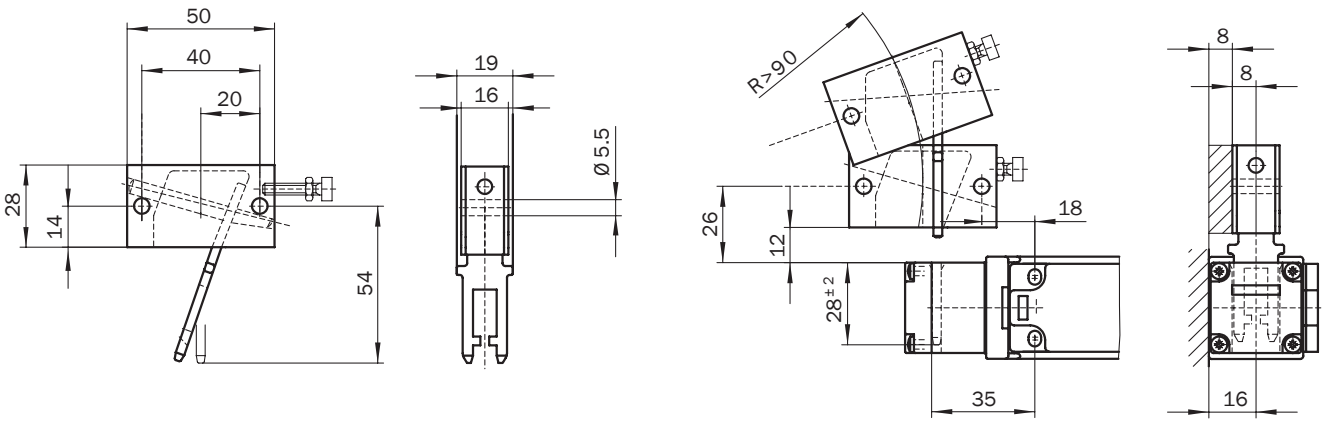

2 safety screws included.
Min. door radius 1000 mm.

## iE10-A4




2 safety screws inlcuded
Min. door radius 1000 mm

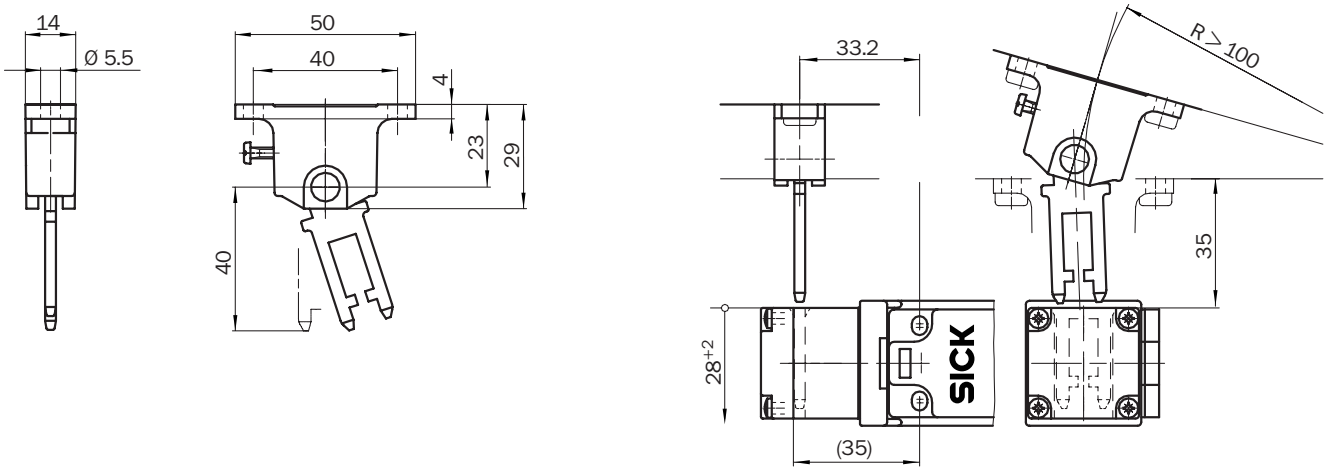
## iE10-R1




2 safety screws included.
Min. door radius 90 mm.


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## iE10-R2

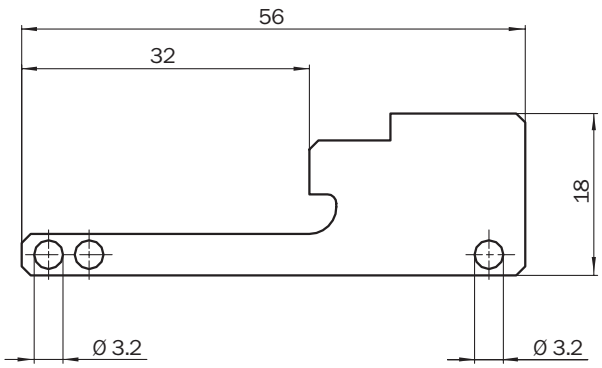



2 safety screws included.
Min. door radius 100 mm.

# Lockout bar

| Type | Part number |
|---|---|
| iE10-S3 | 5306536 |

## iE10-S3



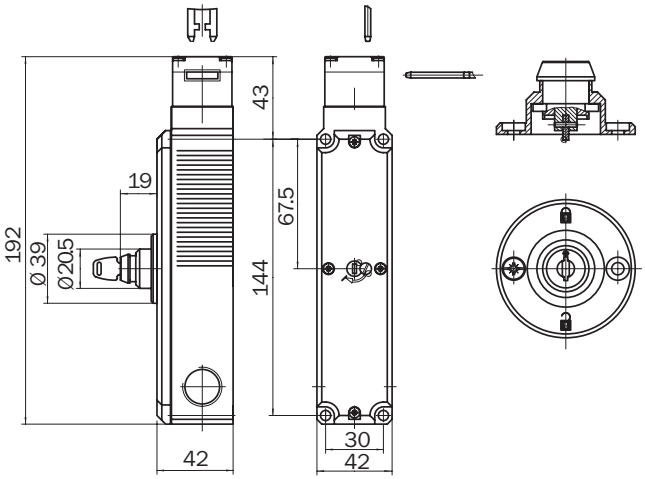

The locking bar can be inserted into the safety switch in place of the actuator when the protective device is in the open condition and can be secured to prevent its removal by standard commercially available padlocks (max. 2 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

# Lock

| Property | Delivery | Type | Part number |
|---|---|---|---|
| Parallel closing | Including key | iE10-K2 | 5308270 |


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## iE10-K2




The mechanical unlocking mechanism of the i10 Lock can easily be carried out via a key. The selected lock on the front of the i10 Lock is fixed with two screws.

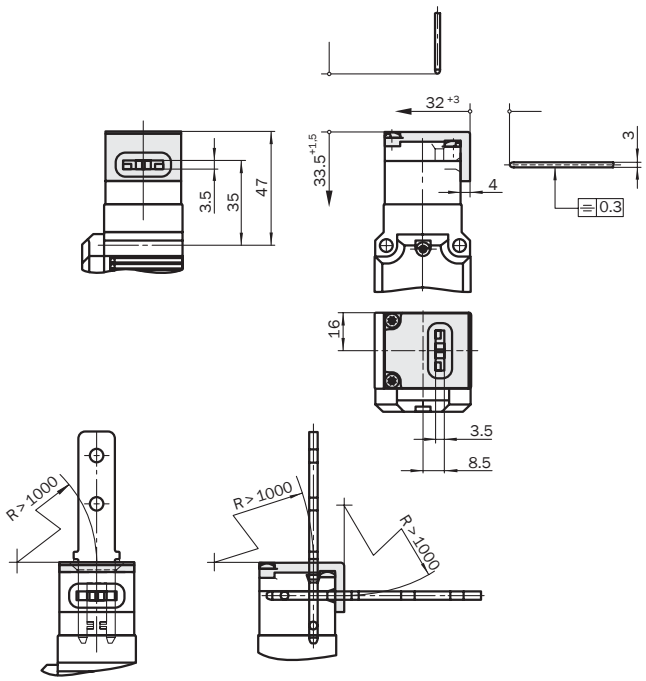
- Parallel closing locking mechanism

Delivery with fixing screws and two keys

# Alignment aid

| Type | Part number |
|---|---|
| iE10-G1 | 5318460 |

## iE10-G1




The metal alignment aid provides the actuator with a wider entry area into the safety locking device i10 Lock. With the alignment aid the safety switch is better protected against damage.

- It may be secured to the locking device with the two M3 x 34 self-tapping screws (screws supplied with delivery).
- It can only be used in combination with actuators with overtravel (iE10-A4, iE10-S4).
- It can not be used with special locking devices (i10-E0313S02) which have already a longer top entry overtravel.

# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 2 / 3 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Number of positive action normally closed door monitoring contacts** | 0 |
| **Number of normally open door monitoring contacts** | 0 |
| **Number of normally closed door monitoring contacts** | 0 |
| **Housing material** | Plastic |
| **Locking force** | 1200 N |
| **Locking type** | Mechanical |

## Product description

- Safety switches with remote multi-coded actuator and tumbler mechanism
- 3-pole contact element
- Easy conversion of actuating direction through rotatable head

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

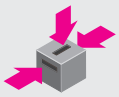
| Positive action normally closed | Normally open | Door monitoring: Positive action normally closed | Door monitoring: Normally open | Door monitoring: Normally closed | Solenoid operating voltage | Locking type | Type | Part number |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 0 | 0 | 0 | 24 V DC | Mechanical | i14-M0213 Lock | 6025060 |
| 3 | 0 | 0 | 0 | 0 | 24 V DC | Mechanical | i14-M0303 Lock | 6025062 |

Please order actuator separately






- Housing material glass-fibre reinforced thermoplastic
- Locking force 1200 N
- Three actuating directions
- Cable gland 3 x M20
- LED solenoid monitoring
- Mechanical unlocking mechanisms on three sides



| Further information | Page |
|---|---|
| → Technical specifications | I-10 |
| → Dimensional drawings | I-11 |
| → Switching elements | I-11 |
| → Actuator travel diagram | I-11 |
| → Actuator | I-11 |
| → Key | I-12 |
| → Other accessories | I-12 |
| → Services | A-2 |



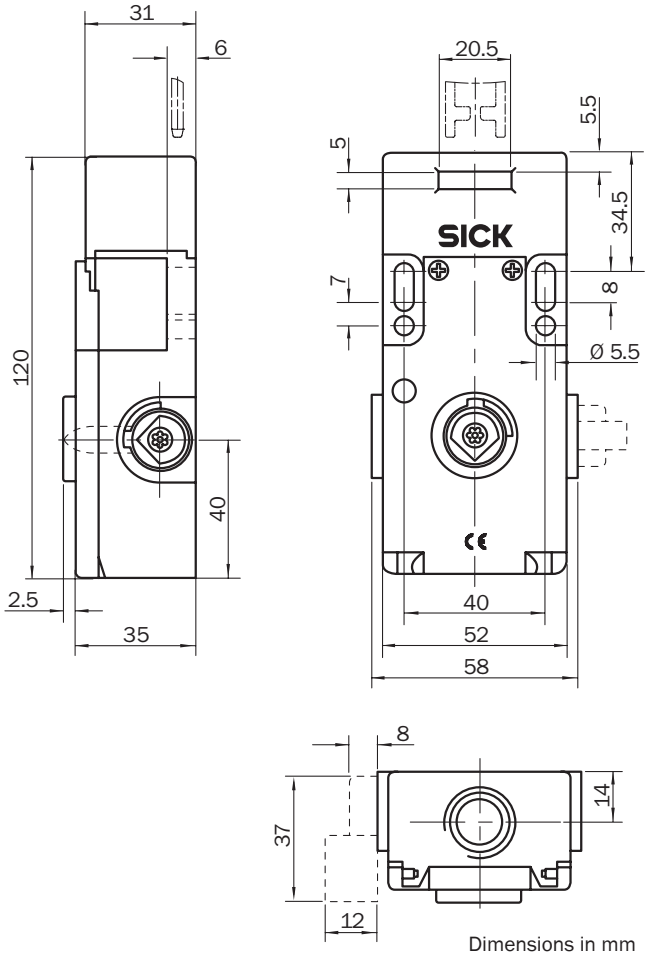
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# Detailed technical specifications

| Type | i14-M0213 Lock | i14-M0303 Lock |
|---|---|---|
| Housing material | Glass-fibre reinforced thermoplastic | |
| Enclosure rating | IP 65 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –10 °C ... +60 °C | |
| Maximum approach speed | 160 mm/s | |
| Actuation force | Min. 12 N | |
| Locking force | 1200 N | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 2 | 3 |
| Number of normally open contacts | 1 | 0 |
| Number of positive action normally closed door monitoring contacts | 0 | |
| Number of normally open door monitoring contacts | 0 | |
| Number of normally closed door monitoring contacts | 0 | |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 2 A (250 V AC), 2 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 5 V DC | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | |
| Solenoid operating voltage | 24 V (20.4 V ... 26.4 V) DC | |
| Power consumption | Max. 7 W | |
| Duty cycle | 100 % | |
| Connection type | Cable gland | |
| Maximum connection wire cross-section | 1.5 mm² | |
| Short-circuit protection | 2A gG | |
| Weight | 0.37 kg | |


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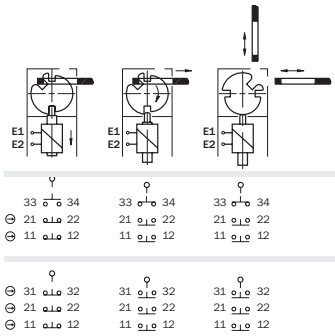
## Dimensional drawings




Dimensions in mm

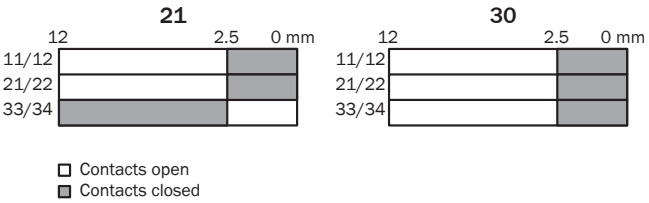
## Switching elements

| Actuator inserted | | Actuator removed | |
|---|---|---|---|
| locked | unlocked | | |



| | |
|---|---|
| 21, 2 positive action N/C contacts + 1 N/O contact | |
| 30, 3 positive action N/C contacts | |

## Actuator travel diagram

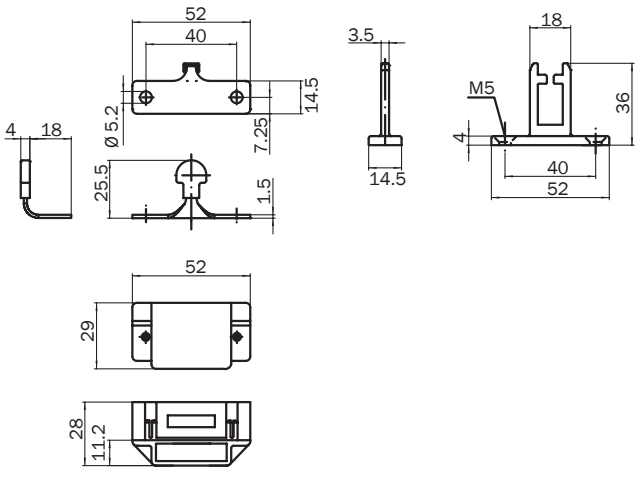



Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)

## Actuator

| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 160 mm | iE14-S1 | 5311133 |

### iE14-S1





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## Key

| Mechanical unlocking mechanism | Type | Part number |
|---|---|---|
| ✔ | iE14-E01 | 5311282 |

### iE14-E01




## Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 |
| **Number of normally open contacts (depending on type)** | 0 / 1 |
| **Number of positive action normally closed door monitoring contacts** | 2 |
| **Number of normally open door monitoring contacts** | 1 |
| **Number of normally closed door monitoring contacts** | 0 |
| **Housing material** | Plastic |
| **Locking force** | 2000 N |
| **Locking type (depending on type)** | Electrical / mechanical |

## Product description

- Safety switches with remote multi-coded actuator and tumbler mechanism
- Twin contact element for remote locking and door monitoring functions
- Straight, flexible or bolt actuator available

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

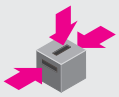
| Positive action normally closed | Normally open | Door monitoring: Positive action normally closed | Door monitoring: Normally open | Door monitoring: Normally closed | Solenoid operating voltage | Locking type | Type | Part number |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 1 | 0 | 24 V DC | Mechanical | I200-M0323 Lock | 6025113 |
| 2 | 0 | 2 | 1 | 0 | 24 V DC | Mechanical | I200-M0413 Lock | 6025115 |
| 1 | 1 | 2 | 1 | 0 | 24 V DC | Electrical | I200-E0323 Lock | 6026140 |

Please order actuator separately






- Housing material glass-fibre reinforced thermoplastic
- Entry for actuator made of stainless steel
- Locking force 2000 N
- Three actuating directions
- Cable gland 3 x M20
- Mechanical unlocking mechanisms on three sides
- LED solenoid monitoring



| Further information | Page |
|---|---|
| → Technical specifications | I-14 |
| → Dimensional drawings | I-15 |
| → Switching elements | I-15 |
| → Actuator travel diagram | I-15 |
| → Actuators | I-16 |
| → Bolt | I-16 |
| → Other accessories | I-16 |
| → Services | A-2 |



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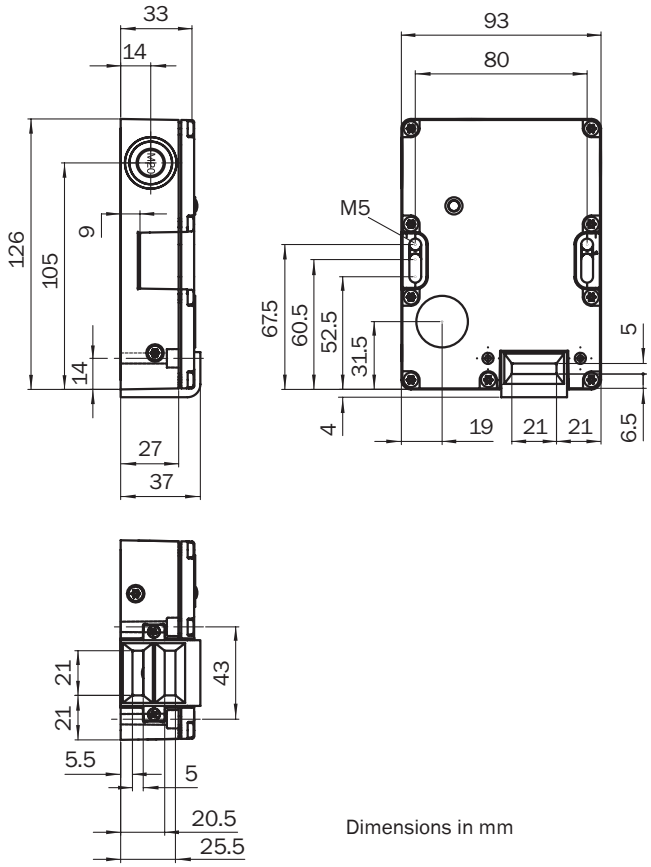
# Detailed technical specifications

| Type | I200-M0323 Lock | I200-M0413 Lock | I200-E0323 Lock |
|---|---|---|---|
| Housing material | Glass-fibre reinforced polyester | | |
| Enclosure rating | IP 65 | | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | | |
| Ambient operating temperature from ... to | –20 °C ... +60 °C | | |
| Maximum approach speed | 160 mm/s | | |
| Locking force | 2000 N [1)] | | |
| Switching principle | Slow-action switch | | |
| Number of positive action normally closed contacts | 1 | 2 | 1 |
| Number of normally open contacts | 1 | 0 | 1 |
| Number of positive action normally closed door monitoring contacts | 2 | | |
| Number of normally open door monitoring contacts | 1 | | |
| Number of normally closed door monitoring contacts | 0 | | |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | | |
| Rated operating current (voltage) | 2 A (250 V AC), 2 A (24 V DC) | | |
| Rated insulation voltage $U_i$ | 250 V | | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | | |
| Minimum switching voltage | 5 V DC | | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | | |
| Solenoid operating voltage | 24 V (20.4 V ... 26.4 V) DC | | |
| Power consumption | Max. 7 W | | |
| Duty cycle | 100 % | | |
| Connection type | Cable gland | | |
| Short-circuit protection | 2A gG | | |
| Weight | 0.55 kg | | |

[1)] Only in combination with the delivered fixing screws, otherwise 1500 N


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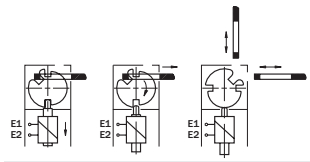
## Dimensional drawings

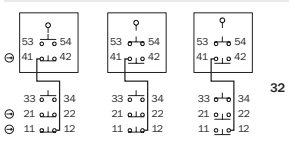



Dimensions in mm

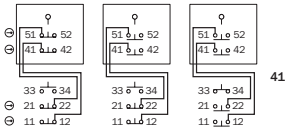
## Switching elements

| Actuator inserted | Actuator removed |
|---|---|
| locked | unlocked |



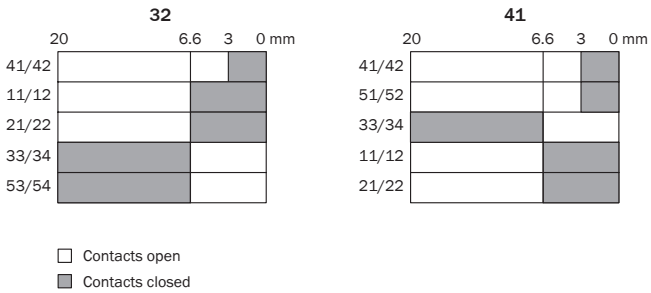



32, 1 positive action N/C contact + 1 N/O contact + 2 positive action N/C as door contacts + 1 N/O as door contact




41, 2 positive action N/C contacts + 2 positive action N/C as door contacts + 1 N/O as door contact

## Actuator travel diagram



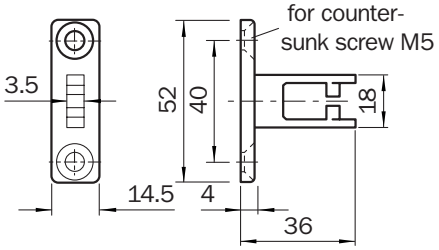

Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)


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# Actuators

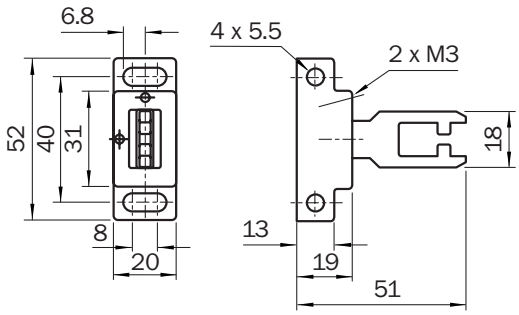
| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Rigid | Min. 175 mm | iE200-S1 | 5308758 |
| | Fully flexible | Min. 80 mm | iE200-F1 | 5308759 |

## iE200-S1




Min. door radius 175 mm

## iE200-F1

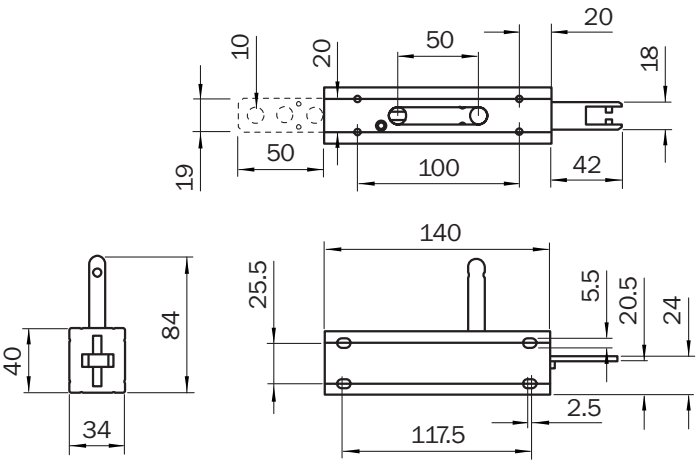



Min. door radius 80 mm

# Bolt

| Type | Part number |
|---|---|
| iE200-B1 | 5308760 |

## iE200-B1




# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Number of positive action normally closed door monitoring contacts** | 2 |
| **Number of normally open door monitoring contacts** | 1 |
| **Number of normally closed door monitoring contacts** | 0 |
| **Housing material** | Metal |
| **Locking force** | 2500 N |
| **Locking type** | Mechanical |

## Product description

- Safety locking device with handle-operated actuator
- Two contact elements for separate door and solenoid monitoring
- The system can compensate for any misalignment, such as caused by door drop

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Positive action normally closed | Normally open | Door monitoring: Positive action normally closed | Door monitoring: Normally open | Door monitoring: Normally closed | Solenoid operating voltage | Locking type | Type | Part number |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 1 | 0 | 24 V DC | Mechanical | i1001-24 Lock | 6021013 |

Actuator supplied with delivery






- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED status indicator
- Handle actuator



| Further information | Page |
|---|---|
| → Technical specifications | I-18 |
| → Dimensional drawings | I-18 |
| → Internal circuitry | I-19 |
| → Trapped key systems | I-19 |
| → Actuator | I-21 |
| → Lockout bar | I-21 |
| → Other accessories | I-22 |
| → Services | A-2 |

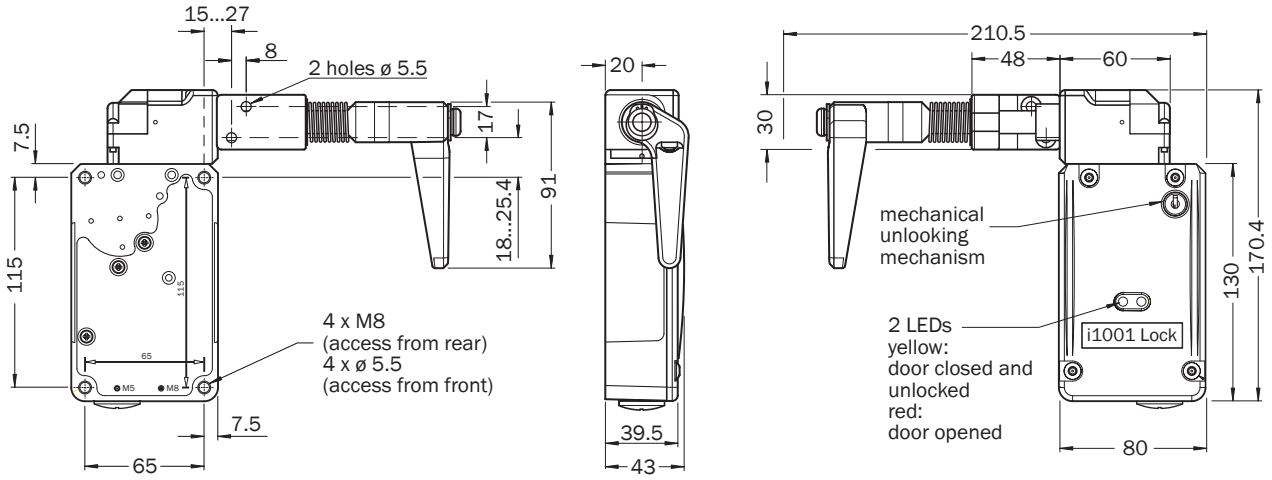


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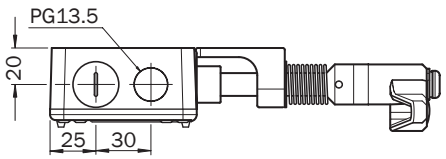
## Detailed technical specifications

| | |
|---|---|
| **Housing material** | Zinc alloy and stainless steel |
| **Surface treatment** | Varnished |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –5 °C ... +40 °C |
| **Maximum approach speed** | 333.3 mm/s |
| **Locking force** | 2500 N |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Number of positive action normally closed door monitoring contacts** | 2 |
| **Number of normally open door monitoring contacts** | 1 |
| **Number of normally closed door monitoring contacts** | 0 |
| **Usage category in compliance with IEC 947-5-1** | DC-13 |
| **Rated operating current (voltage)** | 10 A (24 V DC) |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Solenoid operating voltage** | 24 V (20.4 V ... 26.4 V) DC |
| **Power consumption** | Max. 12 W |
| **Duty cycle** | 100 % |
| **Contact material** | 90 % silver and 10 % nickel |
| **Connection type** | Cable gland |
| **Maximum connection wire cross-section** | 2.5 mm² |
| **Weight** | 2.25 kg |

## Dimensional drawings



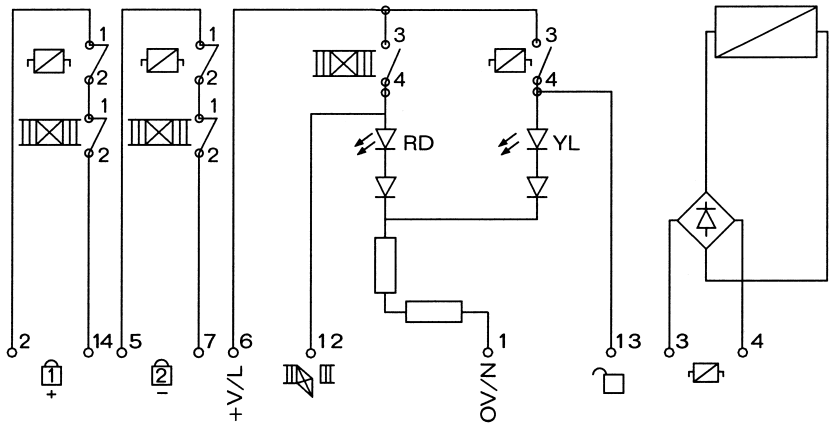

Dimensions in mm





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## Internal circuitry

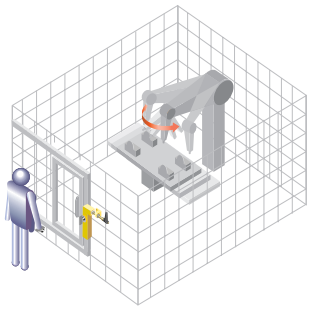



## Trapped key systems

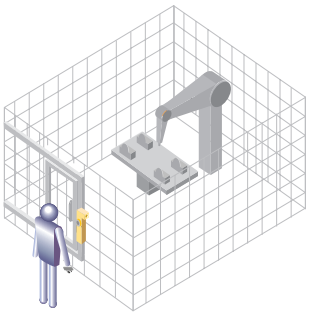
| Accessory type | Coding | Delivery | Type | Part number |
|---|---|---|---|---|
| Access key adapter | 1 | Key supplied with delivery | iE1000-AK1 | 5308302 |
| | 2 | Key supplied with delivery | iE1000-AK2 | 5308303 |
| Safety key adapter | 1 | Key supplied with delivery | iE1000-SK1 | 5308297 |
| | 2 | Key supplied with delivery | iE1000-SK2 | 5308298 |
| Enabling unit | 1 | Key supplied with delivery | iE1000-ES1 | 6021019 |
| | 2 | Key supplied with delivery | iE1000-ES2 | 6021020 |

Additional types on request

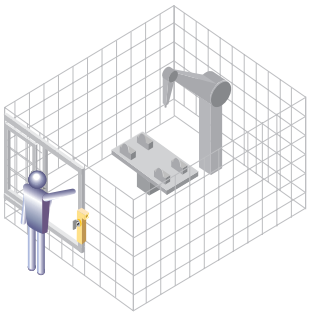
### Access key adapter



Plant in action, no key inserted



Key is inserted, plant comes to a standstill



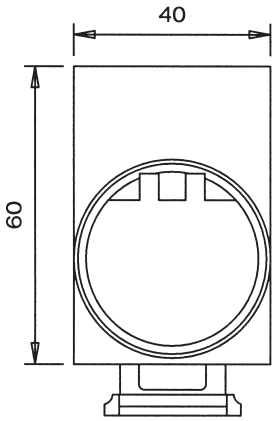
Door can now be opened

**Access function**

■ Application example

Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.



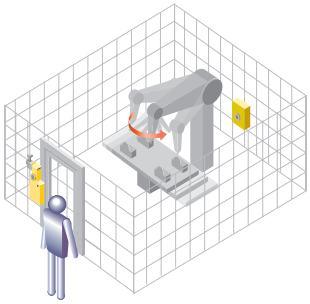




The access key adapter is installed between the head and the housing of the safety switch.

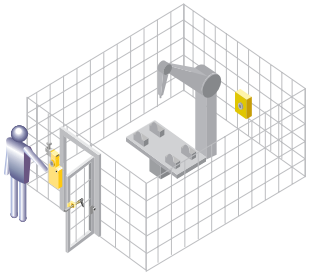
If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).


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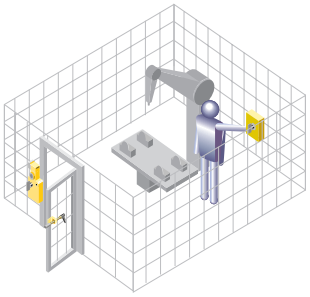
## Safety key adapter



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



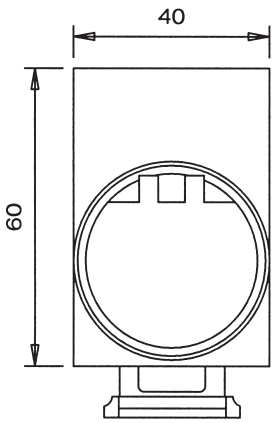
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

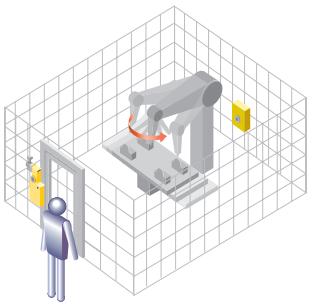
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



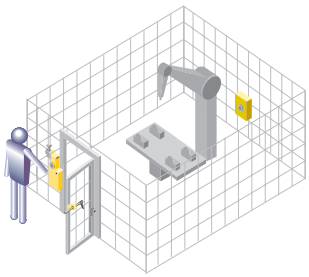




The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

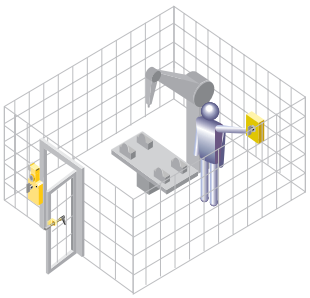
## Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



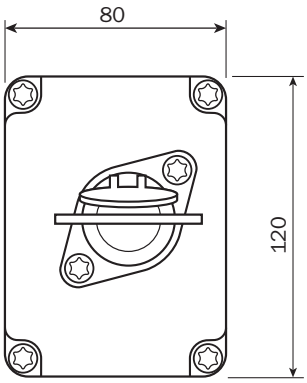
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.




Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.


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## Actuator

| Actuation option | Way of actuation | Type | Part number |
|---|---|---|---|
| Turning lever | Fully flexible | iE1001-R1 | 5308316 |

### iE1001-R1



## Lockout bar

| Type | Part number |
|---|---|
| iE1002-R1 | 5308313 |

### iE1002-R1




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# Other accessories

### Key

| Prevention of unintentional machine start | Access function | Enabling function | Mechanical unlocking mechanism | Coding | Type | Part number |
|---|---|---|---|---|---|---|
| – | ✔ | – | – | 1 | Key AK1 | 5308686 |
| | | | | 2 | Key AK2 | 5308687 |
| ✔ | – | ✔ | – | 1 | Key SK1 | 5308307 |
| | | | | 2 | Key SK2 | 5308308 |
| – | – | – | ✔ | – | Key for emergency release | 5308320 |

### Cable gland

| Type | Part number |
|---|---|
| Cable gland PG13.5 | 5305811 |

### Safety screws

| Type | Part number |
|---|---|
| Safety allen screws | 5308317 |

### Safety switch accessories, miscellaneous

| Usage | Type | Part number |
|---|---|---|
| For safety allen screws | BIT | 5308319 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Number of positive action normally closed door monitoring contacts** | 2 |
| **Number of normally open door monitoring contacts** | 1 |
| **Number of normally closed door monitoring contacts** | 0 |
| **Housing material** | Metal |
| **Locking force** | 2500 N |
| **Locking type** | Mechanical |

## Product description

- Safety switch with separate coded actuator and guard locking
- Two contact elements for separate door and solenoid monitoring
- The system can compensate for any misalignment, such as caused by door drop

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Positive action normally closed | Normally open | Door monitoring: Positive action normally closed | Door monitoring: Normally open | Door monitoring: Normally closed | Solenoid operating voltage | Locking type | Type | Part number |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 2 | 1 | 0 | 24 V DC | Mechanical | i1002-24 Lock | 6021007 |

Actuator supplied with delivery






- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED status indicator
- Separate actuator



| Further information | Page |
|---|---|
| → Technical specifications | I-24 |
| → Dimensional drawings | I-25 |
| → Internal circuitry | I-25 |
| → Trapped key systems | I-26 |
| → Actuator | I-28 |
| → Lockout bar | I-28 |
| → Other accessories | I-29 |
| → Services | A-2 |



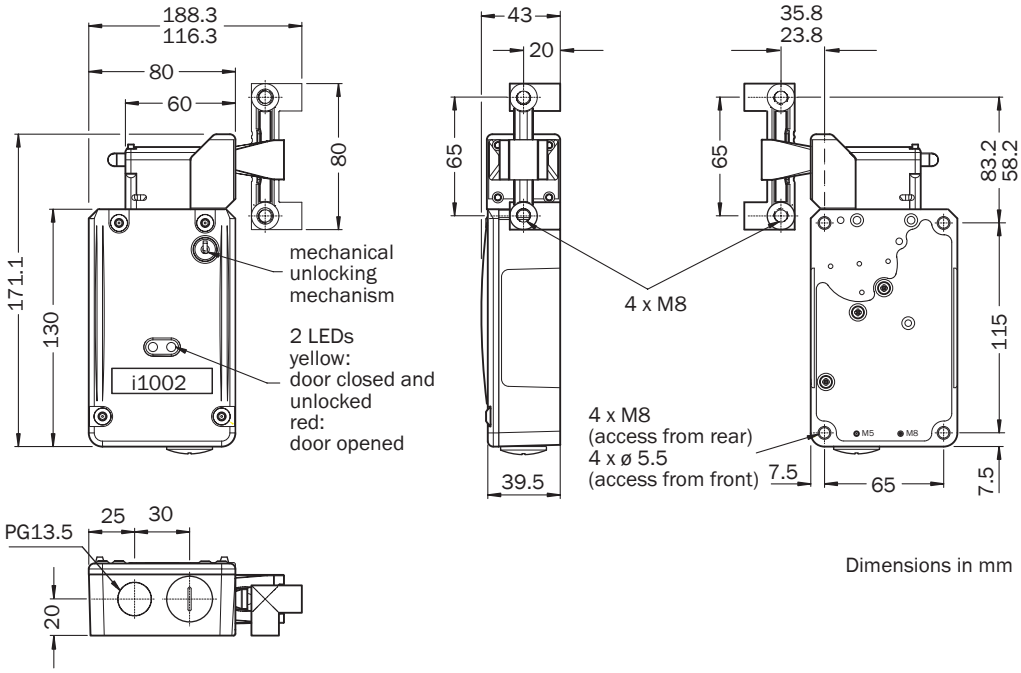
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# Detailed technical specifications

| | |
|---|---|
| **Housing material** | Zinc alloy and stainless steel |
| **Surface treatment** | Varnished |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –5 °C ... +40 °C |
| **Maximum approach speed** | 333.3 mm/s |
| **Actuation force** | Min. 5 N |
| **Locking force** | 2500 N |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Number of positive action normally closed door monitoring contacts** | 2 |
| **Number of normally open door monitoring contacts** | 1 |
| **Number of normally closed door monitoring contacts** | 0 |
| **Usage category in compliance with IEC 947-5-1** | DC-13 |
| **Rated operating current (voltage)** | 10 A (24 V DC) |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Solenoid operating voltage** | 24 V (20.4 V ... 26.4 V) DC |
| **Power consumption** | Max. 12 W |
| **Duty cycle** | 100 % |
| **Contact material** | 90 % silver and 10 % nickel |
| **Connection type** | Cable gland |
| **Maximum connection wire cross-section** | 2.5 mm² |
| **Weight** | 1.98 kg |

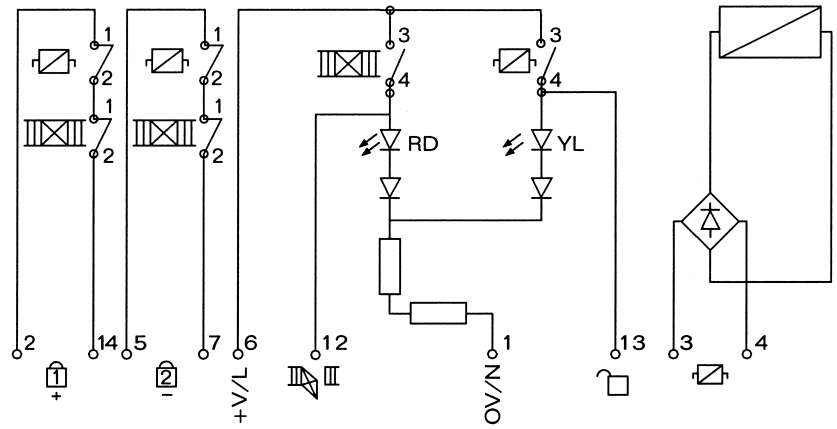

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## Dimensional drawings




Dimensions in mm

## Internal circuitry





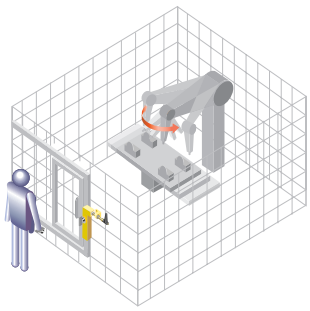
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# Trapped key systems

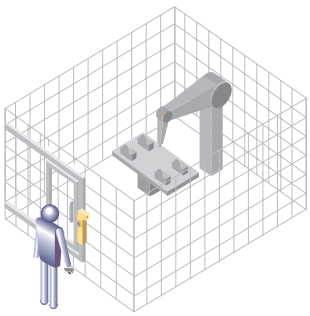
| Accessory type | Coding | Delivery | Type | Part number |
|---|---|---|---|---|
| Access key adapter | 1 | Key supplied with delivery | iE1000-AK1 | 5308302 |
| | 2 | Key supplied with delivery | iE1000-AK2 | 5308303 |
| Safety key adapter | 1 | Key supplied with delivery | iE1000-SK1 | 5308297 |
| | 2 | Key supplied with delivery | iE1000-SK2 | 5308298 |
| Enabling unit | 1 | Key supplied with delivery | iE1000-ES1 | 6021019 |
| | 2 | Key supplied with delivery | iE1000-ES2 | 6021020 |

Additional types on request

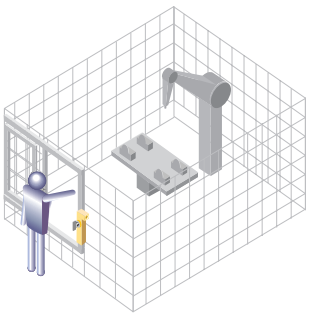
## Access key adapter



Plant in action, no key inserted



Key is inserted, plant comes to a standstill



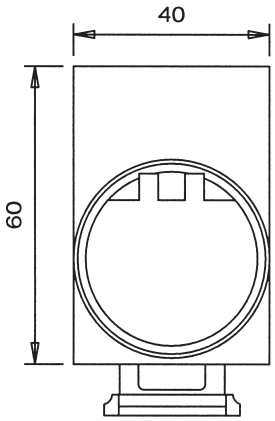
Door can now be opened

**Access function**

■ Application example

Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.



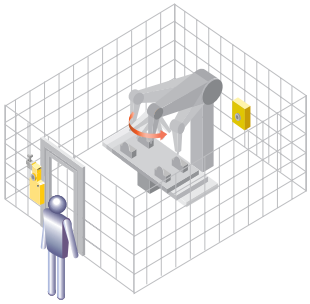




The access key adapter is installed between the head and the housing of the safety switch.

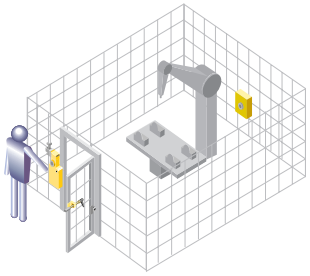
If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).


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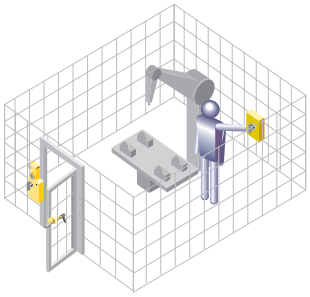
## Safety key adapter



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



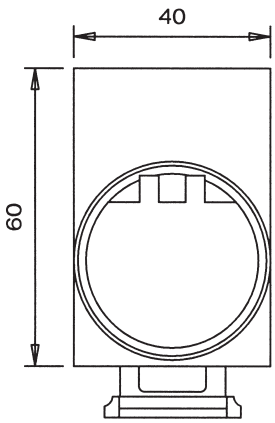
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

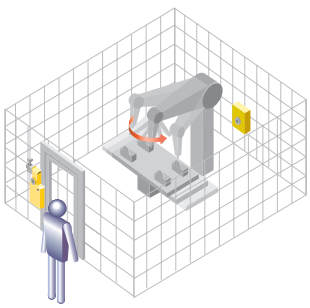
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



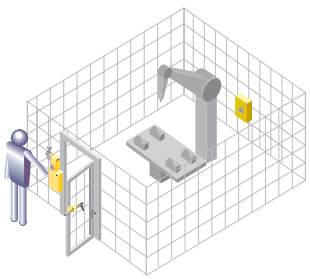




The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

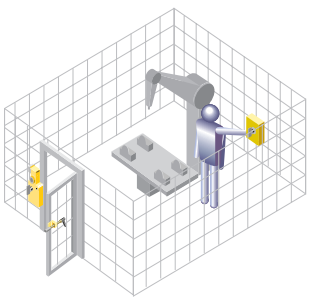
## Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened



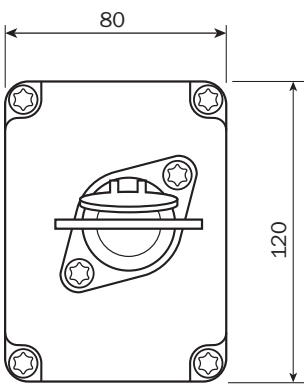
Person enters, key inserted inside, plant runs in enable mode

**Enable function**

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



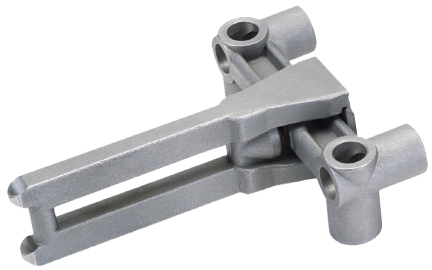

Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.


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## Actuator

| Actuation option | Way of actuation | Door radius | Type | Part number |
|---|---|---|---|---|
| Straight | Semi flexible | Min. 300 mm | iE1002-S2 | 5308315 |

### iE1002-S2



## Lockout bar

| Type | Part number |
|---|---|
| iE1002-S3 | 5308312 |

### iE1002-S3




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# Other accessories

### Key

| Prevention of unintentional machine start | Access function | Enabling function | Mechanical unlocking mechanism | Coding | Type | Part number |
|---|---|---|---|---|---|---|
| – | ✔ | – | – | 1 | Key AK1 | 5308686 |
| | | | | 2 | Key AK2 | 5308687 |
| ✔ | – | ✔ | – | 1 | Key SK1 | 5308307 |
| | | | | 2 | Key SK2 | 5308308 |
| – | – | – | ✔ | – | Key for emergency release | 5308320 |

### Cable gland

| Type | Part number |
|---|---|
| Cable gland PG13.5 | 5305811 |

### Safety screws

| Type | Part number |
|---|---|
| Safety allen screws | 5308317 |

### Safety switch accessories, miscellaneous

| Usage | Type | Part number |
|---|---|---|
| For safety allen screws | BIT | 5308319 |


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# Explanations of features

**Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

**Housing material**

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

**Switching principle**

- Slow-action switch

The speed with which the slow-acting switching element is actuated directly affects the speed of normally closed contacts or normally open contacts. The switching points for actuating and resetting the position switch are in the same position.

- Snap-action switch

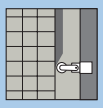
Snap-action switching elements react independently of the actuation speed and open or close at a defined point. The contacts of the snap-action switching elements have a different switching point depending on the directional movement, i.e. the switching points for actuating and resetting the position switch are in different positions.



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# Safety position switches



| Safety application | Number of positive action normally closed contacts/normally open contacts [1] | Housing material [1] | Switching principle [1] | Type of actuator | Enclosure rating | Product | Page |
|---|---|---|---|---|---|---|---|
|  | 2 / 1 | Plastic | Slow-action switch | Roller plunger | IP 66 | i10P | J-2 |
| | | | | Turning lever | | i10R | J-4 |
| | 3 / 1 | Metal | Slow-action switch | Roller plunger | IP 67 | i100P | J-7 |
| | | | | Turning lever | | i100R | J-10 |
| | 1 / 1<br>2 / 2<br>3 / 1 | | Slow-action switch/ snap-action switch | Roller plunger | IP 66 | i110P | J-13 |
| | | | | Turning lever | | i110R | J-16 |

[1] Explanation see page J-0

J



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- Housing material glass-fibre reinforced thermoplastic
- Cable gland M20
- Design according to EN 50047
- Enclosure rating IP 66



J

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Switching principle** | Slow-action switch |
| **Type of actuator** | Roller plunger |
| **Housing material** | Plastic |
| **Enclosure rating** | IP 66 |

## Product description

- Roller plunger design
- Plunger made of plastic
- 3-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Switching principle | Type | Part number |
|---|---|---|---|---|
| 2 | 1 | Slow-action switch | i10-PA213 | 6025088 |

| Further information | Page |
|---|---|
| → Services | A-2 |

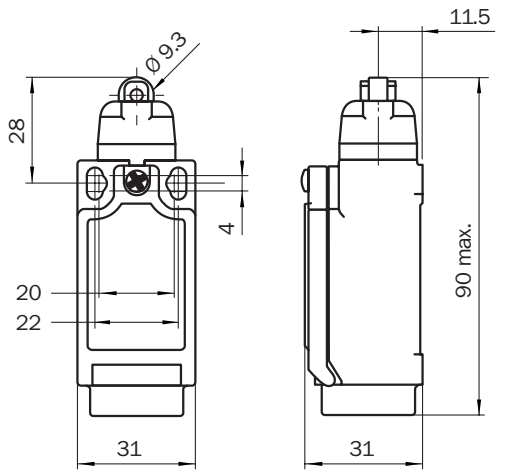


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# Detailed technical specifications

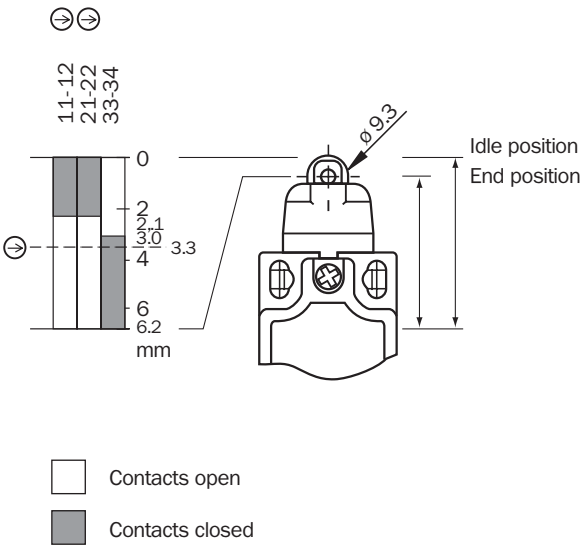
| | |
|---|---|
| **Housing material** | Glass-fibre reinforced thermoplastic |
| **Enclosure rating** | IP 66 |
| **Mechanical life (relay contacts)** | 10 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –25 °C ... +80 °C |
| **Approach speed from ... to** | 0.1 m/min ... 15 m/min |
| **Actuation force** | Min. 6 N |
| **Actuation frequency** | Max. 1.67 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 3 A (230 V AC), 0.27 A (230 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 5 V DC |
| **Minimum switching current (switching voltage)** | 5 mA (5 V DC) |
| **Connection type** | Cable gland |
| **Maximum connection wire cross-section** | 2.5 mm² |
| **Short-circuit protection** | F15 |
| **Positive break travel** | 3.5 mm |
| **Weight** | 0.11 kg |

# Dimensional drawings




Dimensions in mm

# Actuator travel diagram




# Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |



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- Housing material glass-fibre reinforced thermoplastic
- Cable gland M20
- Design according to EN 50047
- Enclosure rating IP 66



J

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Switching principle** | Slow-action switch |
| **Type of actuator** | Turning lever |
| **Housing material** | Plastic |
| **Enclosure rating** | IP 66 |

## Product description

- Turning lever design
- Roller made of plastic
- 3-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Switching principle | Type | Part number |
|---|---|---|---|---|
| 2 | 1 | Slow-action switch | i10-RA213 | 6025085 |


| Further information | Page |
|---|---|
| → Dimensional drawings | J-6 |
| → Actuator travel diagram | J-6 |
| → Accessories | J-6 |
| → Services | A-2 |




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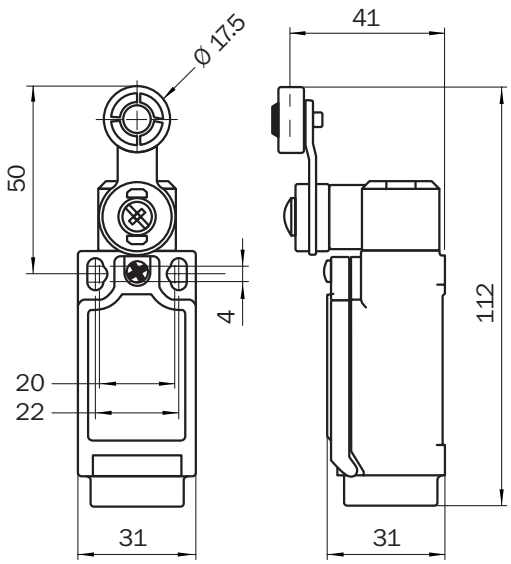
# Detailed technical specifications

| | |
|---|---|
| **Housing material** | Glass-fibre reinforced thermoplastic |
| **Enclosure rating** | IP 66 |
| **Mechanical life (relay contacts)** | 10 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –25 °C ... +80 °C |
| **Minimum actuation torque** | 0.14 Nm |
| **Approach speed from ... to** | 0.1 m/min ... 15 m/min |
| **Actuation frequency** | Max. 1.67 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 3 A (230 V AC), 0.27 A (230 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 5 V DC |
| **Minimum switching current (switching voltage)** | 5 mA (5 V DC) |
| **Connection type** | Cable gland |
| **Maximum connection wire cross-section** | 2.5 mm² |
| **Short-circuit protection** | F15 |
| **Positive break angle** | 47° |
| **Weight** | 0.11 kg |

J

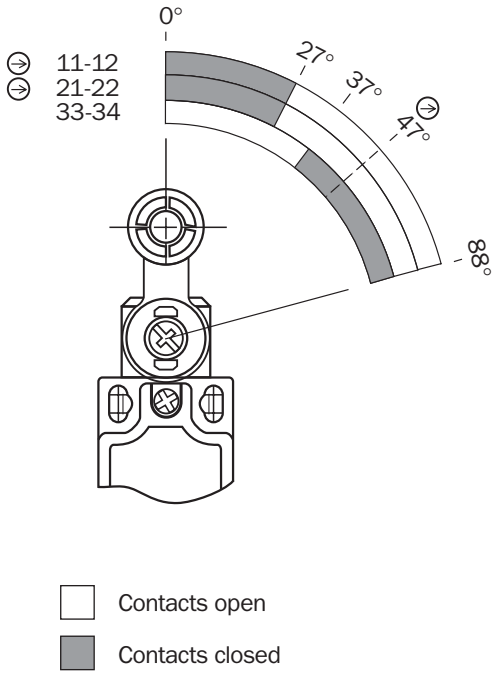

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## Dimensional drawings




Dimensions in mm

## Actuator travel diagram




## Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 3 |
| **Number of normally open contacts** | 1 |
| **Switching principle** | Slow-action switch |
| **Type of actuator** | Roller plunger |
| **Housing material** | Metal |
| **Enclosure rating** | IP 67 |

## Product description

- Roller plunger design
- 4-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Switching principle | Type | Part number |
|---|---|---|---|---|
| 3 | 1 | Slow-action switch | i100-P313 | 6022589 |





- Housing material die-cast light alloy
- Roller plunger with stainless steel roller
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 67



J

| Further information | Page |
|---|---|
| → Technical specifications | J-8 |
| → Dimensional drawings | J-8 |
| → Actuator travel diagram | J-9 |
| → Accessories | J-9 |
| → Services | A-2 |

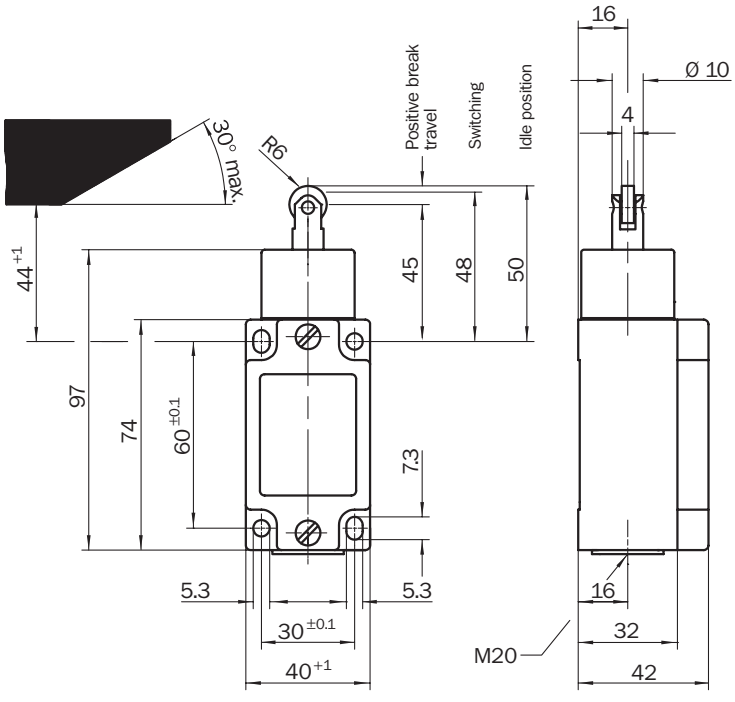
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## Detailed technical specifications

| | |
|---|---|
| **Housing material** | Die-cast light alloy |
| **Surface treatment** | Anodized |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –25 °C ... +80 °C |
| **Approach speed from ... to** | 0.1 m/min ... 20 m/min |
| **Actuation force** | Min. 30 N |
| **Actuation frequency** | Max. 1.94 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 3 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 4 A (230 V AC), 4 A (24 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 12 V DC |
| **Minimum switching current (switching voltage)** | 1 mA (24 V DC) |
| **Contact material** | Silver alloy, gold flashed |
| **Connection type** | Cable gland |
| **Maximum connection wire cross-section** | 1.5 mm² |
| **Short-circuit protection** | 4A gG |
| **Positive break travel** | 5 mm |
| **Weight** | 0.33 kg |

J

## Dimensional drawings

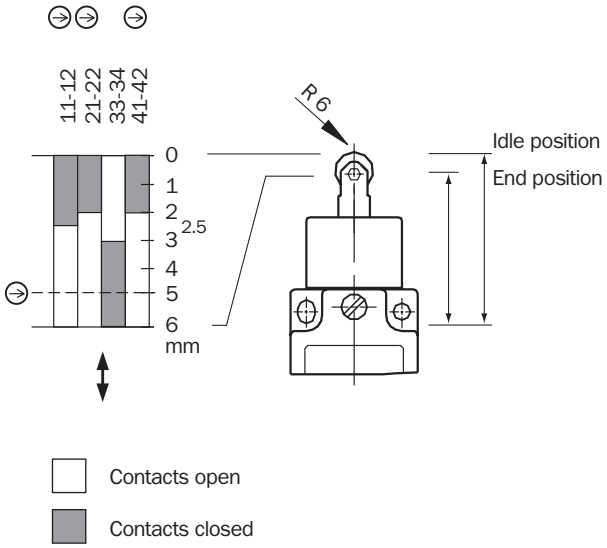



Dimensions in mm



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## Actuator travel diagram




## Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

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- Housing material die-cast light alloy
- Adjustable switching direction (left, right, both sides)
- Turning lever with stainless steel roller
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 67

J



## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 3 |
| **Number of normally open contacts** | 1 |
| **Switching principle** | Slow-action switch |
| **Type of actuator** | Turning lever |
| **Housing material** | Metal |
| **Enclosure rating** | IP 67 |

## Product description

- Turning lever design
- 4-pole contact element
- High flexibility through adjustable switching direction

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Switching principle | Type | Part number |
|---|---|---|---|---|
| 3 | 1 | Slow-action switch | i100-R313 | 6022588 |

| Further information | Page |
|---|---|
| → Actuator travel diagram | J-12 |
| → Accessories | J-12 |
| → Services | A-2 |

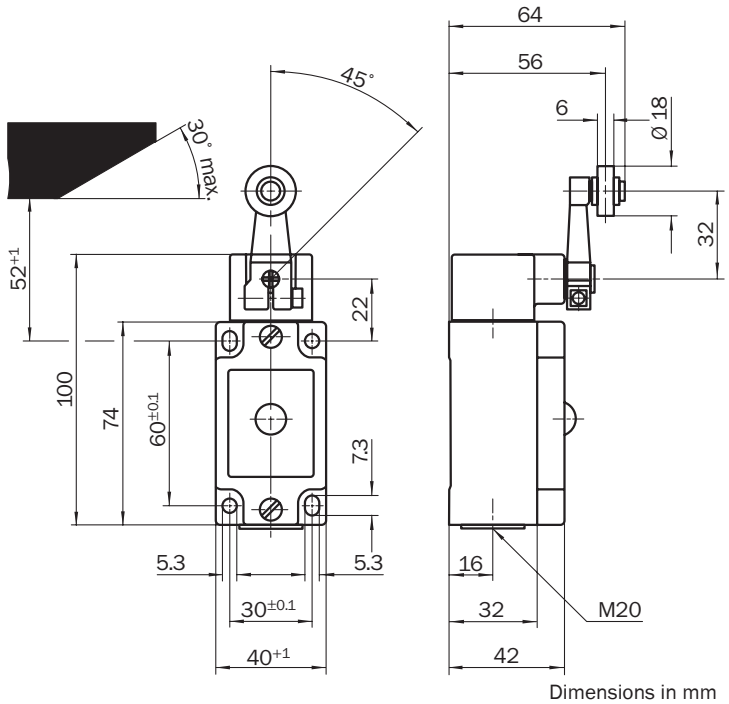


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## Detailed technical specifications

| | |
|---|---|
| **Housing material** | Die-cast light alloy |
| **Surface treatment** | Anodised |
| **Enclosure rating** | IP 67 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –25 °C ... +80 °C |
| **Approach speed from ... to** | 0.1 m/min ... 60 m/min |
| **Actuation force** | Min. 15 N |
| **Actuation frequency** | Max. 2.78 Hz |
| **Switching principle** | Slow-action switch |
| **Number of positive action normally closed contacts** | 3 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 4 A (230 V AC), 4 A (24 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 12 V DC |
| **Minimum switching current (switching voltage)** | 1 mA (24 V DC) |
| **Contact material** | Silver alloy, gold flashed |
| **Connection type** | Cable gland |
| **Maximum connection wire cross-section** | 1.5 mm² |
| **Short-circuit protection** | 4A gG |
| **Positive break angle** | 45° |
| **Weight** | 0.37 kg |

## Dimensional drawings

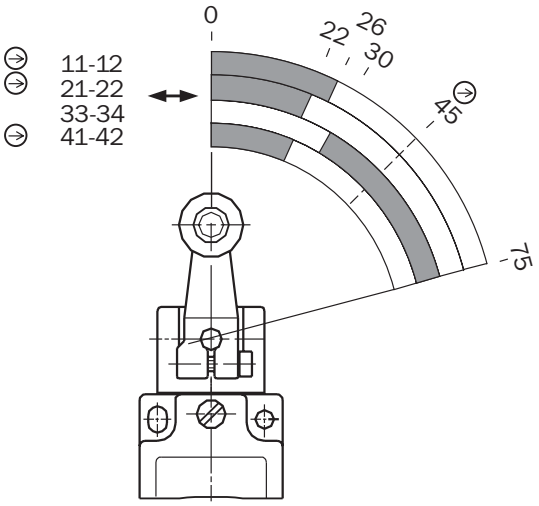



Dimensions in mm

J


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## Actuator travel diagram




Contacts open

Contacts closed

## Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

J



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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 / 3 |
| **Number of normally open contacts (depending on type)** | 1 / 2 |
| **Switching principle (depending on type)** | Slow-action switch / snap-action switch |
| **Type of actuator** | Roller plunger |
| **Housing material** | Metal |
| **Enclosure rating** | IP 66 |

## Product description

- Roller plunger design
- 4-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Switching principle | Type | Part number |
|---|---|---|---|---|
| 1 | 1 | Snap-action switch | i110-PA123 | 6025106 |
| 2 | 2 | Slow-action switch | i110-PA223 | 6025105 |
| 3 | 1 | Slow-action switch | i110-PA313 | 6025104 |






- Housing material die-cast zinc
- Roller plunger with stainless steel roller
- Slow- or snap-action switch
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 66



J

| Further information | Page |
|---|---|
| → Technical specifications | J-14 |
| → Dimensional drawings | J-14 |
| → Actuator travel diagrams | J-15 |
| → Accessories | J-15 |
| → Services | A-2 |

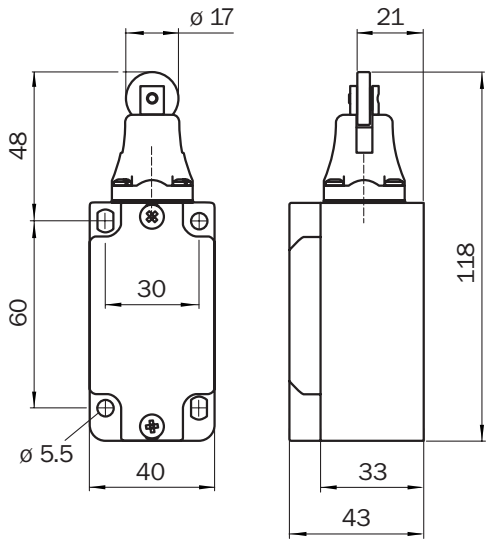
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## Detailed technical specifications

| Type | i110-PA123 | i110-PA223 | i110-PA313 |
|---|---|---|---|
| Housing material | Zinc die-cast | | |
| Surface treatment | Varnished | | |
| Enclosure rating | IP 66 | | |
| Mechanical life (relay contacts) | 10 x $10^6$ switching cycles | | |
| Ambient operating temperature from ... to | –25 °C ... +80 °C | | |
| Approach speed from ... to | 0.1 m/min ... 15 m/min | | |
| Actuation force | Min. 13 N | Min. 11 N | |
| Actuation frequency | Max. 1.67 Hz | | |
| Switching principle | Snap-action switch | Slow-action switch | |
| Number of positive action normally closed contacts | 1 | 2 | 3 |
| Number of normally open contacts | 1 | 2 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | | |
| Rated operating current (voltage) | 3 A (230 V AC), 0.27 A (230 V DC) | | |
| Rated insulation voltage $U_i$ | 250 V | | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | | |
| Minimum switching voltage | 5 V DC | | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | | |
| Connection type | Cable gland | | |
| Maximum connection wire cross-section | 2.5 mm² | | |
| Short-circuit protection | F15 | | |
| Positive break travel | 4.5 mm | 4 mm | |
| Weight | 0.43 kg | | |

J

## Dimensional drawings

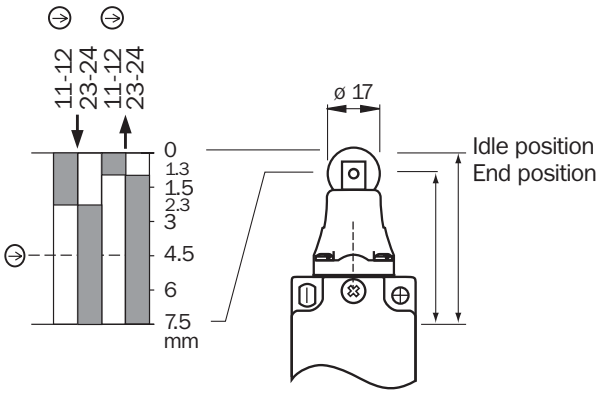



Dimensions in mm


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# Actuator travel diagrams

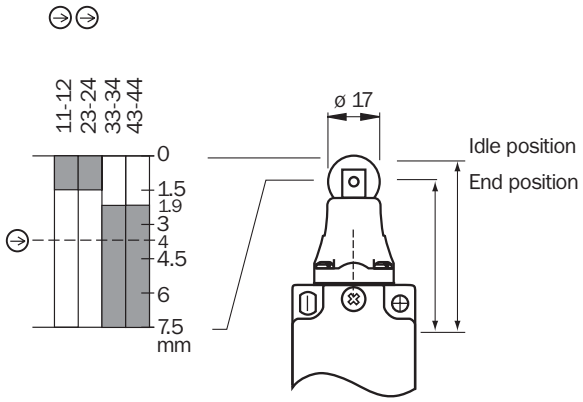
**i110-PA123**




Contacts open

Contacts closed

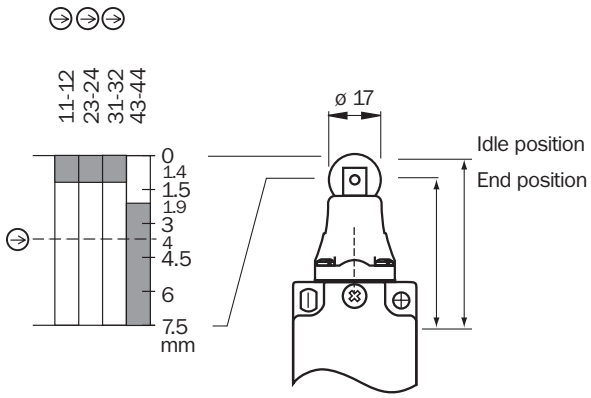
**i110-PA223**




Contacts open

Contacts closed

**i110-PA313**




Contacts open

Contacts closed

# Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

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- Housing material die-cast zinc
- Turning lever with plastic roller
- Slow- or snap-action switch
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 66



J

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 / 3 |
| **Number of normally open contacts (depending on type)** | 1 / 2 |
| **Switching principle (depending on type)** | Slow-action switch / snap-action switch |
| **Type of actuator** | Turning lever |
| **Housing material** | Metal |
| **Enclosure rating** | IP 66 |

## Product description

- Turning lever design
- 4-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Switching principle | Type | Part number |
|---|---|---|---|---|
| 1 | 1 | Snap-action switch | i110-RA123 | 6025109 |
| 2 | 2 | Slow-action switch | i110-RA223 | 6025108 |
| 3 | 1 | Slow-action switch | i110-RA313 | 6025107 |

| Further information | Page |
|---|---|
| → Actuator travel diagrams | J-18 |
| → Accessories | J-19 |
| → Services | A-2 |

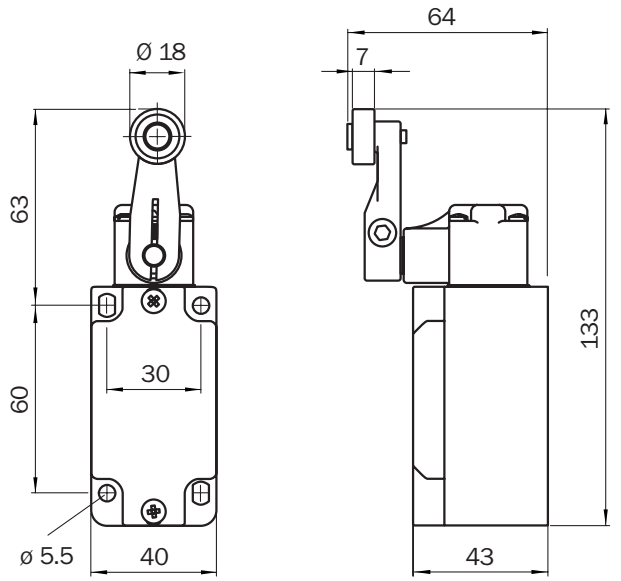


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## Detailed technical specifications

| Type | i110-RA123 | i110-RA223 | i110-RA313 |
|---|---|---|---|
| Housing material | Zinc die-cast | | |
| Surface treatment | Varnished | | |
| Enclosure rating | IP 66 | | |
| Mechanical life (relay contacts) | 10 x $10^6$ switching cycles | | |
| Ambient operating temperature from ... to | –25 °C ... +80 °C | | |
| Minimum actuation torque | 0.34 Nm | | |
| Approach speed from ... to | 0.1 m/min ... 15 m/min | | |
| Actuation frequency | Max. 1.67 Hz | | |
| Switching principle | Snap-action switch | Slow-action switch | |
| Number of positive action normally closed contacts | 1 | 2 | 3 |
| Number of normally open contacts | 1 | 2 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | | |
| Rated operating current (voltage) | 3 A (230 V AC), 0.27 A (230 V DC) | | |
| Rated insulation voltage $U_i$ | 250 V | | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | | |
| Minimum switching voltage | 5 V DC | | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | | |
| Connection type | Cable gland | | |
| Maximum connection wire cross-section | 2.5 mm² | | |
| Short-circuit protection | F15 | | |
| Positive break angle | 54° | 44° | |
| Weight | 0.52 kg | | |

## Dimensional drawings

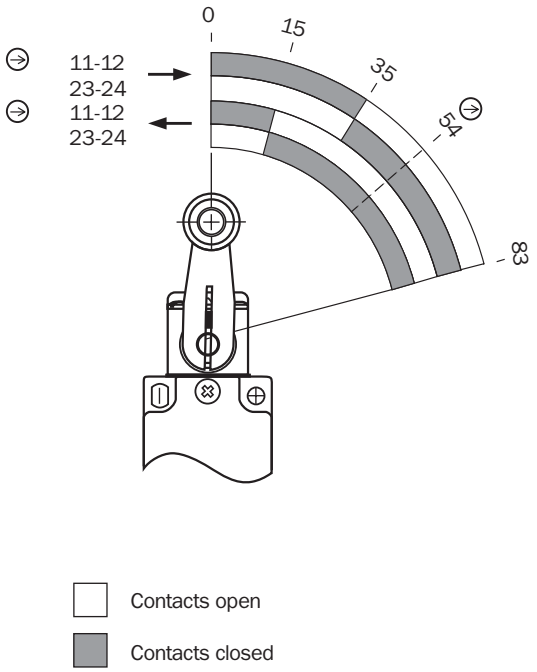



Dimensions in mm

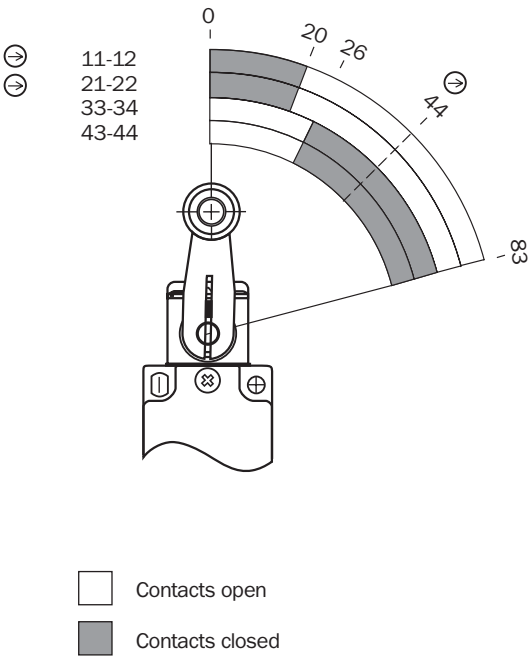

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# Actuator travel diagrams

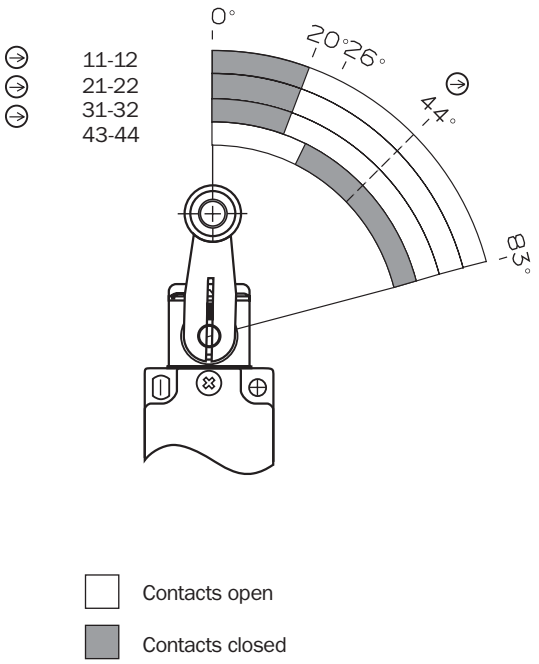
**i110-RA123**




**i110-RA223**




**i110-RA313**




J



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# Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

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# Explanations of features

**Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

**Housing material**

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

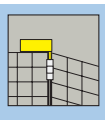
**Shaft version**

The safety hinge switches are designed to be directly fitted to pivotal protective devices. For this, either the solid shaft is used to replace the existing hinge pin, or the solid shaft or hollow shaft is connected directly to the existing hinge pin.


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# Safety hinge switches




| Safety application | Number of positive action normally closed contacts/ normally open contacts [1] | Housing material [1] | Type of shaft [1] | Length of the shaft | Enclosure rating | Product | Page |
|---|---|---|---|---|---|---|---|
|  | 1 / 1<br>2 / 1 | Plastic | Solid | 55 mm<br>85 mm | IP 67 | i10H | K-2 |
| | 2 / 1 | Metal | Hollow shaft | 36.5 mm | IP 66 | i110H | K-5 |

[1] Explanation see page K-0

K



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- Housing material glass-fibre reinforced thermoplastic
- Solid stainless steel shaft
- Cable gland M16
- Adjustable switching point
- Miniature housing and design according to EN 50047
- Enclosure rating IP 67



## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 1 / 2 |
| **Number of normally open contacts** | 1 |
| **Type of shaft** | Solid |
| **Length of the shaft (depending on type)** | 55 mm / 85 mm |
| **Housing material** | Plastic |
| **Enclosure rating** | IP 67 |

## Product description

- Safety hinge switches for direct installation to pivotal protective devices
- Solid shaft design
- 2- or 3-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 1 | 1 | i10-HA113 | 6025050 |
| 2 | 1 | i10-HB213 | 6025053 |


| Further information | Page |
|---|---|
| → Switching elements | K-4 |
| → Actuator travel diagrams | K-4 |
| → Mounting | K-4 |
| → Accessories | K-4 |
| → Services | A-2 |



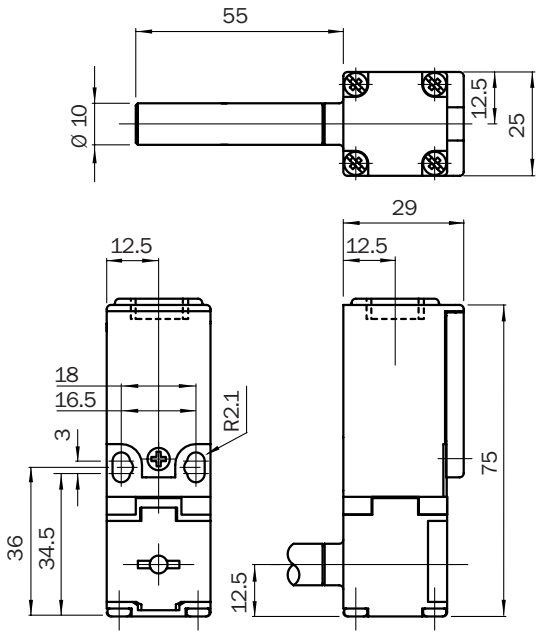

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## Detailed technical specifications

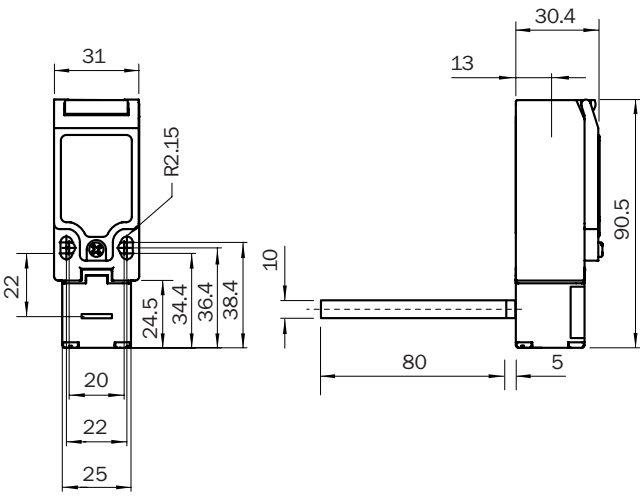
| Type | i10-HA113 | i10-HB213 |
|---|---|---|
| Housing material | Glass-fibre reinforced polyester | |
| Enclosure rating | IP 67 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –20 °C ... +80 °C | |
| Minimum actuation torque | 0.08 Nm | |
| Actuation frequency | Max. 1 Hz | |
| Switching principle | Slow-action switch | |
| Switching angle | Adjustable 3° ... 11° | Adjustable 5° ... 14° |
| Number of positive action normally closed contacts | 1 | 2 |
| Number of normally open contacts | 1 | |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 2 A (250 V AC), 2 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 5 V DC | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | |
| Connection type | Cable gland | |
| Weight | 0.12 kg | 0.17 kg |

## Dimensional drawings

**i10-HA113**




**i10-HB213**

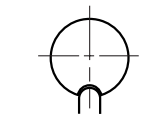
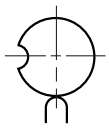
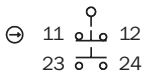
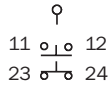
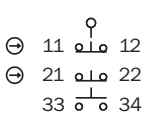
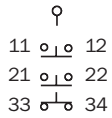



Dimensions in mm

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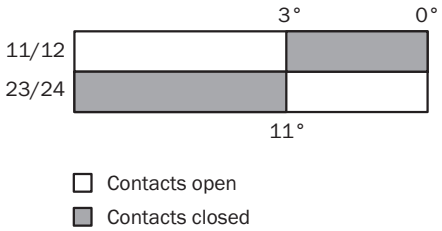

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## Switching elements

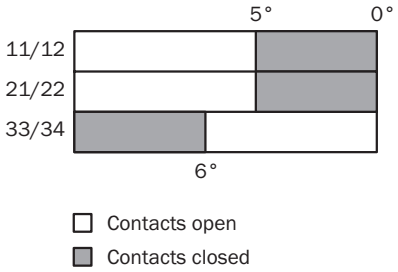
| Not actuated | Actuated | |
|---|---|---|
|  |  | |
|  |  | 11, 1 positive action N/C contact + 1 N/O contact |
|  |  | 21, 2 positive action N/C contacts + 1 N/O contact |

## Actuator travel diagrams

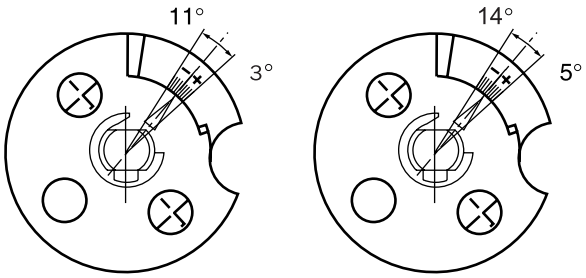
**i10-HA113**




**i10-HB213**




## Mounting




K

**Adjusting the switching angle**

The switching angle can be set in the range of 3° ... 11° (i10HA) or 5° ... 14° (i10HB).
After functional testing safety hinge switches and switch cams must be pinned together to ensure integral intermeshed connection.

## Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M16 | 5309163 |
| M16 to 1/2 inch NPT adapter | 5311531 |


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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Type of shaft** | Hollow shaft |
| **Length of the shaft** | 36.5 mm |
| **Housing material** | Metal |
| **Enclosure rating** | IP 66 |

## Product description

- Safety hinge switch for direct installation to pivotal protective devices
- Hollow shaft design
- 3-pole contact element

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 2 | 1 | i110-HA213 | 6025072 |






- Housing material die-cast zinc
- Hollow shaft stainless steel
- Cable gland M20
- Adjustable switching point
- Enclosure rating IP 66





K

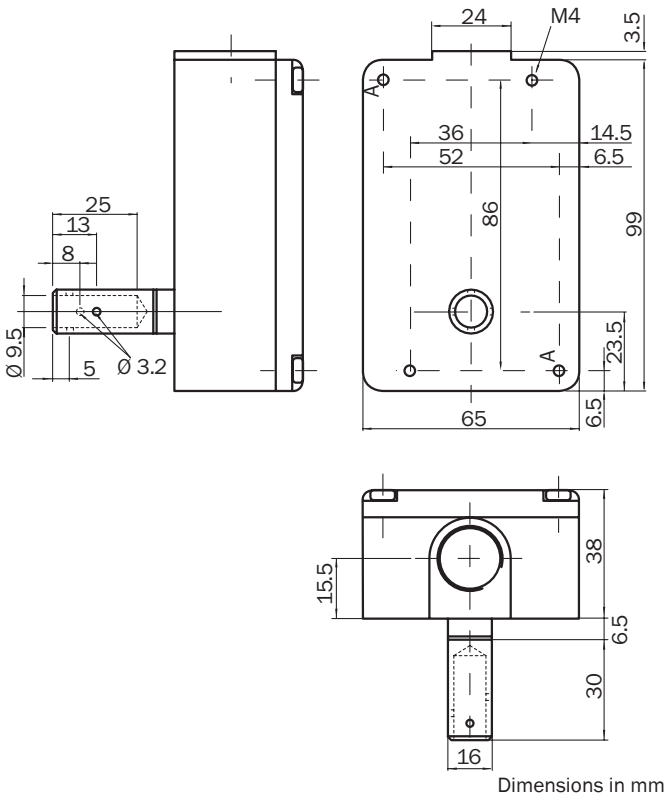
| Further information | Page |
|---|---|
| → Technical specifications | K-6 |
| → Dimensional drawings | K-6 |
| → Switching elements | K-7 |
| → Actuator travel diagram | K-7 |
| → Mounting | K-7 |
| → Accessories | K-7 |
| → Services | A-2 |

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## Detailed technical specifications

| | |
|---|---|
| **Housing material** | Zinc die-cast |
| **Surface treatment** | Varnished |
| **Enclosure rating** | IP 66 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –25 °C ... +80 °C |
| **Minimum actuation torque** | 0.12 Nm |
| **Actuation frequency** | Max. 1 Hz |
| **Switching principle** | Slow-action switch |
| **Switching angle** | Adjustable 5° ... 11° |
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 1 |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 2 A (250 V AC), 5 A (100 V AC), 2 A (24 V DC) |
| **Rated insulation voltage $U_i$** | 250 V |
| **Rated impulse withstand voltage $U_{imp}$** | 2500 V AC |
| **Minimum switching voltage** | 5 V DC |
| **Minimum switching current (switching voltage)** | 5 mA (5 V DC) |
| **Connection type** | Cable gland |
| **Maximum connection cable cross-section** | 1.5 mm² |
| **Short-circuit protection** | 2A gG |
| **Weight** | 0.45 kg |

## Dimensional drawings

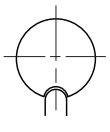
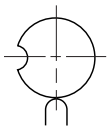
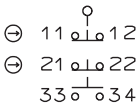
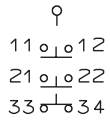



Dimensions in mm

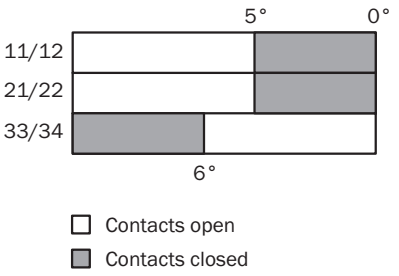


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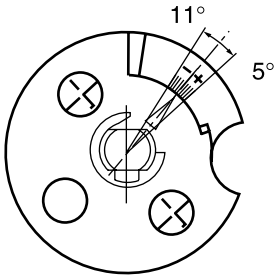
## Switching elements

| Not actuated | Actuated | |
|---|---|---|
|  |  | |
|  |  | 21, 2 positive action N/C contacts + 1 N/O contact |

## Actuator travel diagram




## Mounting




**Adjusting the switching angle**

The switching angle can be set within the range of 5° ... 11°. After functional testing safety hinge switches and switch cams must be pinned together to ensure integral intermeshed connection.

## Accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

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# Explanations of features

**Sensor principle**

Non-contact safety switches can be organized into the following groups according to their principle of operation:

- Reed
  These sensors have reed-type contacts in the sensor, which are opened or closed in the actuator by means of solenoids/ magnets.
- Transponder
  In the case of transponder-type sensors, a wireless communication link is effected between the sensor and the actuator. Each actuator is distinctly coded and is consequently a “unique copy”.
  Data is transferred between the sensor and the actuator within the response zone of the sensor. The code of the actuator is scanned and compared with the code stored in the memory of the evaluation unit.
- Inductive
  Inductive sensors do not require any physical actuators. The sensors are actuated by metal (typically ST37 steel) in the response zone.

**Category according to EN 954-1**

In accordance with the Directive on Machinery, machine manufacturers and system manufacturers must carry out a risk assessment analysis.

The EN 954-1 Standard will assist in determining the category of the safety-related parts of the manufacturer's control system.

The illustrated non-contact safety switches comply in each case with the requirements of the category in accordance with EN 954-1.

**Type of output**

Non-contact safety switches generally have 2 or 3 components:

- the sensor
- any possible actuator and
- an evaluation unit

The evaluation units are grouped into 2 categories, based upon the technologies utilized:

- with relay outputs and
- with semi-conductor outputs

**Number of safe outputs**

Apart from the category and the type of output adopted, the number of safe outputs plays an important role when connecting non-contact safety switches to the control system.

The number required is dependent upon the number of safe outputs of the evaluation unit.

**External device monitoring (EDM)**

See glossary page Q-3

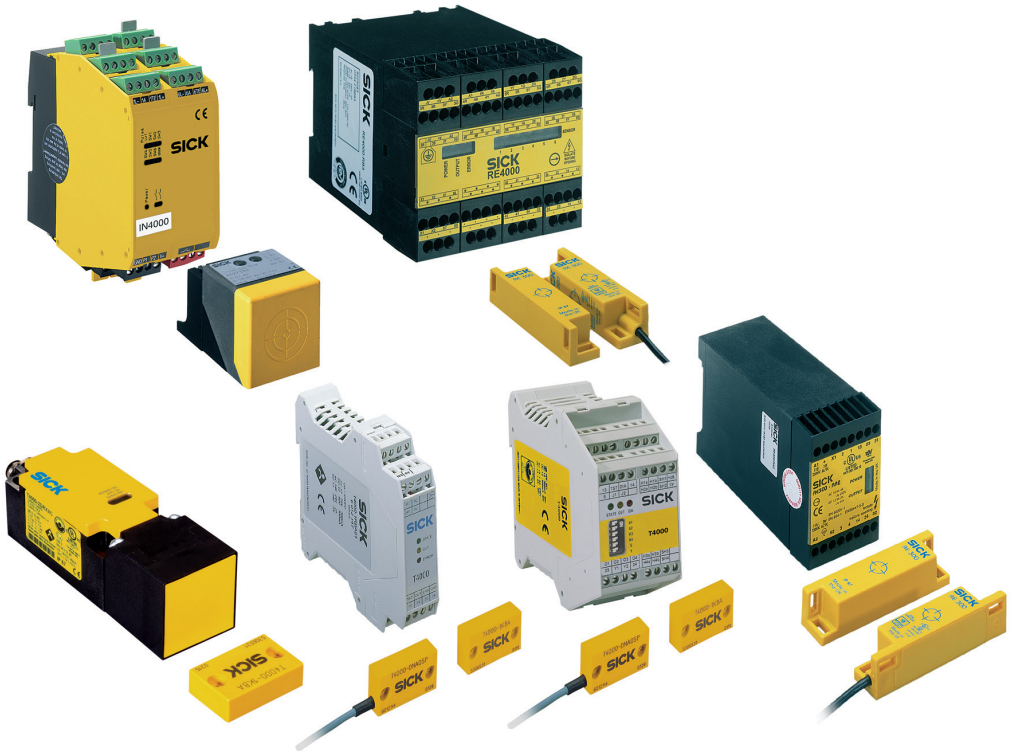
**Restart interlock**

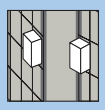
See glossary page Q-9



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# Non-contact safety switches




| Safety application | Sensor principle [1] | Type of output [1] | Category according to EN 954-1 | Maximum number of sensors | Number of safe outputs | Restart interlock (RES) [1] | External device monitoring (EDM) [1] | Product | Page |
|---|---|---|---|---|---|---|---|---|---|
|  | Reed | Relay | 3 | 1 | 2 | ✔ | ✔ | RE300 | L-2 |
| | | | 4 | 6 | 3 | ✔ | ✔ | RE4000 | L-7 |
| | Transponder | Relay | 3 | 1 | 2 | – | – | T4000 | L-12 |
| | | | 4 | 2 / 4 | 2 | ✔ | ✔ | T4000 Multi | L-17 |
| | | Semiconductor | 3 | 1 | 2 | – | – | T4000 Compact | L-23 |
| | Inductive | Relay | 4 | 10 | 3 | – | ✔ | IN4000 | L-28 |

[1] Explanation see page L-0

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- Actuator with coding
- Sensor and actuator with IP 67 enclosure rating
- Direct connection of the sensors to safe control possible
- Evaluation unit for all common operating voltages



L

| Further information | Page |
|---|---|
| → Dimensional drawings | L-4 |
| → Internal circuitry | L-5 |
| → Mounting | L-6 |
| → Response range | L-6 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Sensor principle** | Reed |
| **Category according to EN 954-1** | 3 |
| **Number of non-contact safety switches** | 1 |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 2 |
| **Number of application diagnostic outputs** | 1 x Relay |

## Product description

The RE300 is a magnetically coded non-contact safety switch, whose contacts are operated with the corresponding RE300 element. The sensor is equipped with two complementary switching contacts in N/O / N/C combination.

The switching signals are evaluated either with the special SICK RE300/RE4000 evaluation units or by suitable safety evaluation electronics such as a safety programmable logic controller.

## Ordering information

| System part | Cable length | Type | Part number |
|---|---|---|---|
| Evaluation unit | – | RE300-RA2 | 6025082 |
| Sensor & Actuator | 3 m | RE300-DA03P | 6025080 |
| | 10 m | RE300-DA10P | 6025079 |



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# Detailed technical specifications

## Evaluation unit

| | |
|---|---|
| **Category according to EN 954-1** | 3 |
| **Classification in compliance with IEC/EN 60947-5-3** | PDF-S |
| **Housing material** | PC, polycarbonate |
| **Enclosure rating** | IP 20 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –10 °C ... +55 °C |
| **Shock resistance** | 30 g, 11 ms (IEC 60068-2-27) |
| **Vibration resistance** | 10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6) |
| **Operating voltage** | 230 V AC (207 V AC ... 253 V AC) [1] |
| **Operating voltage** | 110 V AC (99 V AC ... 121 V AC) [1] |
| **Operating voltage** | 24 V AC/DC (21.6 V AC/DC ... 26.4 V AC/DC) [2] |
| **Number of non-contact safety switches** | 1 |
| **Rated impulse withstand voltage $U_{imp}$** | 4000 V AC |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 2 |
| **Number of application diagnostic outputs** | 1 x Relay |
| **Short-circuit protection** | F5 (AC), F3 (DC) |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 4 A (250 V AC), 2 A (30 V DC) |
| **Minimum switching current (switching voltage)** | 10 mA (10 V DC) |
| **Minimum switching current (switching voltage)** | 10 mA (10 V AC) |
| **Maximum switching current (switching voltage)** | 2 A (30 V DC) |
| **Maximum switching current (switching voltage)** | 4 A (250 V AC) |
| **Maximum switching power** | 1000 VA (cos phi = 1) |
| **Weight** | 0.503 kg |
| **Out indication** | ✔ |
| **Power indication** | ✔ |
| **Maximum switch on time** | 70 ms |
| **Switching delay from state change** | 25 ms |
| **Maximum cable resistance at sensor input** | 75 Ohm |
| **External device monitoring** | ✔ |

[1] When using the 110 V AC or 230 V AC operating voltage, protective earth conductor PE must be connected to the –/PE terminal.

[2] PELV earthed safety extra-low voltage. When using terminals +/–, terminal –/PE must be connected to the protective earth conductor PE.

Continued on next page

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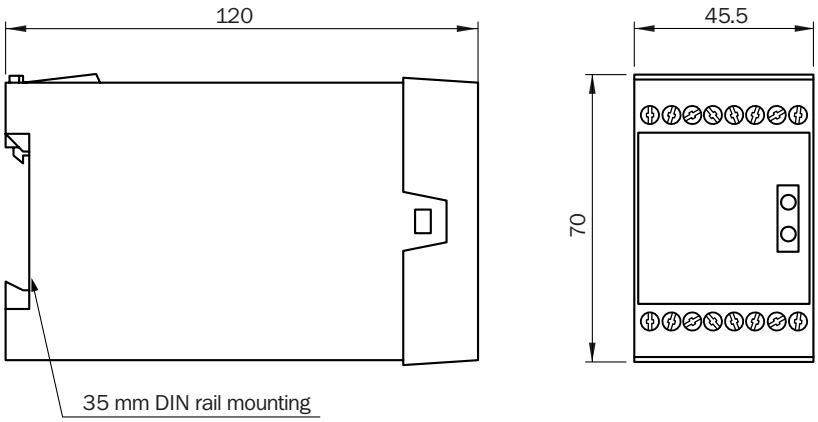
### Sensor & actuator

| Type | RE300-DA03P | RE300-DA10P |
|---|---|---|
| Sensor principle | Reed | |
| Category according to EN 954-1 | 3 [1)] | |
| Housing material | ABS shape | |
| Enclosure rating | IP 67 | |
| Ambient operating temperature from ... to | –10 °C ... +55 °C | |
| Shock resistance | 30 g, 11 ms (IEC 60068-2-29) | |
| Vibration resistance | 10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6) | |
| Maximum switching voltage | 30 V DC | |
| Maximum switching current | 30 mA | |
| Weight | 0.168 kg | 0.322 kg |
| Switch-on distance | 5 mm | |
| Switch-off distance | 15 mm | |
| Safe switch-off distance | 15 mm | |
| Minimum approach speed | 17 mm/s | |
| Cable length | 3 m | 10 m |
| Cable material | PVC | |
| Maximum cable resistance at sensor input | 75 Ohm | |

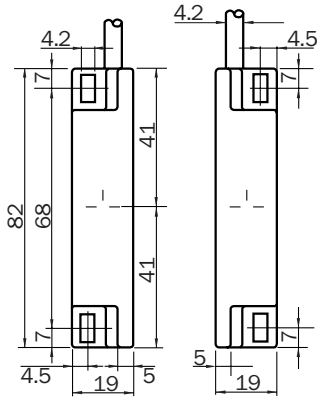
[1)] Depends on the evaluation unit. Systems up to category 3 according to EN 954-1 can be implemented using the evaluation unit RE300 or a safe control; using the evalutation unit RE400 systems up to category 4 can be implemented.

## Dimensional drawings

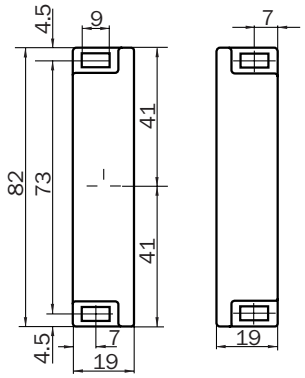
**Evaluation unit**




**Sensor**




**Actuator**

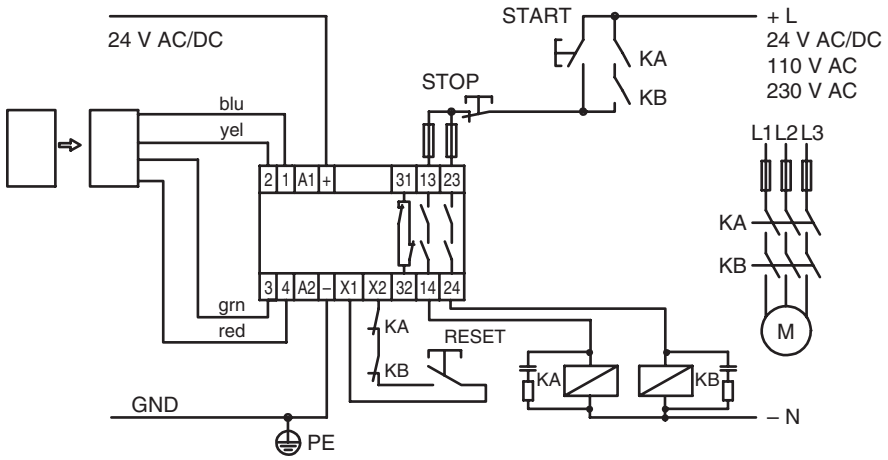



Dimensions in mm


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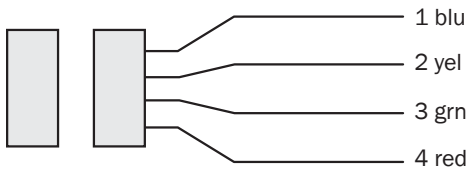
# Internal circuitry

**Evaluation unit**

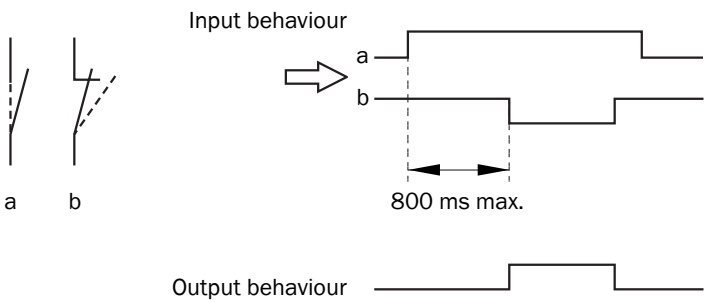



Example of wiring 24 V AC/DC with contactor control and static reset

**Sensor**




**Sensor (stand-alone)**




**Direct connection of the sensor to safe control**

When evaluating the sensor signals of RE300 with a safe control both contact signals 1/4 and 2/3 MUST be monitored. Both contacts must switch complementarily with a maximum discrepancy time of 800 ms; this time must be monitored by the evaluation electronics (safe control).

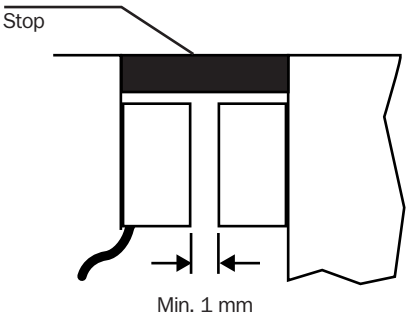
When connecting the sensor to a fail-safe control, the input module must be configured, such that the set discrepancy time has no effect on the response time of the evaluation (typical parameterisation "provide 0 value"). If this is not possible, this must be taken into account when calculating the reaction time.

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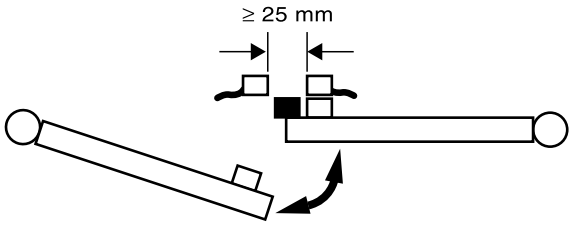


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## Mounting

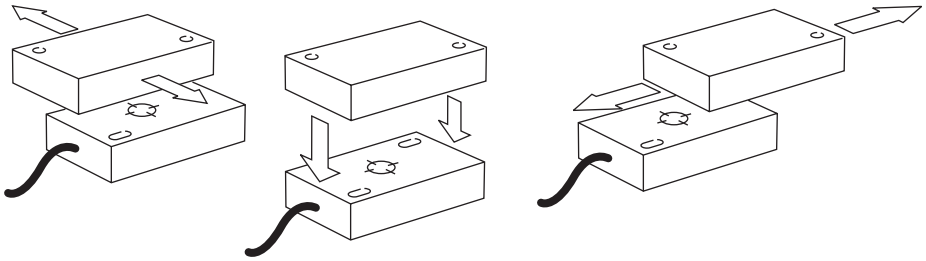


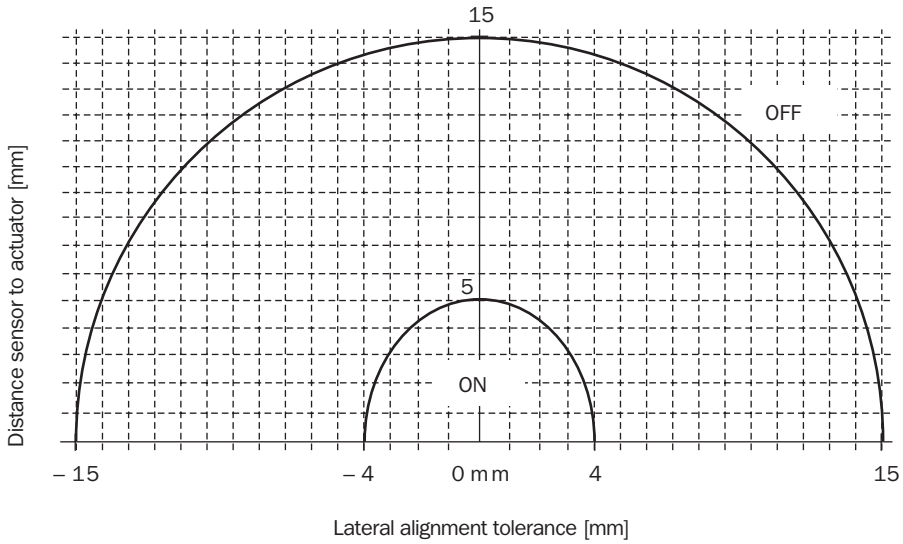

Minimum distance between sensor and actuator




Minimum distance to neighbouring sensors

## Response range






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## Overview of technical specifications

| | |
|---|---|
| **Sensor principle** | Reed |
| **Category according to EN 954-1 (depending on type)** | Up to cat. 4 |
| **Number of non-contact safety switches from ... to** | 2 ... 6 |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 3 |
| **Number of application diagnostic outputs** | 1 x Relay |
| **Number of delayed safe outputs (N/O)** | 1 |

## Product description

The RE4000 non-contact safety switch system comprises of the following components:

- 2 to 6 sensors
- 2 to 6 magnetically coded actuators and
- 1 evaluation unit

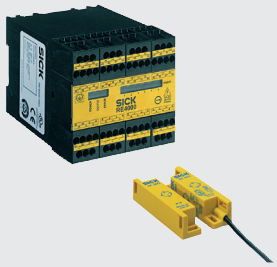
The evaluation unit is further equipped with:

- 1 application diagnostic output (normally closed contact)
- 1 delayed output (normally open contact) with adjustable time delay from 0.6 s to 30 s
- 2 LED status displays and
- 6 LEDs for status display of each individual sensor

## Ordering information

| System part | Cable length | Type | Part number |
|---|---|---|---|
| Evaluation unit | – | RE4000-RB3 | 6025083 |
| Sensor & Actuator | 3 m | RE300-DA03P | 6025080 |
| | 10 m | RE300-DA10P | 6025079 |





- Actuator with coding
- Sensor and actuator with IP 67 enclosure rating
- Evaluation unit for all common operating voltages
- Evaluation unit for monitoring 2 to 6 independently actuated protective devices
- Adjustable release delay from 0.6 to 30 s for additional safety output



L

| Further information | Page |
|---|---|
| → Technical specifications | L-8 |
| → Dimensional drawings | L-9 |
| → Internal circuitry | L-10 |
| → Mounting | L-10 |
| → Response range | L-11 |
| → Services | A-2 |



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# Detailed technical specifications

## Evaluation unit

| | |
|---|---|
| **Category according to EN 954-1** | Up to cat. 4 [1] |
| **Classification in compliance with IEC/EN 60947-5-3** | PDF-S |
| **Housing material** | PC, polycarbonate |
| **Enclosure rating** | IP 20 |
| **Mechanical life (relay contacts)** | 1 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | –10 °C ... +55 °C |
| **Shock resistance** | 30 g, 11 ms (IEC 60068-2-27) |
| **Vibration resistance** | 10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6) |
| **Operating voltage** | 230 V AC (196 V AC ... 253 V AC) [2] |
| **Operating voltage** | 110 V AC (94 V AC ... 121 V AC) [2] |
| **Operating voltage** | 24 V AC/DC (20.4 V AC/DC ... 27.6 V AC/DC) [3] |
| **Number of non-contact safety switches from ... to** | 2 ... 6 |
| **Rated impulse withstand voltage $U_{imp}$** | 4000 V AC |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 3 |
| **Number of application diagnostic outputs** | 1 x Relay |
| **Number of delayed safe outputs (N/O)** | 1 |
| **Off delay min ... max** | 0.6 s ... 30 s |
| **Short-circuit protection** | F5 (AC), F3 (DC) |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 2 A (240 V AC), 1 A (24 V DC) |
| **Minimum switching current (switching voltage)** | 10 mA (10 V DC) |
| **Minimum switching current (switching voltage)** | 10 mA (10 V AC) |
| **Maximum switching current (switching voltage)** | 2 A (30 V DC) |
| **Maximum switching current (switching voltage)** | 4 A (250 V AC) |
| **Maximum switching power** | 1000 VA (cos phi = 1) |
| **Weight** | 0.675 kg |
| **Out indication** | ✔ |
| **Power indication** | ✔ |
| **Error indication** | ✔ |
| **Sensor display** | ✔ |
| **Maximum switch on time** | 50 ms |
| **Switching delay from state change** | 25 ms |
| **Maximum cable resistance at sensor input** | 50 Ohm |
| **External device monitoring** | ✔ |

[1] When using the delayed release output 57/58 up to cat. 3

[2] On the usage of 110 V AC or 230V AC operating voltage, the –V/PE terminal must be connected to the PE earth conductor.

[3] PELV earthed safety extra-low voltage. On usage of +V/–V terminals, the –V/PE terminal must be connected to the PE earth conductor.

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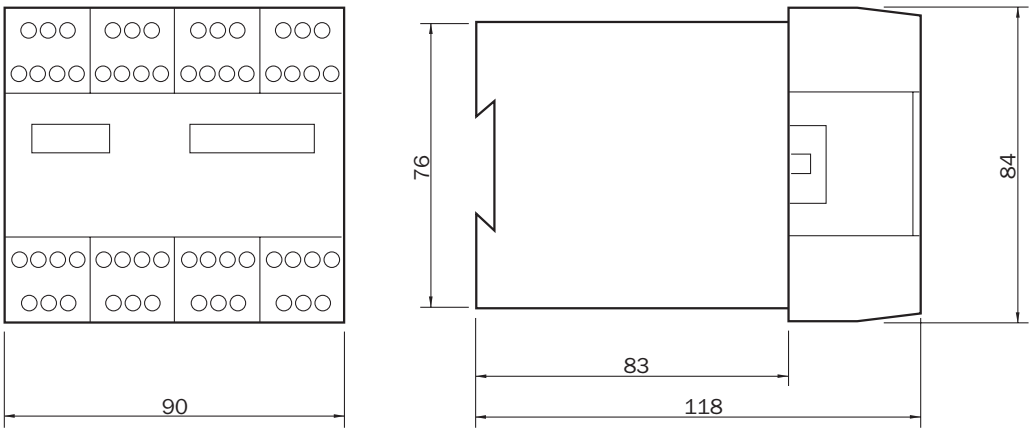
### Sensor & actuator

| Type | RE300-DA03P | RE300-DA10P |
|---|---|---|
| Sensor principle | Reed | |
| Category according to EN 954-1 | 3 [1] | |
| Housing material | ABS shape | |
| Enclosure rating | IP 67 | |
| Ambient operating temperature from ... to | –10 °C ... +55 °C | |
| Shock resistance | 30 g, 11 ms (IEC 60068-2-29) | |
| Vibration resistance | 10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6) | |
| Maximum output voltage | 30 V DC | |
| Maximum output current | 30 mA | |
| Weight | 0.168 kg | 0.322 kg |
| Switch-on distance | 5 mm | |
| Switch-off distance | 15 mm | |
| Safe switch-off distance | 15 mm | |
| Minimum approach speed | 17 mm/s | |
| Cable length | 3 m | 10 m |
| Cable material | PVC | |
| Maximum cable resistance at sensor input | 75 Ohm | |

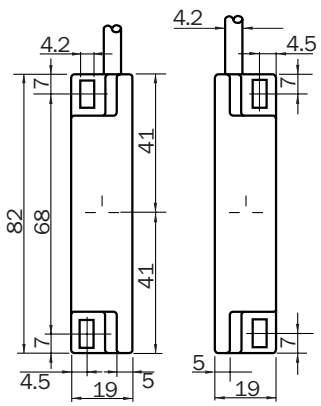
[1] Depends on the evaluation unit. Systems up to category 3 according to EN 954-1 can be implemented using the evaluation unit RE300 or a safe control; using the evalutation unit RE4000 systems up to category 4 can be implemented.

## Dimensional drawings

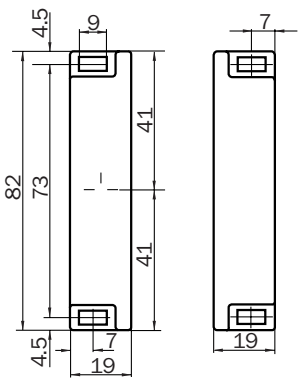
**Evaluation unit**




**Sensor**




**Actuator**

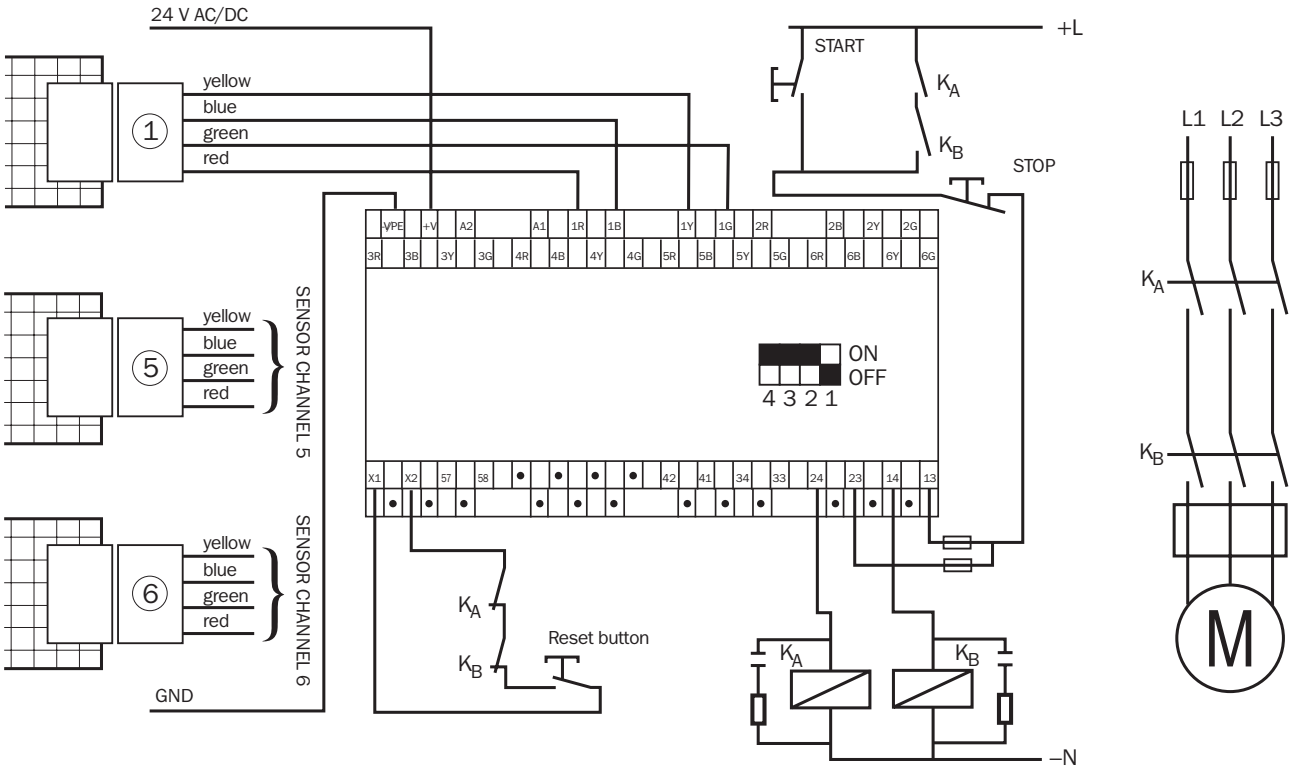



Dimensions in mm



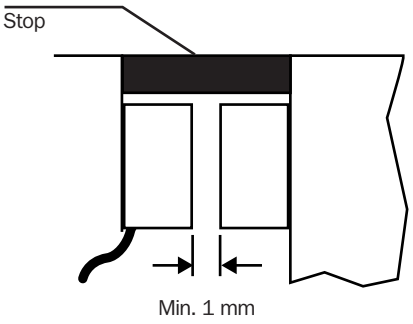
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## Internal circuitry

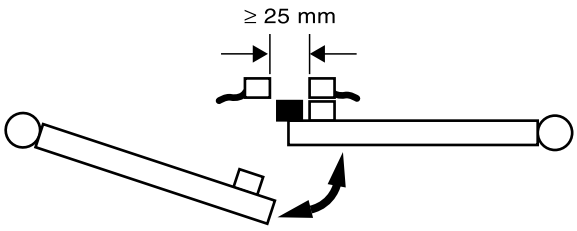



Example wiring for 24 V AC/DC with 3 sensors, with external device monitoring and static reset

## Mounting




Minimum distance between sensor and actuator



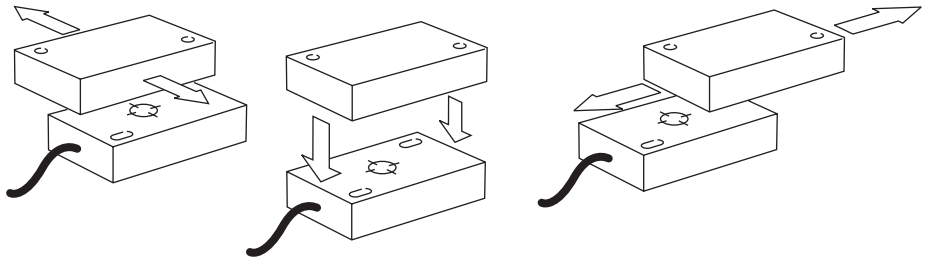

Minimum distance to neighbouring sensors

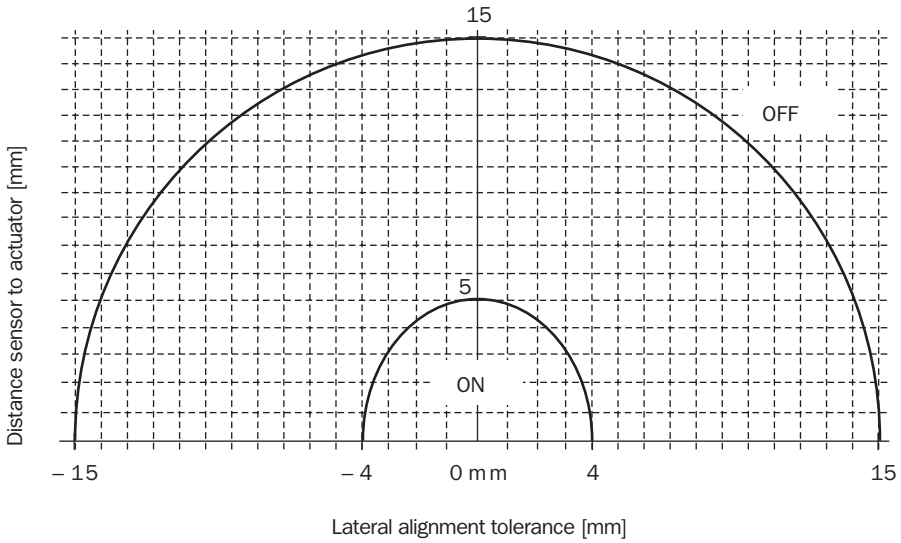
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## Response range






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- High protection against manipulation through individually coded actuator
- Small compact design of sensor and actuator
- Sensor and actuator with IP 67 protection



## Overview of technical specifications

| | |
|---|---|
| **Sensor principle** | Transponder |
| **Category according to EN 954-1** | 3 |
| **Number of non-contact safety switches** | 1 |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 2 |
| **Number of application diagnostic outputs** | 1 x Semiconductor, p-switching |

## Product description

The T4000 non-contact safety switch system comprises of the following components:

- 1 sensor
- 1 coded actuator (unique copy)
- 1 evaluation unit

The evaluation unit is further equipped with:

- 1 solid-state application diagnostic output
- 2 LED status displays

## Ordering information

| System part | Connection type | Cable length | Type | Part number |
|---|---|---|---|---|
| Evaluation unit | Plug-in terminals | – | T4000-1 RBA 01 | 6012147 |
| Sensor | Connector | – | T4000 DNAC | 6021912 |
| | Cable | 5 m | T4000 DNA05P | 6012144 |
| | | 10 m | T4000 DNA10P | 6012145 |
| | | 15 m | T4000 DNA15P | 6012146 |
| Actuator | – | – | T4000-1 KBA | 5306531 |

Connecting cable not supplied with delivery

L

| Further information | Page |
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| → Dimensional drawings | L-14 |
| → Internal circuitry | L-15 |
| → Response range | L-16 |
| → Accessories | L-16 |
| → Services | A-2 |



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# Detailed technical specifications

## Evaluation unit

| | |
|---|---|
| **Category according to EN 954-1** | 3 |
| **Classification in compliance with IEC/EN 60947-5-3** | PDF-M |
| **Classification according to cULus**<br>**Note operating voltage**<br>**External fuse**<br>**Maximum switching voltage** | Class 2<br>Operation with UL-class 2 power supply only<br>At supply voltage 0.25 A ... 8 A<br>60 V DC/30 V AC |
| **Housing material** | Plastic PA6.6 |
| **Enclosure rating** | IP 20 |
| **Mechanical life (relay contacts)** | 10 x $10^6$ switching cycles |
| **Ambient operating temperature from ... to** | 0 °C ... +55 °C |
| **Protection class** | 3 |
| **Shock resistance** | 30 g, 11 ms (IEC 60068-2-27) |
| **Vibration resistance** | 10 Hz ... 55 Hz, 0.5 mm (IEC 60068-2-6) |
| **Operating voltage** | 24 V DC (21 V DC ... 27 V DC) |
| **Number of non-contact safety switches** | 1 |
| **Connection type** | Plug-in terminals |
| **Rated insulation voltage $U_i$** | 63 V |
| **Rated impulse withstand voltage $U_{imp}$** | 1500 V AC |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 2 |
| **Number of application diagnostic outputs** | 1 x Semiconductor, p-switching |
| **Short-circuit protection** | 6A gG |
| **Usage category in compliance with IEC 947-5-1** | AC-12/DC-12, AC-140/DC-13 |
| **Rated operating current (voltage)** | 0.3 A (60 V AC) 50 Hz, 2 A (30 V AC) 50 Hz, 0.3 A (60 V DC), 4 A (30 V DC) |
| **Minimum switching current (switching voltage)** | 1 mA (0.1 V DC) |
| **Maximum switching power** | 60 VA |
| **Weight** | 0.327 kg |
| **Out indication** | ✔ |
| **Error indication** | ✔ |
| **Status display** | ✔ |
| **Maximum switch on time** | 3000 ms |
| **Switching delay from state change** | 180 ms |

Continued on next page





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### Sensor

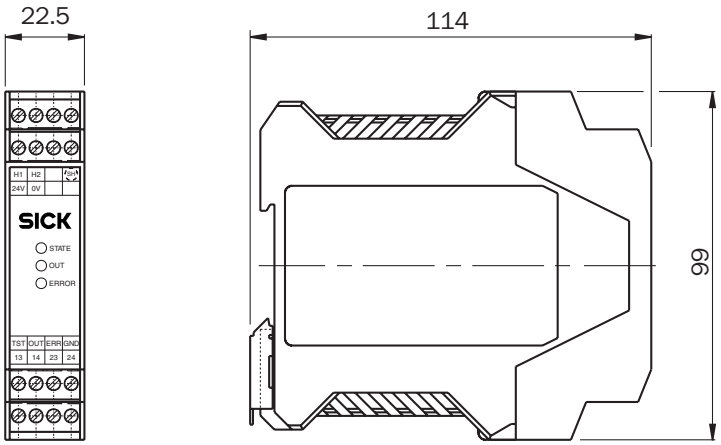
| Type | T4000 DNAC | T4000 DNA05P | T4000 DNA10P | T4000 DNA15P |
|---|---|---|---|---|
| Sensor principle | Transponder | | | |
| Housing material | Fortron, glass-fibre reinforced thermoplastic | | | |
| Enclosure rating | IP 67 | | | |
| Ambient operating temperature from ... to | –25 °C ... +70 °C | | | |
| Connection type | Connector | Cable | | |
| Size of the cable gland | M8 | | | |
| Weight | 0.12 kg | 0.25 kg | 0.39 kg | 0.53 kg |
| Monitoring time minimum dwell time | 0.5 s | | | |
| Cable length | – | 5 m | 10 m | 15 m |
| Maximum cable length | 50 m | | | |
| Cable material | – | PVC | | |

### Actuator

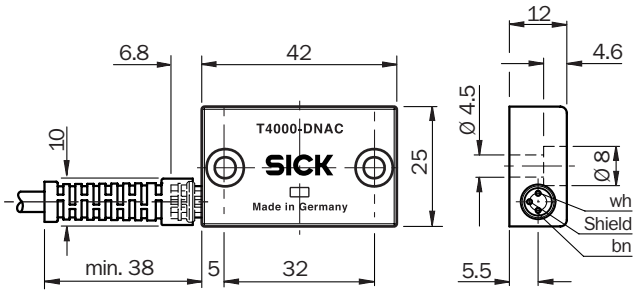
| | |
|---|---|
| Housing material | Fortron, glass-fibre reinforced thermoplastic |
| Enclosure rating | IP 67 |
| Ambient operating temperature from ... to | –25 °C ... +70 °C |
| Weight | 0.03 kg |
| Monitoring time minimum dwell time | 0.5 s |

## Dimensional drawings

**Evaluation unit**



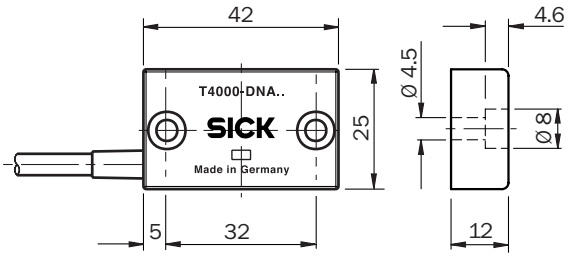

**Sensor, connector**



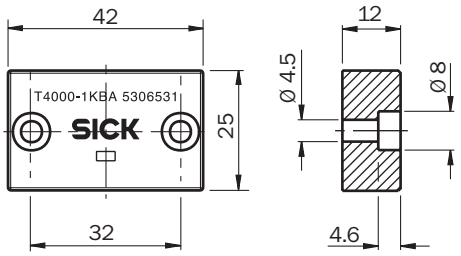

Dimensions in mm


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**Sensor, cable**

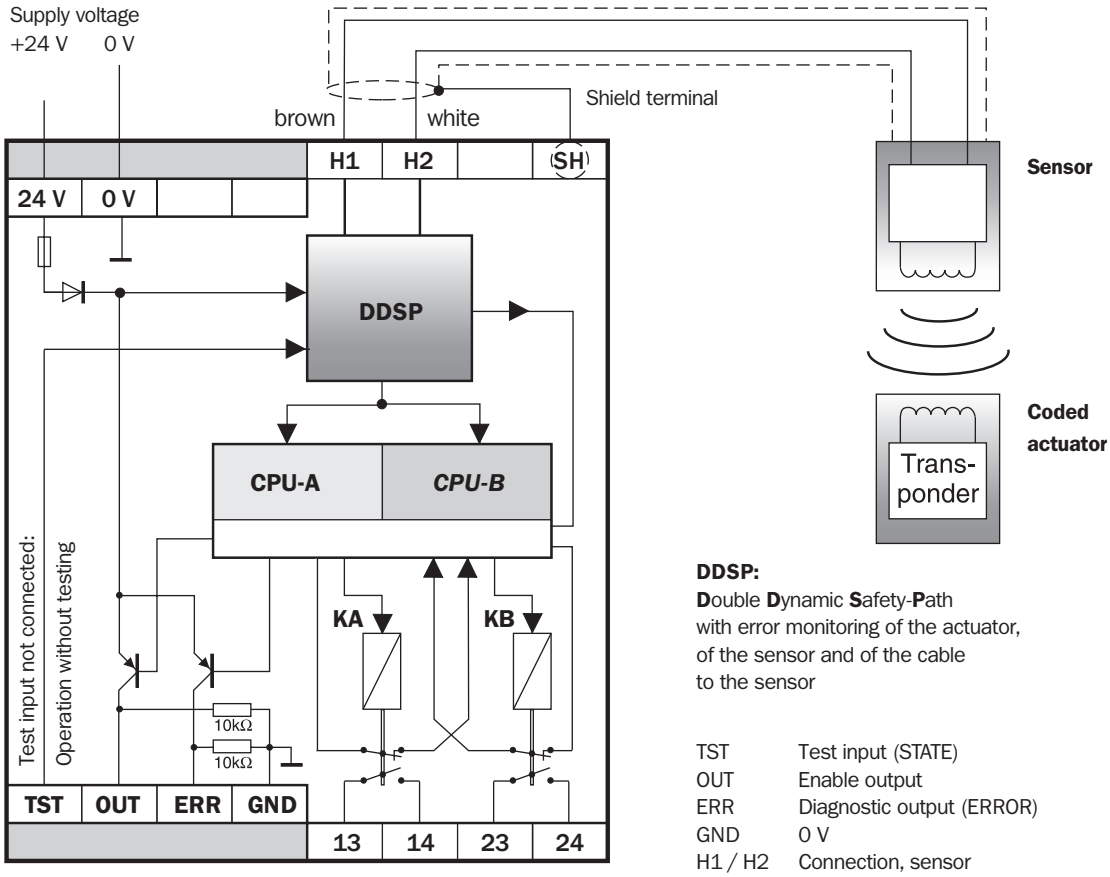



**Actuator**




Dimensions in mm

## Internal circuitry



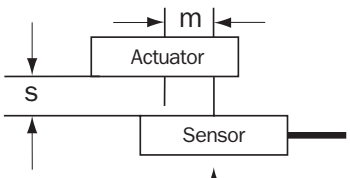

**DDSP:**
**D**ouble **D**ynamic **S**afety-**P**ath
with error monitoring of the actuator,
of the sensor and of the cable
to the sensor

| | |
|---|---|
| TST | Test input (STATE) |
| OUT | Enable output |
| ERR | Diagnostic output (ERROR) |
| GND | 0 V |
| H1 / H2 | Connection, sensor |
| 13 / 14 | Connection, N/O contact 1, enable contact safety relay |
| 23 / 24 | Connection, N/O contact 2, enable contact safety relay |

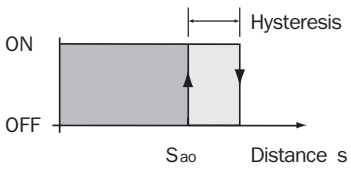

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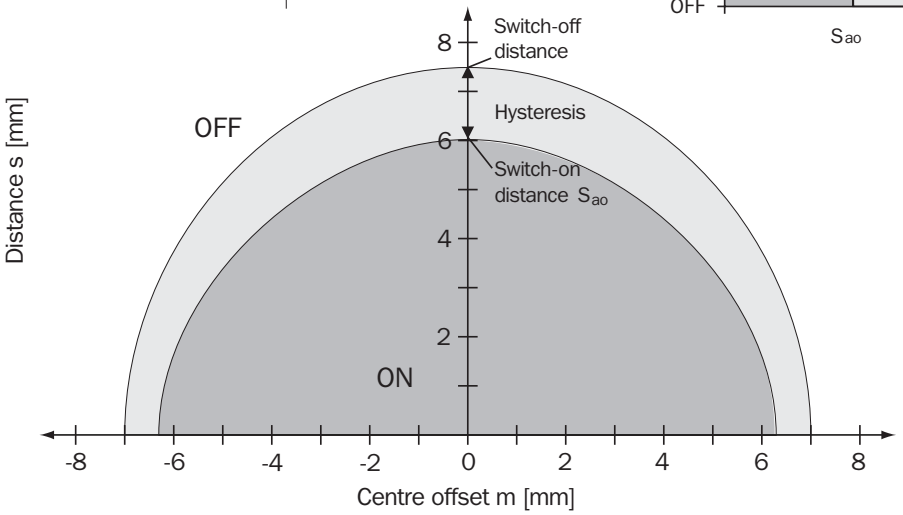
## Response range

Observe the safe switch-off distance $s_{ar}$ = 23 mm. Relay outputs are safely deactivated




Output state




## Accessories

### Connection cable

| Cable length | Type | Part number |
|---|---|---|
| 20 m | T4000-DNA20C | 6021913 |
| 25 m | T4000-DNA25C | 6021914 |
| 50 m | T4000-DNA50C | 6021915 |

### Safety screws

| Packing unit | Type | Part number |
|---|---|---|
| 20 | Safety screws T4000 | 5309170 |

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## Overview of technical specifications

| | |
|---|---|
| **Sensor principle** | Transponder |
| **Category according to EN 954-1** | 4 |
| **Number of non-contact safety switches from ... to (depending on type)** | 1 ... 2 / 1 ... 4 |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 2 |
| **Number of application diagnostic outputs (depending on type)** | 2 x Semiconductor, p-switching / 4 x Semiconductor, p-switching |

## Product description

The T4000 Multi non-contact safety switch system comprises of the following components:

- 1 to 4 sensors
- 1 to 4 coded actuators (unique copy)
- 1 evaluation unit

The evaluation unit is further equipped with:

- 2 LED status displays
- External device monitoring (EDM)
- Restart interlock

## Ordering information

| System part | Connection type | Number of read heads from ... to | Cable length | Type | Part number |
|---|---|---|---|---|---|
| Evaluation unit | – | 1 ... 2 | – | T4000-1RCA02 | 6029946 |
| | | 1 ... 4 | – | T4000-1RCA04 | 6029947 |
| Sensor | Connector | – | – | T4000 DNAC | 6021912 |
| | Cable | – | 5 m | T4000 DNA05P | 6012144 |
| | | | 10 m | T4000 DNA10P | 6012145 |
| | | | 15 m | T4000 DNA15P | 6012146 |
| Actuator | – | – | – | T4000-1 KBA | 5306531 |

Connecting cable not supplied with delivery






- Connection of multiple sensors to one evaluation unit
- High protection against manipulation through individually coded actuator
- Small compact design of sensor and actuator
- Sensor and actuator with IP 67 enclosure rating



L

| Further information | Page |
|---|---|
| → Technical specifications | L-18 |
| → Dimensional drawings | L-19 |
| → Internal circuitry | L-20 |
| → Response range | L-22 |
| → Accessories | L-22 |
| → Services | A-2 |

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# Detailed technical specifications

## Evaluation unit

| Type | T4000-1RCA02 | T4000-1RCA04 |
|---|---|---|
| Category according to EN 954-1 | 4 | |
| Classification in compliance with IEC/EN 60947-5-3 | PDF-M | |
| Classification according to cULus<br>Note operating voltage<br>External fuse<br>Maximum switching voltage | Class 2<br>Operation with UL-class 2 power supply only<br>At operating voltage 0.25 A ... 8 A<br>60 V DC/30 V AC | |
| Housing material | Plastic PA6.6 | |
| Enclosure rating | IP 20 | |
| Mechanical life (relay contacts) | 10 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | 0 °C ... +55 °C | |
| Protection class | 3 | |
| Operating voltage | 24 V DC (21 V DC ... 27 V DC) | |
| Number of non-contact safety switches from ... to | 1 ... 2 | 1 ... 4 |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 4000 V AC | |
| Type of output | Relay | |
| Number of safe outputs (N/O) | 2 | |
| Number of application diagnostic outputs | 2 x Semiconductor, p-switching | 4 x Semiconductor, p-switching |
| Short-circuit protection | 6A gG | |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 1.5 A (230 V AC), 1.2 A (24 V DC) | |
| Minimum switching current (switching voltage) | 1 mA (1 V DC) | |
| Maximum switching current (switching voltage) | 6 A (240 V AC) | |
| Weight | 250 g | |
| Out indication | ✔ | |
| Power indication | ✔ | |
| Error indication | ✔ | |
| Status display | ✔ | |
| Maximum switch on time | 12 s | |
| Switching delay from state change | 290 ms | 450 ms |
| External device monitoring | ✔ | |
| Restart interlock | ✔ | |

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### Sensor

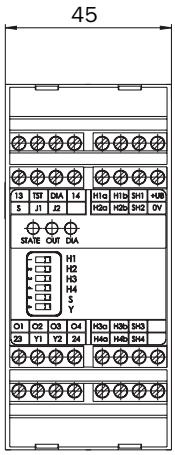
| Type | T4000 DNAC | T4000 DNA05P | T4000 DNA10P | T4000 DNA15P |
|---|---|---|---|---|
| Sensor principle | Transponder | | | |
| Housing material | Fortron, glass-fibre reinforced thermoplastic | | | |
| Enclosure rating | IP 67 | | | |
| Ambient operating temperature from ... to | –25 °C ... +70 °C | | | |
| Connection type | Connector | Cable | | |
| Size of the cable gland | M8 | | | |
| Weight | 0.12 kg | 0.25 kg | 0.39 kg | 0.53 kg |
| Monitoring time minimum dwell time | 0.5 s | | | |
| Cable length | – | 5 m | 10 m | 15 m |
| Maximum cable length | 50 m | | | |
| Cable material | – | PVC | | |

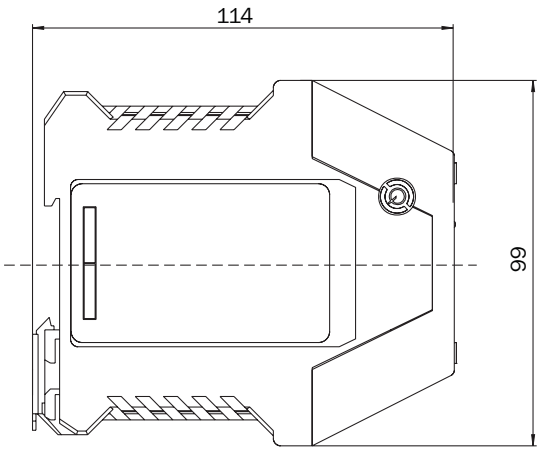
### Actuator

| | |
|---|---|
| Housing material | Fortron, glass-fibre reinforced thermoplastic |
| Enclosure rating | IP 67 |
| Ambient operating temperature from ... to | –25 °C ... +70 °C |
| Weight | 0.03 kg |
| Monitoring time minimum dwell time | 0.5 s |

## Dimensional drawings

**Evaluation unit**

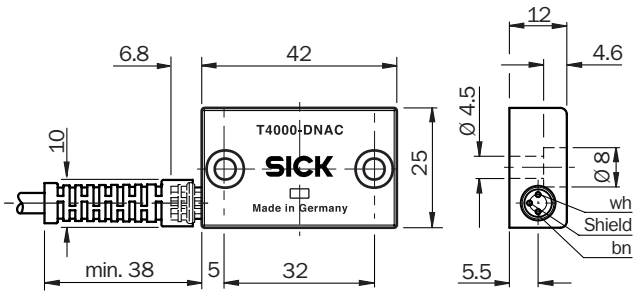


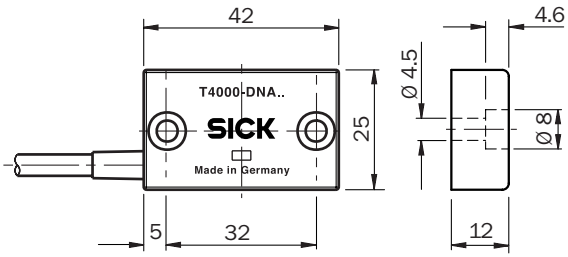

Dimensions in mm


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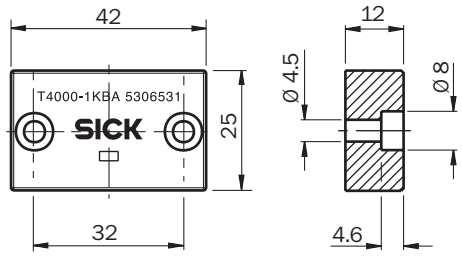
**Sensor, connector**




**Sensor, cable**



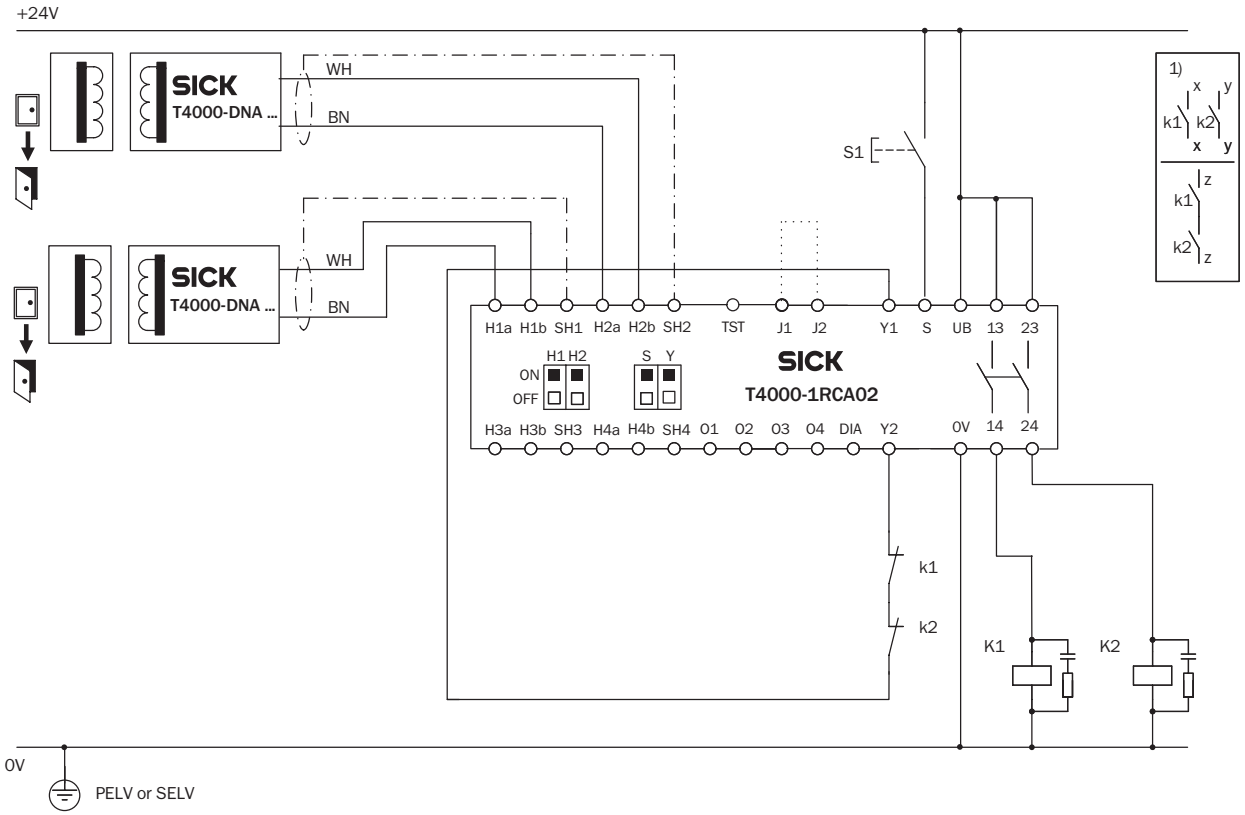

**Actuator**




Dimensions in mm

## Internal circuitry

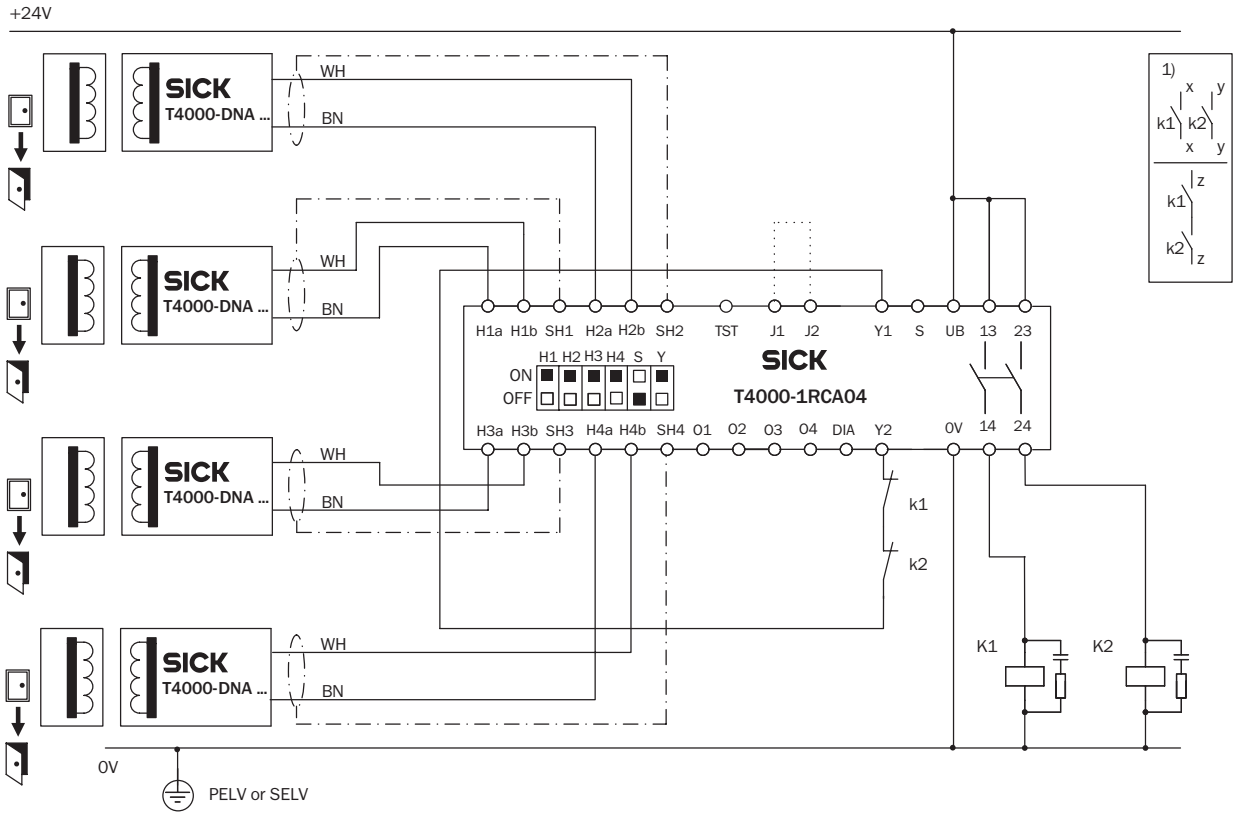
**T4000-1RCA02**




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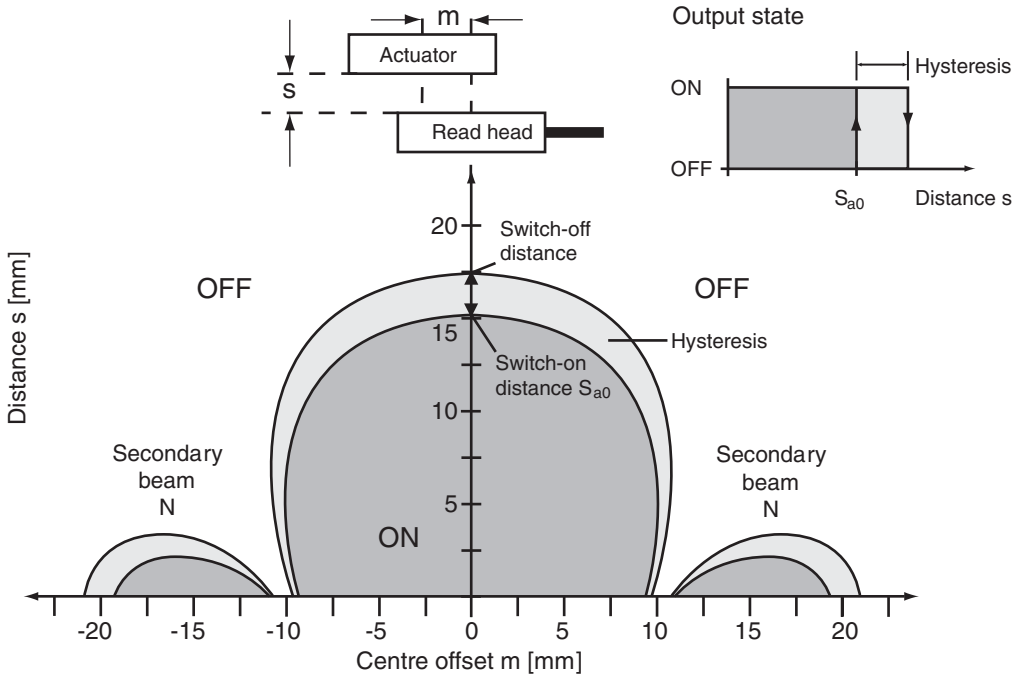
**T4000-1RCA04**




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## Response range




## Accessories

**Connection cable**

| Cable length | Type | Part number |
|---|---|---|
| 20 m | T4000-DNA20C | 6021913 |
| 25 m | T4000-DNA25C | 6021914 |
| 50 m | T4000-DNA50C | 6021915 |

**Safety screws**

| Packing unit | Type | Part number |
|---|---|---|
| 20 | Safety screws T4000 | 5309170 |

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## Overview of technical specifications

| | |
|---|---|
| **Sensor principle** | Transponder |
| **Category according to EN 954-1** | 3 |
| **Number of non-contact safety switches** | 1 |
| **Type of output** | Semiconductor, p-switching |
| **Number of safe outputs** | 2 |

## Product description

The T4000 Compact non-contact safety switch system comprises of the following components:

- 1 sensor with integrated evaluation unit and
- 1 coded actuator

The sensor with integrated evaluation unit is further equipped with:

- 1 solid-state application diagnostic output
- 2 LED status displays

## In-system added value

Possible connections to

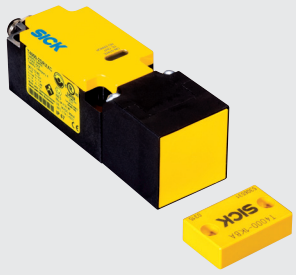
- SICK UE10 safety relays series (see table) → see N-0
- SICK UE440 and UE470 safety controllers → see 0-0
- SICK UE4100 PROFIsafe safety remote I/Os → see 0-0

## Ordering information

| System part | Type | Part number |
|---|---|---|
| Evaluation Unit & Sensor | T4000-2 DRNAC | 6022052 |
| Actuator | T4000-1 KBA | 5306531 |

Connecting cable not supplied with delivery





- High protection against manipulation through individually coded actuator
- Sensor response range up to 20 mm
- Compact design of the actuator
- Sensor with integrated evaluation unit
- Sensor with LED status display – directly on the protective device
- Sensor with integrated evaluation unit and actuator with IP 67 enclosure rating





L

| Further information | Page |
|---|---|
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| → Dimensional drawings | L-25 |
| → Internal circuitry | L-26 |
| → Response range | L-27 |
| → Accessories | L-27 |
| → Services | A-2 |



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# Detailed technical specifications

## Evaluation Unit & Sensor

| | |
|---|---|
| **Sensor principle** | Transponder |
| **Category according to EN 954-1** | 3 |
| **Classification in compliance with IEC/EN 60947-5-3** | PDF-M |
| **Classification according to cULus**<br>**Note operating voltage**<br>**External fuse**<br>**Maximum switching voltage** | Class 2<br>Operation with UL-class 2 power supply only<br>At supply voltage 0.25 A ... 8 A<br>24 V DC |
| **Housing material** | Plastic PTB VO GF30 |
| **Enclosure rating** | IP 67 |
| **Ambient operating temperature from ... to** | –20 °C ... +55 °C |
| **Protection class** | 3 |
| **Shock resistance** | 30 g, 11 ms (IEC 60068-2-27) |
| **Vibration resistance** | 10 Hz ... 55 Hz, 0.5 mm (IEC 60068-2-6) |
| **Operating voltage** | 18 V DC ... 27 V DC |
| **Number of non-contact safety switches** | 1 |
| **Size of the cable gland** | M12 |
| **Rated insulation voltage $U_i$** | 30 V |
| **Rated impulse withstand voltage $U_{imp}$** | 1500 V AC |
| **Type of output** | Semiconductor, p-switching |
| **Number of safe outputs** | 2 |
| **Short-circuit protection** | F0.4 |
| **Usage category in compliance with IEC 947-5-1** | DC-13 |
| **Rated operating current (voltage)** | 0.4 A (24 V DC) |
| **Maximum switching power** | 2 VA |
| **Weight** | 0.4 kg |
| **Out indication** | ✔ |
| **Error indication** | ✔ |
| **Status display** | ✔ |
| **Switch-on distance** | 20 mm |
| **Switch-off distance** | 23 mm |
| **Safe switch-off distance** | 40 mm |
| **Monitoring time minimum dwell time** | 0.5 s |
| **Maximum switch on time** | 3 s |
| **Switching delay from state change** | 180 ms |
| **Discrepancy time of the safety outputs** | Max. 120 ms |
| **Cable length** | 300 m |

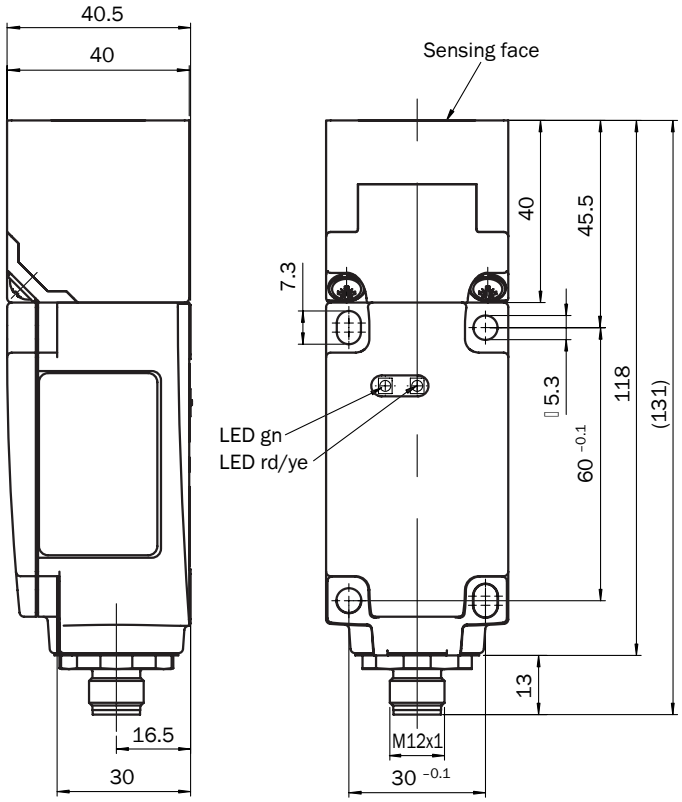
## Actuator

| | |
|---|---|
| **Housing material** | Fortron, glass-fibre reinforced thermoplastic |
| **Enclosure rating** | IP 67 |
| **Ambient operating temperature from ... to** | –25 °C ... +70 °C |
| **Weight** | 0.03 kg |
| **Monitoring time minimum dwell time** | 0.5 s |

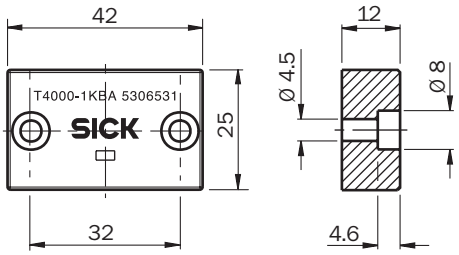

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# Dimensional drawings

**Evaluation Unit & Sensor**




**Actuator**

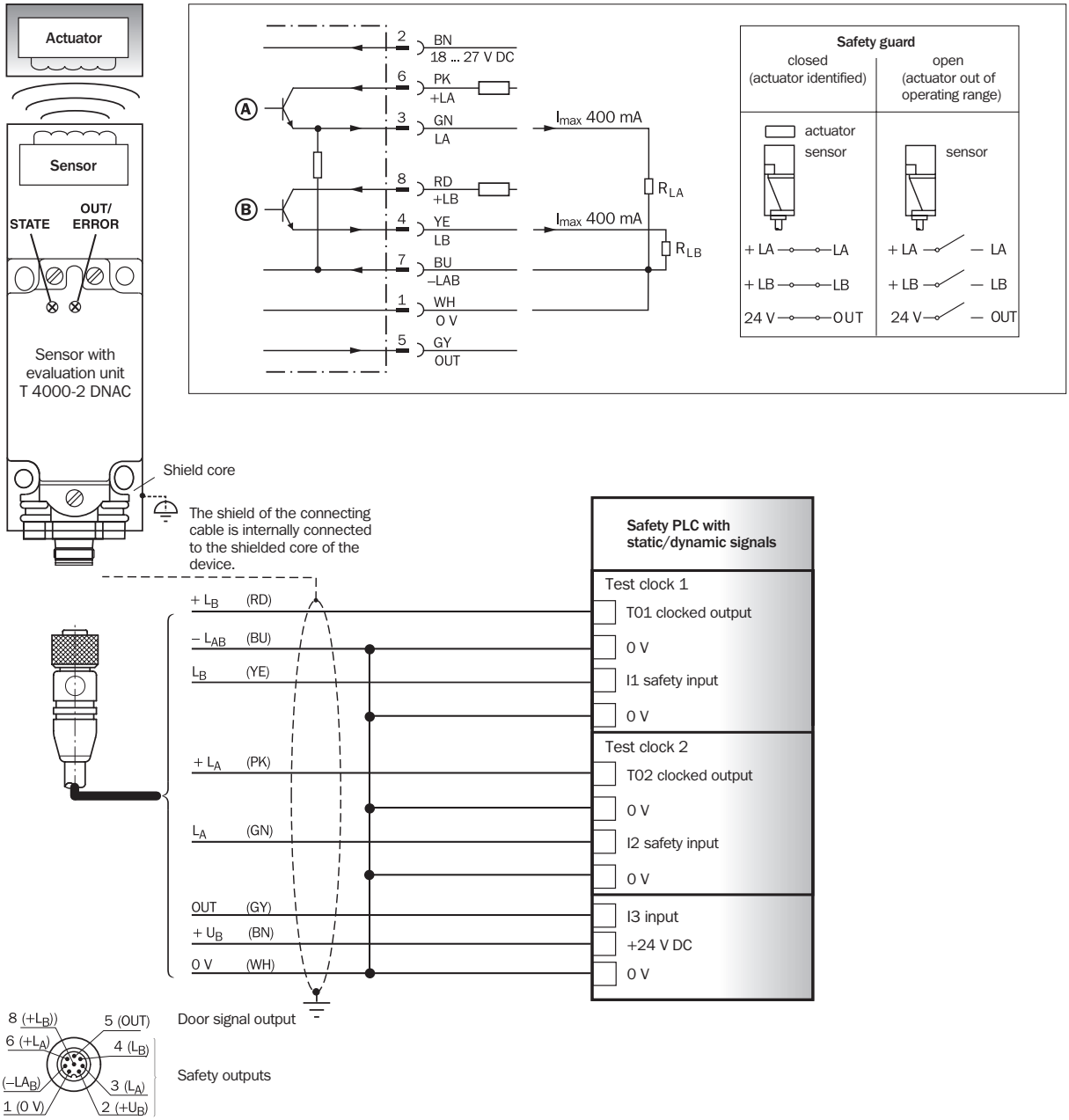



Dimensions in mm

L


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# Internal circuitry



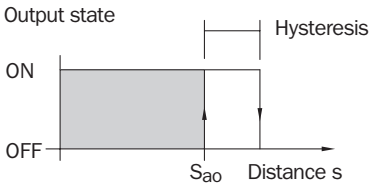

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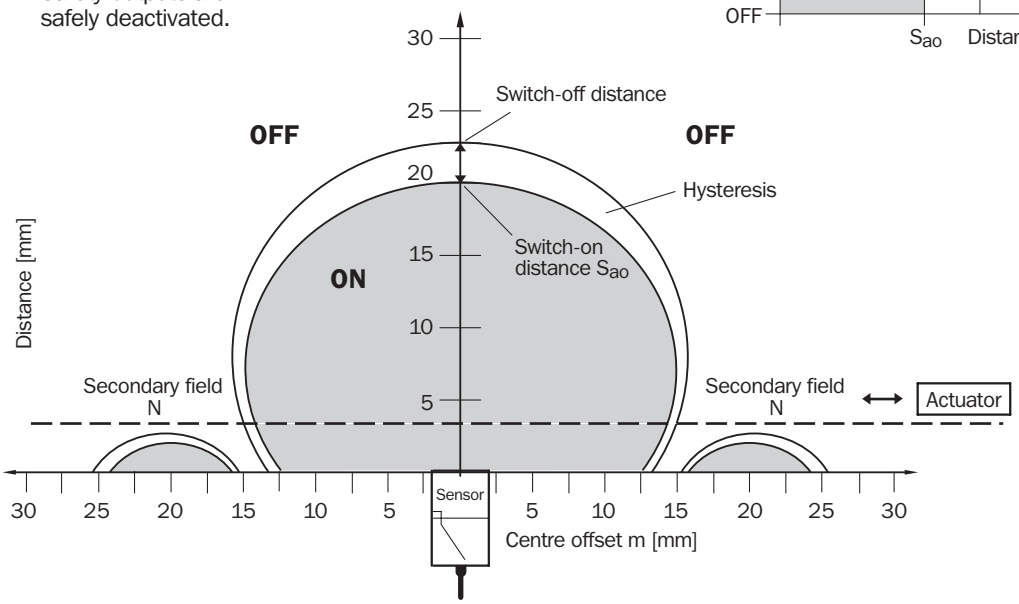

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## Response range

With internal component failure, observe the safe switch-off distance $S_{ar}$ = 40 mm. Safety outputs are safely deactivated.






A minimum distance of s = 3 mm must be maintained in the case of lateral approach in order to prevent entry into the operating range of the secondary fields.

## Accessories

**Connection cable**

| Cable length | Type | Part number |
|---|---|---|
| 5 m | DOL-1208-G05MA | 6020993 |
| 10 m | DOL-1208-G10MA | 6022152 |
| 15 m | DOL-1208-G15MA | 6022153 |
| 30 m | DOL-1208-G30MA | 6022242 |

**Safety screws**

| Packing unit | Type | Part number |
|---|---|---|
| 20 | Safety screws T4000 | 5309170 |


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- Category 4 according to EN 954-1
- No actuator necessary
- Sensor with LED status display
- Safe cascading of the sensors possible
- Direct connection of the sensors to safe PLC
- Connection of up to 10 sensors to one evaluation unit








L

| Further information | Page |
|---|---|
| → Dimensional drawings | L-30 |
| → Internal circuitry | L-31 |
| → Response range | L-32 |
| → T-junction | L-32 |
| → Accessories | L-33 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Sensor principle** | Inductive |
| **Category according to EN 954-1** | 4 |
| **Number of non-contact safety switches from ... to** | 1 ... 10 |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 3 |
| **Number of application diagnostic outputs** | 2 x Relay |

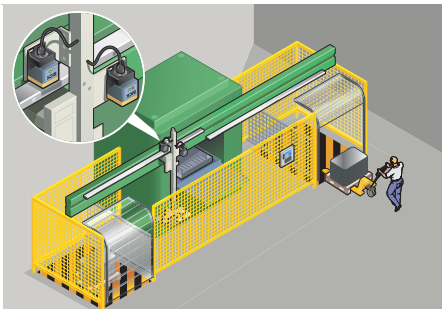
## Product description

The non-contact safety switch IN4000 is an inductive sensor that is activated by metal (e.g. steel ST37). It does not, therefore, require a separate coded actuator.
Due to the non-contact form of operation, this sensor has advantages in that it is straightforward to adjust and install. It also has increased resistance to shock and vibration.
The response range of the sensor is monitored spatially and over time. In this way, increased protection against tampering is provided.

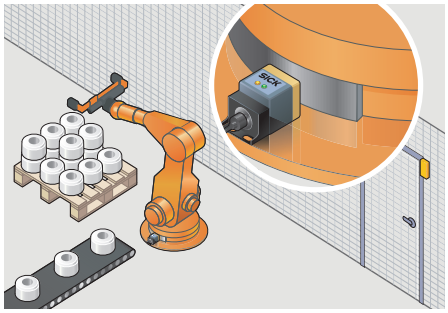
## In-system added value

→ Possible connections to SICK safety remote I/Os PROFIsafe and modular safety controller UE410 Flexi, see appendix "Sensor systems and safe control solutions from SICK"

## Applications



Safe position monitoring on a gantry robot



Safe axis monitoring of a robot

## Ordering information

| System part | Design | Housing diameter | Connection type | Type | Part number |
|---|---|---|---|---|---|
| Evaluation unit | – | – | – | IN40-R1212B | 6027390 |
| Sensor | Cuboid | – | Connector | IN40-D0101K | 6027389 |
| | Cylindrical | M30 | | IN40-D0202K | 6027392 |
| | | M18 | | IN40-D0303K | 6027391 |

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# Detailed technical specifications

## Evaluation unit

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Housing material** | PA |
| **Enclosure rating** | IP 20 |
| **Ambient operating temperature from ... to** | 0 °C ... +70 °C |
| **Operating voltage** | 24 V DC (19.2 V DC ... 30 V DC) |
| **Number of non-contact safety switches from ... to** | 1 ... 10 |
| **Type of output** | Relay |
| **Number of safe outputs (N/O)** | 3 |
| **Number of application diagnostic outputs** | 2 x Relay |
| **Usage category in compliance with IEC 947-5-1** | AC-15/DC-13 |
| **Rated operating current (voltage)** | 3 A (250 V AC), 3 A (24 V DC) |
| **Weight** | 350 g |
| **Out indication** | ✔ |
| **Power indication** | ✔ |
| **Error indication** | ✔ |
| **Status display** | ✔ |
| **Sensor display** | ✔ |
| **Maximum switch on time** | 1000 ms |
| **Switching delay from state change** | 210 ms |
| **External device monitoring** | ✔ |

## Sensor

| **Type** | **IN40-D0101K** | **IN40-D0202K** | **IN40-D0303K** |
|---|---|---|---|
| **Sensor principle** | Inductive | | |
| **Category according to EN 954-1** | 4 | | |
| **Classification in compliance with IEC/EN 60947-5-3** | PDF-M | | |
| **Housing material** | PPE/zink-die cast | PEEK/V4A | PBT/V4A |
| **Enclosure rating** | IP 67 | IP 69K | |
| **Ambient operating temperature from ... to** | –25 °C ... +70 °C | 0 °C ... +70 °C | –25 °C ... +70 °C |
| **Protection class** | 3 | | |
| **Shock resistance** | according to EN 60947-5-3 | | |
| **Vibration resistance** | according to EN 60947-5-3 | | |
| **Operating voltage** | 24 V DC (19.2 V DC ... 30 V DC) | | |
| **Connection type** | Connector | | |
| **Size of the cable gland** | M12 | | |
| **Weight** | 0.22 kg | 0.13 kg | 0.06 kg |
| **Power indication** | ✔ | | |
| **Status display** | ✔ | | |
| **Switch-on distance from ... to** | 10 mm ... 15 mm [1] | 6 mm ... 12 mm [1] | 3 mm ... 6 mm [1] |
| **Safe switch-off distance** | 30 mm [1] | | 15 mm [1] |
| **Monitoring time minimum dwell time** | 0.2 s | | |
| **Switching delay from state change** | T2 + 20 ms [2] | | |

[1] Dependent on material. The indicated values refer to steel ST37.

[2] During this time the output is switched off (Logical “0“), see response range.

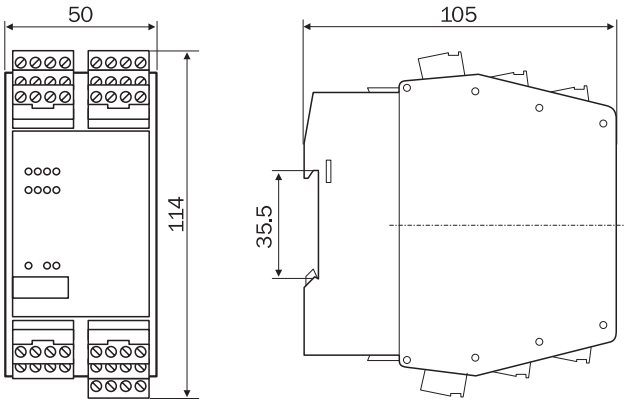




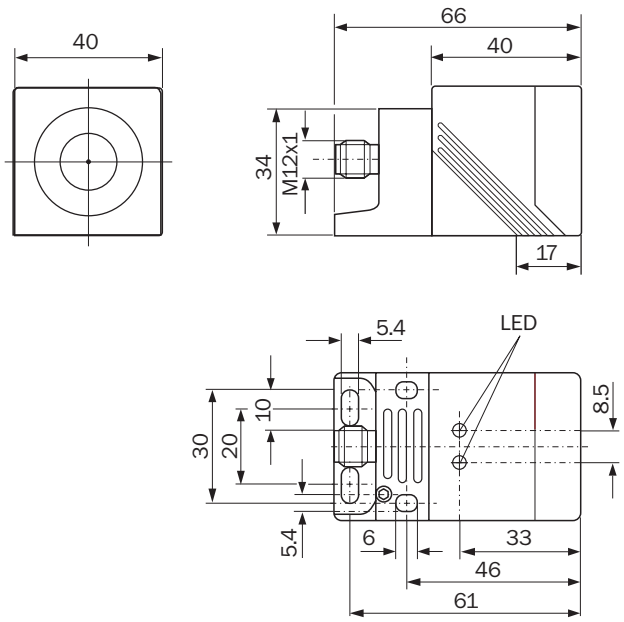
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# Dimensional drawings

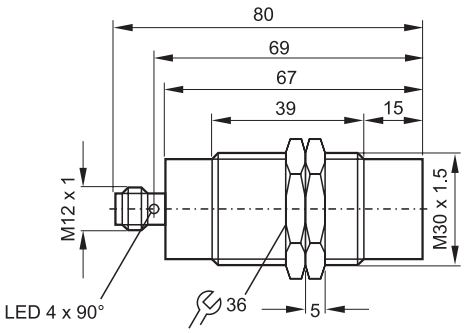
**Evaluation unit, IN40-R1212B**




**Sensor, IN40-D0101K**

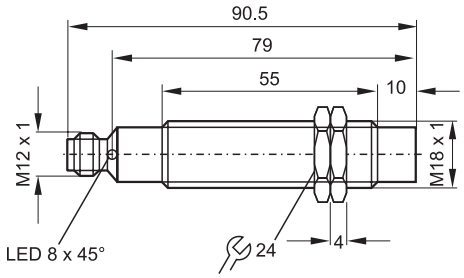



**Sensor, IN40-D0202K**




Dimensions in mm

**Sensor, IN40-D0303K**

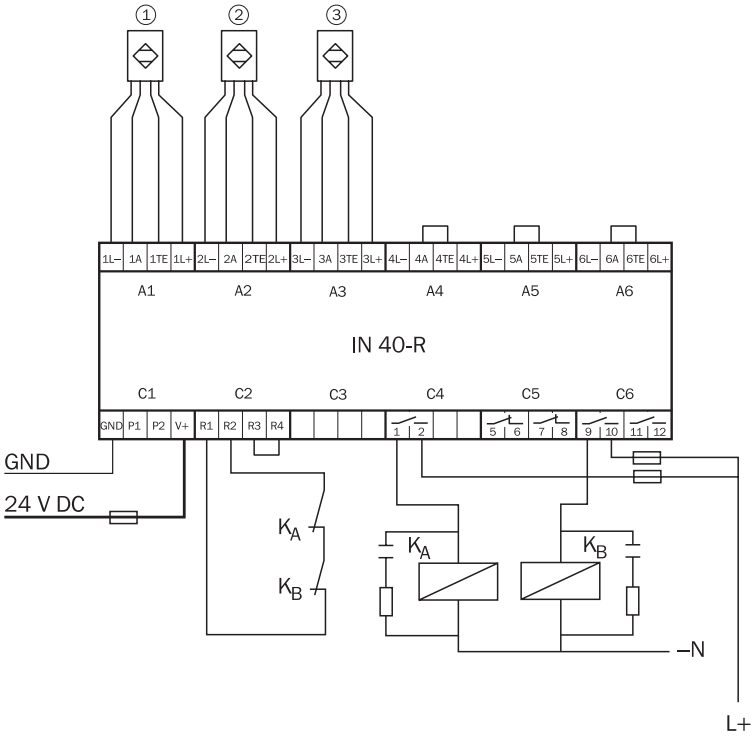


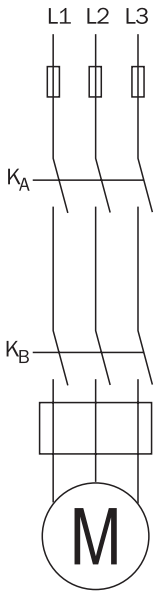



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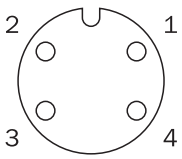
# Internal circuitry

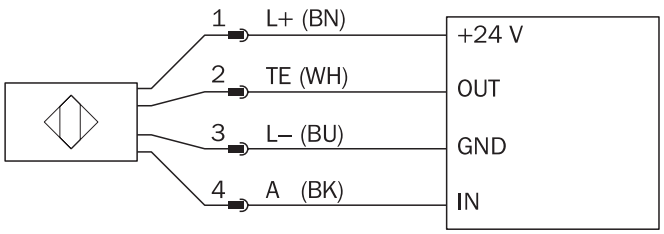
### Evaluation unit



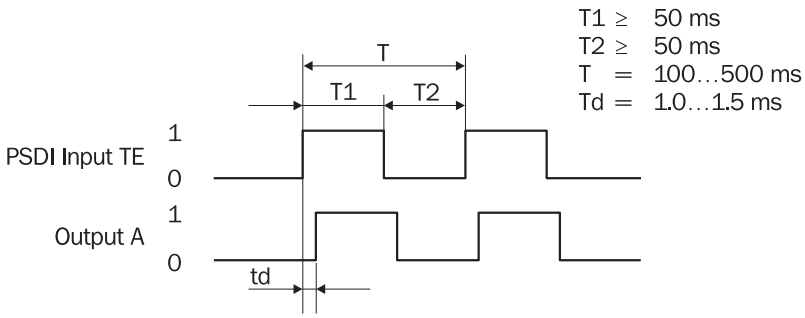




### Sensor connections




### Sensor timing

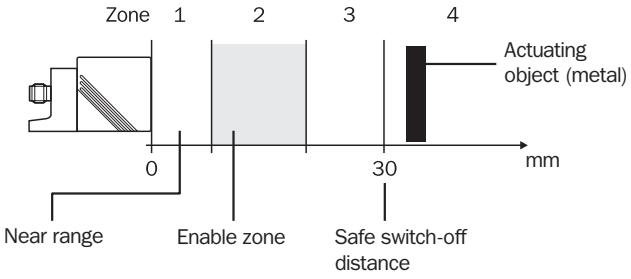



T1 ≥ 50 ms
T2 ≥ 50 ms
T = 100…500 ms
Td = 1.0…1.5 ms

L


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## Response range




## T-junction

| Type | Description | Part number |
|---|---|---|
| IN40-A2121N | T-junction for serial connection of IN4000 sensors | 5315025 |

L


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# Accessories

**Connector**

| Cable length | Type | Part number |
|---|---|---|
| 5 m | DOL-1204-G05M | 6009866 |
| 10 m | DOL-1204-G10M | 6010543 |
| 15 m | DOL-1204-G15M | 6010753 |





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# Explanations of features

**Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

**Housing material**

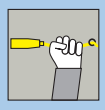
The housing materials used can be separated into two large groups – “metals” and “plastics”. The metal versions of the rope switch are made of painted die-cast zinc. Neoprene is used for the plastic cap of the enabling switch.



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# Safety operating devices



| Safety application | Model | Number of positive action normally closed contacts/normally open contacts [1] | Housing material [1] | Connection type | Cable length/ number x size of cable gland | Enclosure rating | Product | Page |
|---|---|---|---|---|---|---|---|---|
|  | Enabling switch | 2 / 2 | Plastic | Cable | 5 m<br>10 m<br>25 m | IP 65<br>IP 67 | E100 | M-2 |
|  | Rope-operated emergency stop switch | 3 / 1<br>2 / 2 | Metal | Cable gland | 1 x M20 | IP 66 | i110RP | M-5 |
| | Rope-operated emergency stop switch | 3 / 1<br>2 / 2 | Metal | Cable gland | 3 x M20 | Contact factory | i150RP | M-8 |

[1] Explanation see page M-0

M



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- Enabling switch to EN 775
- Ergonomic design
- Light weight
- 3 position operation
- Options with additional plus/minus buttons

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts** | 2 |
| **Number of normally open contacts** | 2 |
| **Housing material** | Plastic |
| **Connection type** | Cable |
| **Cable length (depending on type)** | 5 m / 10 m / 25 m |
| **Type of connection cable (depending on type)** | Coil / straight |

## Product description

- Enabling switch for safe maintenance work within a hazardous area
- 4-pole contact element
- Plus/minus buttons for additional control of direction of movement

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type of connection cable | Cable length | Plus/minus buttons | Type | Part number |
|---|---|---|---|---|---|---|
| 2 | 2 | Straight | 5 m | – | E100-A2A22S05A | 6012141 |
| | | | 10 m | – | E100-A2A22S10A | 6021916 |
| | | Coil | 5 m | – | E100-A2A22C05A | 6021917 |
| | | Straight | 5 m | ✔ | E100-B2A22S05A | 6022879 |
| | | | 10 m | ✔ | E100-B2A22S10A | 6022880 |
| | | | 25 m | ✔ | E100-B2A22S25A | 6033234 |

M

| Further information | Page |
|---|---|
| → Actuator travel diagram | M-4 |
| → Accessories | M-4 |
| → Services | A-2 |



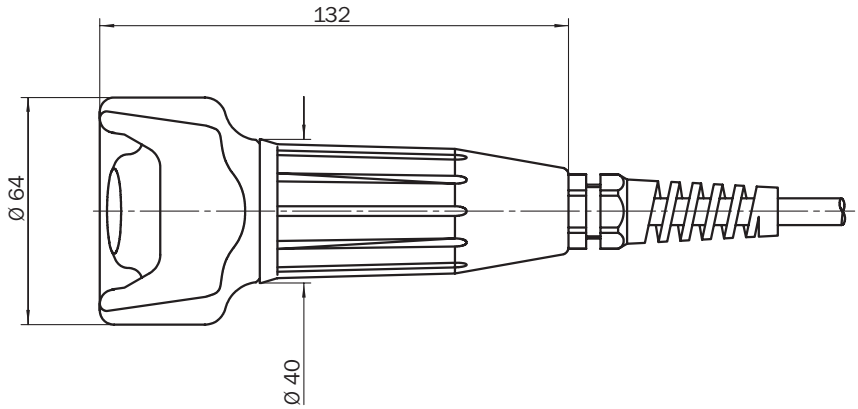
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# Detailed technical specifications

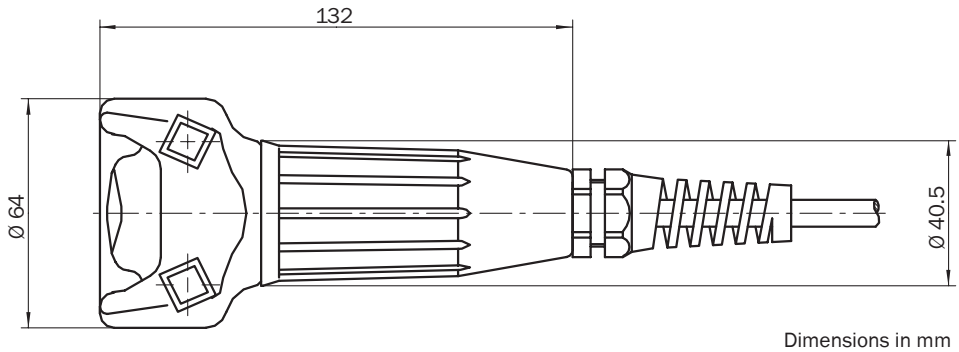
| Type | E100-A2A22S05A | E100-A2A22S10A | E100-A2A22C05A | E100-B2A22S05A | E100-B2A22S10A | E100-B2A22S25A |
|---|---|---|---|---|---|---|
| Housing material | Plastic | | | | | |
| Enclosure rating | IP 67 | | | IP 65 | | |
| Mechanical life (relay contacts) | 1 x $10^5$ switching cycles | | | | | |
| Ambient operating temperature from ... to | –5 °C ... +50 °C | | | | | |
| Switching principle | Slow-action switch | | | | | |
| Number of positive action normally closed contacts | 2 | | | | | |
| Number of normally open contacts | 2 | | | | | |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | | | DC-13 | | |
| Rated operating current (voltage) | 2 A (230 V AC), 2 A (24 V DC) | | | 2 A (24 V DC) | | |
| Rated insulation voltage $U_i$ | 250 V | | | 32 V | | |
| Rated impulse withstand voltage $U_i$Mp | 2500 V AC | | | 800 V AC | | |
| Minimum switching voltage | 12 V DC | | | | | |
| Minimum switching current (switching voltage) | 1 mA (24 V DC) | | | | | |
| Connection type | Cable | | | | | |
| Connection conductor cross-section | 0.34 mm² | | | 0.5 mm² | | |
| Short-circuit protection | 2A gG | | | 2A gG / 0.1A gG | | |
| Weight | 0.86 kg | 1.27 kg | 1.32 kg | | | |

# Dimensional drawings

**E100A**




**E100B**




Dimensions in mm

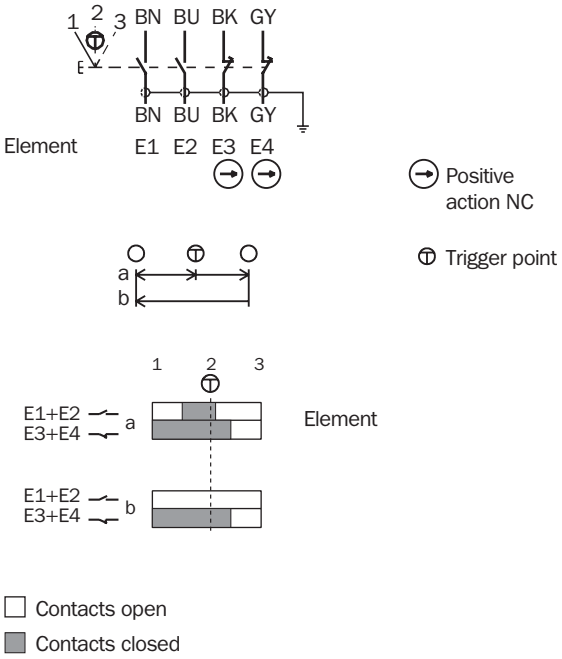
M


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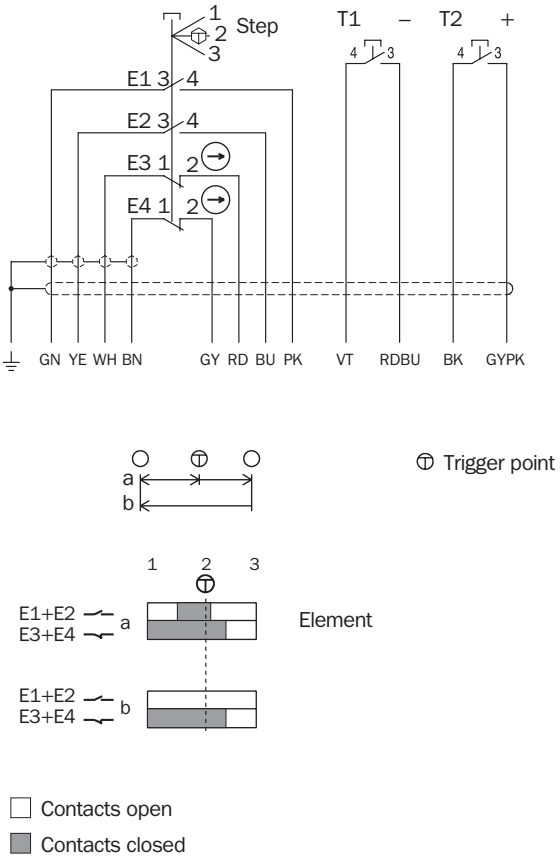
# Actuator travel diagram

**E100A**

2 NO
2 positive action NC




**E100B**

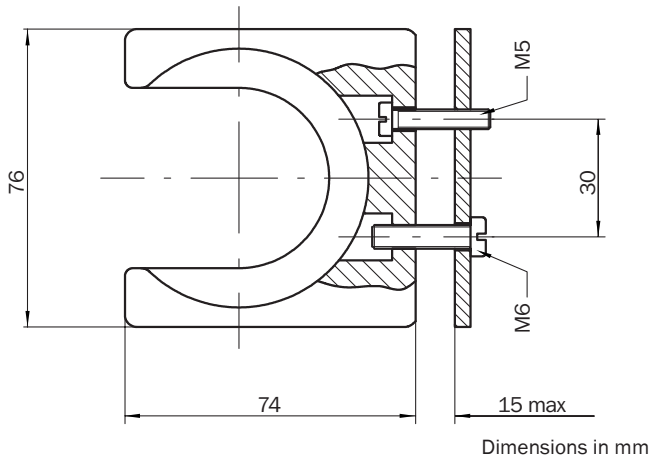



# Accessories

**Safety switch accessories, miscellaneous**

| Type | Part number |
|---|---|
| Fixing bracket | 5308209 |

## Fixing bracket




Dimensions in mm



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## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 2 / 3 |
| **Number of normally open contacts (depending on type)** | 1 / 2 |
| **Housing material** | Metal |
| **Connection type** | Cable gland |

## Product description

- Rope-operated switch
- 4-pole contact element
- Complete wire sets available for simple installation

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page 0-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 2 | 2 | i110-RP223 | 6025077 |
| 3 | 1 | i110-RP313 | 6025076 |





- Rope-operated emergency stop switch according to EN 418 and EN 60947-5-5
- Housing material die-cast zinc
- Cable gland M20
- Design of the basic housing according to EN 50041
- Enclosure rating IP 66
- Wide range of accessories for quick installation



M

| Further information | Page |
|---|---|
| → Technical specifications | M-6 |
| → Dimensional drawings | M-6 |
| → Switching elements | M-6 |
| → Rope accessories | M-7 |
| → Other accessories | M-7 |
| → Services | A-2 |

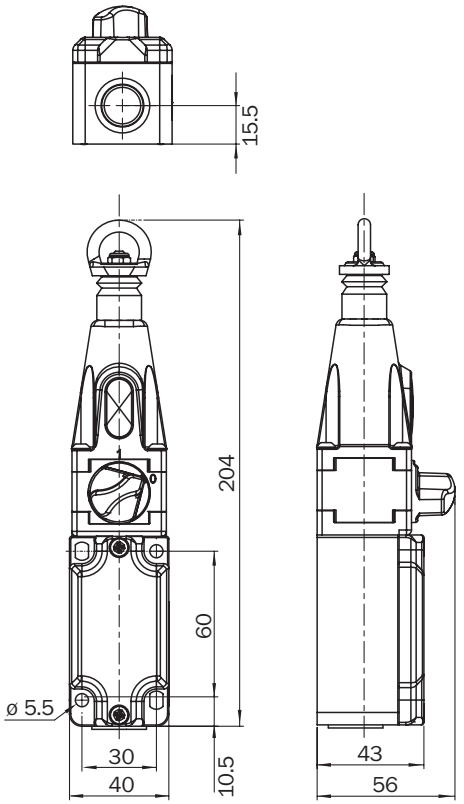


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## Detailed technical specifications

| Type | i110-RP223 | i110-RP313 |
|---|---|---|
| Housing material | Metal | |
| Surface treatment | Varnished | |
| Enclosure rating | IP 66 | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –25 °C ... +80 °C | |
| Actuation force (deflection) | Max. 125 N (300 mm) | |
| Actuation frequency | Max. 1 Hz | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 2 | 3 |
| Number of normally open contacts | 2 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 2 A (250 V AC), 5 A (100 V AC), 2 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 5 V DC | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | |
| Connection type | Cable gland | |
| Connection conductor cross-section | 1.5 mm² | |
| Short-circuit protection | 2A gG | |
| Maximum cord length | 30 m | |
| Weight | 0.84 kg | |

## Dimensional drawings




Dimensions in mm

## Switching elements

| Rope stack | Rope tensio-ned | Rope pulled | |
|---|---|---|---|
|  | | | 31, 3 positive action N/C contacts, 1 N/O contact |
|  | | | 22, 2 positive action N/C contacts, 2 N/O contacts |

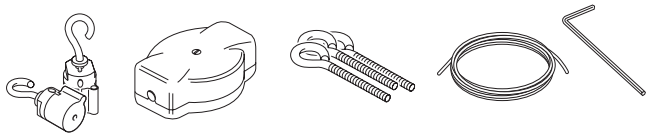


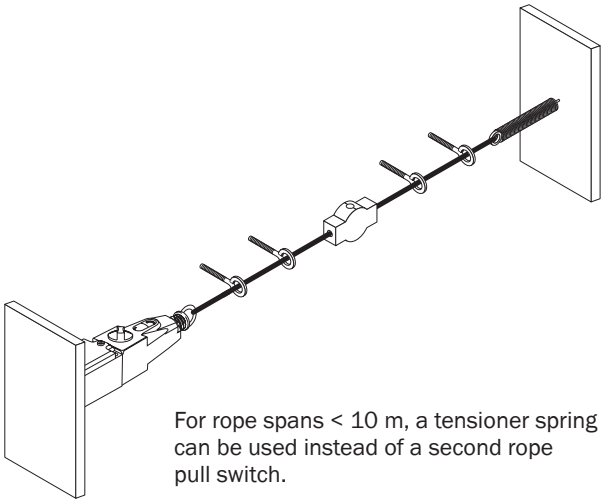
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# Rope accessories

| Accessory type | Cord length | Type | Part number |
|---|---|---|---|
| Rope accessory set | 5 m | iE110-P05 | 5311136 |
| | 10 m | iE110-P10 | 5311137 |
| | 20 m | iE110-P20 | 5311138 |
| | 30 m | iE110-P30 | 5311139 |
| Rope | 30 m | iE110-PL30 | 5310813 |
| | 100 m | iE110-PL100 | 5310814 |
| Eye bolt | – | iE110-PEB | 5309035 |
| Tensioner set | – | iE110-PTR | 5309034 |
| Spring | – | iE110-PTS | 5311290 |
| Rope gripper | – | iE110-PRG | 5314230 |







For rope spans < 10 m, a tensioner spring can be used instead of a second rope pull switch.

## Rope accessory kit iE110-P05

2 rope grippers, 1 tensioner, 3 eye bolts, 5 m rope, 1 allan key

## Rope accessory kit iE110-P10

2 rope grippers, 1 tensioner, 6 eye bolts, 10 m rope, 1 allan key

## Rope accessory kit iE110-P20

2 rope grippers,1 tensioner, 10 eye bolts, 20 m rope, 1 allan key

## Rope accessory kit iE110-P30

2 rope grippers, 1 tensioner, 14 eye bolts, 30 m rope, 1 allan key

## Tensioner kit iE110-PTR

2 rope grippers, 1 tensioner, 1 allan key

## Rope gripper iE110-PRG

2 rope grippers

M

# Other accessories

**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |


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- Up to 75 m cord length
- Lid mounted emergency stop button provides E-Stop access even at the ends of the span
- Rope-operated emergency stop switch according to EN 418 and EN 60947-5-5
- Housing material die-cast zinc
- Cable gland 3 x M20
- Wide range of accessories for quick installation

## Overview of technical specifications

| | |
|---|---|
| **Number of positive action normally closed contacts (depending on type)** | 2 / 3 |
| **Number of normally open contacts (depending on type)** | 1 / 2 |
| **Housing material** | Metal |
| **Connection type** | Cable gland |

## Product description

- Rope-operated switch
- 4-pole contact element
- Complete wire sets available for simple installation

## In-system added value

| Product group | Applications | Further information |
|---|---|---|
| Safety relays | Safety relays allow simple integration of safety components into machinery or plant. | Page N-0 |
| Safety controllers | Safety controllers are utilized when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible and generation of machine variants becomes easier. | Page O-0 |
| Safety fieldbus solutions | Safety fieldbus solutions are utilized in plants and machinery of larger scale. This saves cabling and enables modular design of the safety automation. Potential errors or faults can be easily identified via the comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. | |

## Ordering information

| Number of positive action normally closed contacts | Number of normally open contacts | Type | Part number |
|---|---|---|---|
| 2 | 2 | i150-RP223 | 6024884 |
| 3 | 1 | i150-RP313 | 6024883 |

M

| Further information | Page |
|---|---|
| → Switching elements | M-9 |
| → Rope accessories | M-10 |
| → Other accessories | M-11 |
| → Services | A-2 |

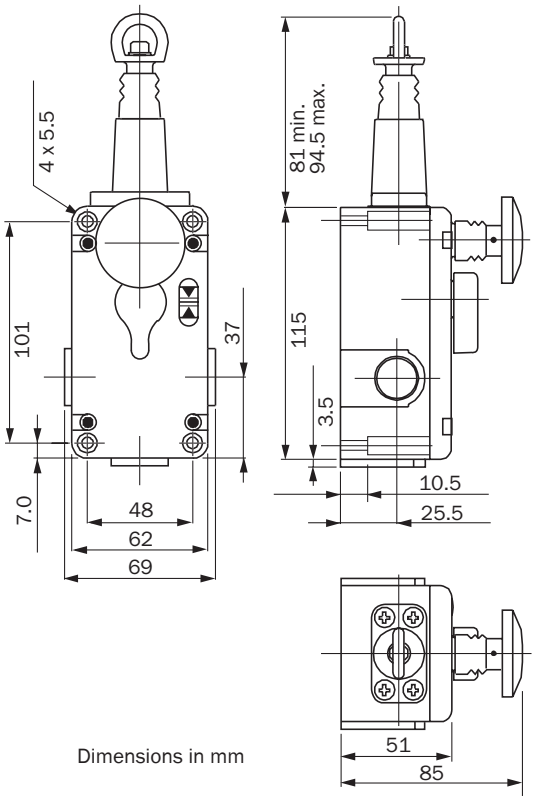


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# Detailed technical specifications

| Type | i150-RP223 | i150-RP313 |
|---|---|---|
| Housing material | Metal | |
| Surface treatment | Varnished | |
| Mechanical life (relay contacts) | 1 x $10^6$ switching cycles | |
| Ambient operating temperature from ... to | –25 °C ... +80 °C | |
| Actuation force (deflection) | Max. 125 N (300 mm) | |
| Actuation frequency | Max. 1 Hz | |
| Switching principle | Slow-action switch | |
| Number of positive action normally closed contacts | 2 | 3 |
| Number of normally open contacts | 2 | 1 |
| Usage category in compliance with IEC 947-5-1 | AC-15/DC-13 | |
| Rated operating current (voltage) | 2 A (250 V AC), 2 A (24 V DC) | |
| Rated insulation voltage $U_i$ | 250 V | |
| Rated impulse withstand voltage $U_{imp}$ | 2500 V AC | |
| Minimum switching voltage | 5 V DC | |
| Minimum switching current (switching voltage) | 5 mA (5 V DC) | |
| Connection type | Cable gland | |
| Connection conductor cross-section | 1.5 mm² | |
| Short-circuit protection | 2A gG | |
| Maximum cord length | 75 m | |
| Weight | 0.84 kg | |

# Dimensional drawings




Dimensions in mm

# Switching elements

| Rope stack | Rope tensioned | Rope pulled | |
|---|---|---|---|
|  |  |  | 31, 3 positive action N/C contacts, 1 N/O contact |
|  |  |  | 22, 2 positive action N/C contacts, 2 N/O contacts |

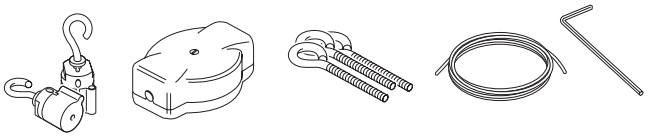
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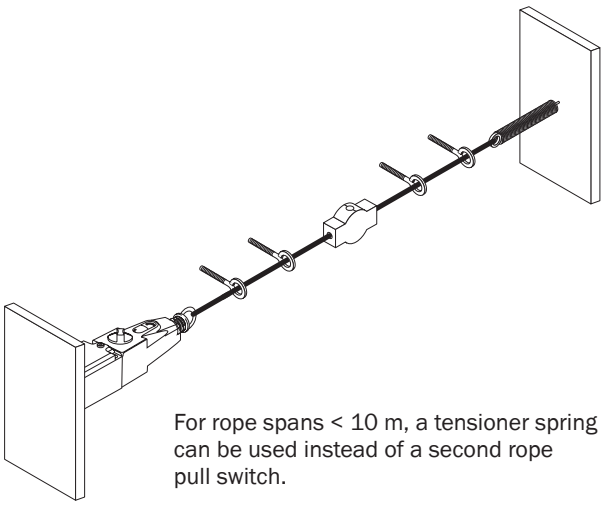

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# Rope accessories

| Accessory type | Cord length | Type | Part number |
|---|---|---|---|
| Rope accessory set | 5 m | iE110-P05 | 5311136 |
| | 10 m | iE110-P10 | 5311137 |
| | 20 m | iE110-P20 | 5311138 |
| | 30 m | iE110-P30 | 5311139 |
| | 50 m | iE110-P50 | 5320016 |
| | 75 m | iE110-P75 | 5320017 |
| Rope | 30 m | iE110-PL30 | 5310813 |
| | 100 m | iE110-PL100 | 5310814 |
| Eye bolt | – | iE110-PEB | 5309035 |
| Tensioner set | – | iE110-PTR | 5309034 |
| Spring | – | iE110-PTS | 5311290 |
| Rope gripper | – | iE110-PRG | 5314230 |







For rope spans < 10 m, a tensioner spring can be used instead of a second rope pull switch.

## Rope accessory kit iE110-P05

2 rope grippers, 1 tensioner, 3 eye bolts, 5 m rope, 1 allan key

## Rope accessory kit iE110-P10

2 rope grippers, 1 tensioner, 6 eye bolts, 10 m rope, 1 allan key

## Rope accessory kit iE110-P20

2 rope grippers,1 tensioner, 10 eye bolts, 20 m rope, 1 allan key

## Rope accessory kit iE110-P30

2 rope grippers, 1 tensioner, 14 eye bolts, 30 m rope, 1 allan key

## Rope accessory kit iE110-P50

2 rope grippers, 1 tensioner, 22 eye bolts, 50 m rope, 1 allan key

## Rope accessory kit iE110-P75

2 rope grippers, 1 tensioner, 33 eye bolts, 75 m rope, 1 allan key

## Tensioner kit iE110-PTR

2 rope grippers, 1 tensioner, 1 allan key

## Rope gripper iE110-PRG

2 rope grippers

M



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# Other accessories

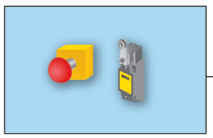
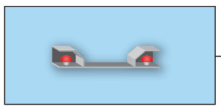
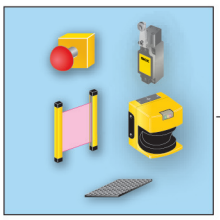
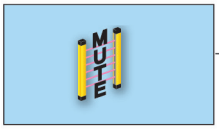
**Cable gland**

| Type | Part number |
|---|---|
| Cable gland M20 | 5309164 |
| M20 to 1/2 inch NPT adapter | 5312998 |

M


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# Selection table

| Main Application | Mode | Features | | UE-Unit | Page |
|---|---|---|---|---|---|
|  | Single-channel Input | | 2/1 | **UE23-2MF** | N-9 |
| | Dual-channel Input | Stop Cat. 0 | 2/1 | **UE43-2MF** | N-18 |
| | | | 3/1 | **UE43-3MF** | N-23 |
| | | | 6/4 | **UE43-6MF** | N-28 |
| | | Stop Cat. 1 | 3/0 | **UE45-3S1 2 3**<br>1 Output<br>up to 3 s Off-Delay | N-32 |
| | | | 3/0 | **UE45-3S1 2 30**<br>1 Output<br>up to 30 s Off-Delay | N-32 |
|  1) | Dual-channel Input | Stop Cat. 0 | 3/0 | **UE44-3SL 2 3**<br>1 Output<br>up to 3 s On-Delay | N-37 |
| | | | 3/0 | **UE44-3SL 2 30**<br>1 Output<br>up to 30 s On-Delay | N-37 |
|  | Dual-channel Input | Stop Cat. 0 | 2/1 | **UE42-2HD** | N-13 |
|  | Dual-channel Input | Stop Cat. 0 | 3/1 | **UE10-3OS** | N-3 |
|  | Dual-channel Input | Stop Cat. 0 | 2/1 | **UE48-2OS** | N-42 |
| | | | 3/0 | **UE48-3OS** | N-48 |
|  | Muting sensor technology | Stop Cat. 0 | 2/1 | **UE49-2MM** | N-53 |
| | | | 3/0 | **UE49-3MM** | N-53 |

1) Safety switch with mechanical locking



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# Safety relays



| Applications | | | | | | | | | Technical specifications | | | | Type of unit | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Emergency stop | Safety switch | Two-hand controls Typ III C | Pressure sensitive mats (in 4-wire technology) | Optoelectronic protective device | Monitoring of simultaneous activation (s) | Muting | Manual reset (monitored) | Automatic reset | Category according to EN 954-1 | Number of enable current paths/ signalling current paths | Input circuit (number of channels) | Housing width (mm) | Main unit | Expansion unit | Product | Page |
| – | – | – | – | ✔ | – | – | – | – | – [1] | 3 / 1 | 1 or 2 | 22.5 | ✔ | – | UE10-3OS | N-3 |
| ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | 4 [2] | 2 / 1 | 1 | 22.5 | ✔ | – | UE23-2MF | N-9 |
| – | ✔ | ✔ | – | – | 0.5 | – | – | ✔ | 4 | 2 / 1 | 2 | 22.5 | ✔ | – | UE42-2HD | N-13 |
| ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | 4 | 2 / 1 | 1 or 2 | 22.5 | ✔ | – | UE43-2MF | N-18 |
| ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | 4 | 3 / 1 | 1 or 2 | 45.0 | ✔ | – | UE43-3MF | N-23 |
| ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | 4 | 6 / 4 | 1 or 2 | 90.0 | ✔ | – | UE43-6MF | N-28 |
| ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | 4 | 3 [3] / 0 | 1 or 2 | 22.5 | ✔ | – | UE44-3SL | N-37 |
| ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | 4 | 3 [4] / 0 | 1 or 2 | 22.5 | ✔ | – | UE45-3S1 | N-32 |
| ✔ | ✔ | – | ✔ | ✔ | – | – | ✔ | ✔ | 4 | 2 / 1 | 1 or 2 | 22.5 | ✔ | – | UE48-2OS | N-42 |
| ✔ | ✔ | – | ✔ | ✔ | – | – | ✔ | ✔ | 4 | 3 / 0 | 1 or 2 | 22.5 | ✔ | – | UE48-3OS | N-48 |
| ✔ | ✔ | – | – | ✔ | 0.22 | ✔ | ✔ | ✔ | 4 | 2 / 1 oder 3 / 0 | 6 | 45.0 | ✔ | – | UE49 | N-53 |
| – | – | – | – | ✔ [5] | – | – | ✔ | ✔ | 2 | 2 | 2 | 100.2 | ✔ | – | LE20 | N-57 |
| – | – | – | – | ✔ [5] | 3 | ✔ | ✔ | ✔ | 2 | 2 | 2 | 100.2 | ✔ | – | LE20 Muting | N-64 |
| – | – | – | – | – | – | – | – | – | – [6] | 4 / 2 | – | 22.5 | – | ✔ | UE10-4XT | N-71 |
| – | – | – | – | – | – | – | – | – | – [6] | 4 / 2 [7] | – | 22.5 | – | ✔ | UE11-4DX | N-74 |

[1] Same as protective device

[2] The wires for the input and output signals shall be routed outside the control cabinet according to the category to be used

[3] One normally open contact on-delayed

[4] One normally open contact off-delayed

[5] Testable

[6] Same as main unit

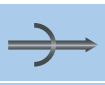
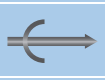
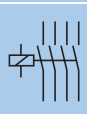
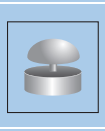
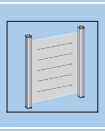
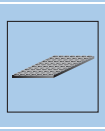
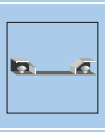
[7] 4 normally open contacts / 2 normally closed contacts with off-delay function

N



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## Symbols

| | | |
|---|---|---|
| **Function** |  | Off-delay |
| |  | On-delay |
| |   | External device monitoring |
| |  | Expansion unit |
| **Reset** |  | Automatic reset |
| |  | Manual reset (monitored) |
| **Applications** |  | Safety switch |
| |  | Emergency stop |
| |  | Safety laser scanner |
| |  | Safety light curtain |
| |  | Pressure sensitive mat |
| |  | Two-hand controls |
| |  | Safety locking device, mechanically locked |



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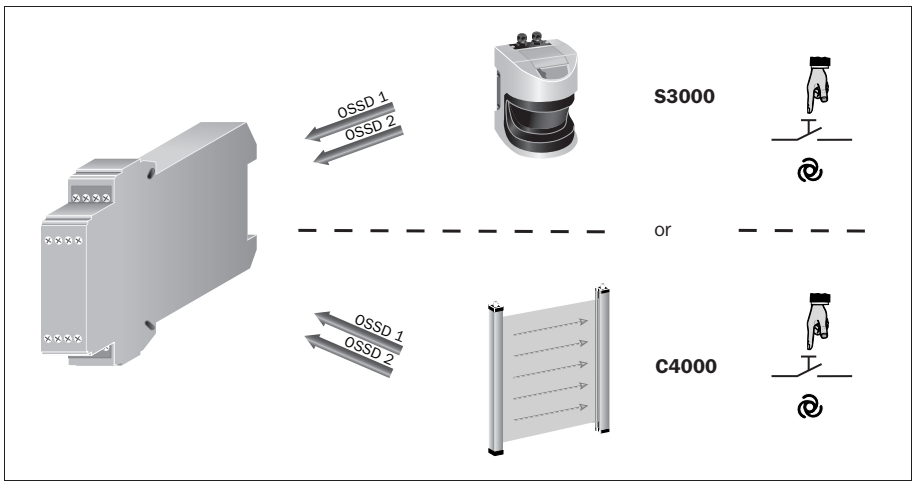
## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 3 / 1 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 22.5 mm |

## Product description

- N/C contact for external device monitoring (EDM)
- 2 LEDs for:
  - Relay K1
  - Relay K2
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- Available with plug-in terminals (key coded)

## Applications



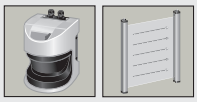

## In-system added value

The safety relay UE10-3OS is a relay module for:

- Optoelectronic protective devices with monitored semiconductor outputs, integral external device monitoring (EDM) and restart interlock, such as
  - C4000
  - C/M2000
  - M4000
  - S3000
- Safety systems with monitored semiconductor outputs, integral external device monitoring and restart interlock, such as
  - LSI
  - LE20

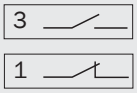
## Ordering information

| Connection type | Type | Part number |
|---|---|---|
| Screw-type terminals | UE10-3OS2D0 | 6024917 |
| Plug-in terminals | UE10-3OS3D0 | 6024918 |






- For safety laser scanners
- For safety light curtains




| Further information | Page |
|---|---|
| → Symbols | N-2 |
| → Technical specifications | N-4 |
| → Internal circuitry | N-5 |
| → Dimensional drawings | N-6 |
| → Connection diagrams | N-7 |
| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |

N



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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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** | 24 V (15 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 N/O, enable current paths, safety relevant<br>1 N/C, signalling current path, not safety relevant<br>1 N/C, contactor monitoring |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage enable current paths/signalling current paths** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching voltage contactor monitoring** | 10 V DC ... 24 V DC |
| **Switching current enable current paths** | 10 mA ... 6 A |
| **Switching current signalling current paths** | 10 mA ... 2 A |
| **Switching current contactor monitoring** | 10 mA ... 0.1 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h)<br>AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | DIN EN 61000-6-4 |
| **Screening against interference** | DIN EN 61000-6-2 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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 $mm^2$ |

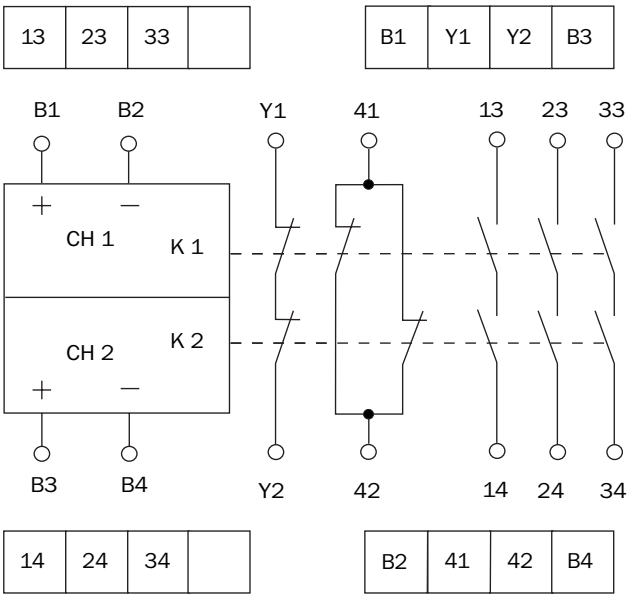
| | |
|---|---|
| **Weight** | 0.2 kg |

N



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# Internal circuitry




**Function**

If the semiconductor outputs of the installed safety device (e.g. C4000, S3000) are energised, then the safety output contacts will close.

When at least one of the semiconductor outputs of the safety device becomes de-energised, then the output contacts revert back to open circuit status.

If restart interlock is needed, then this is achieved in the safety device, for example C4000 or S3000.

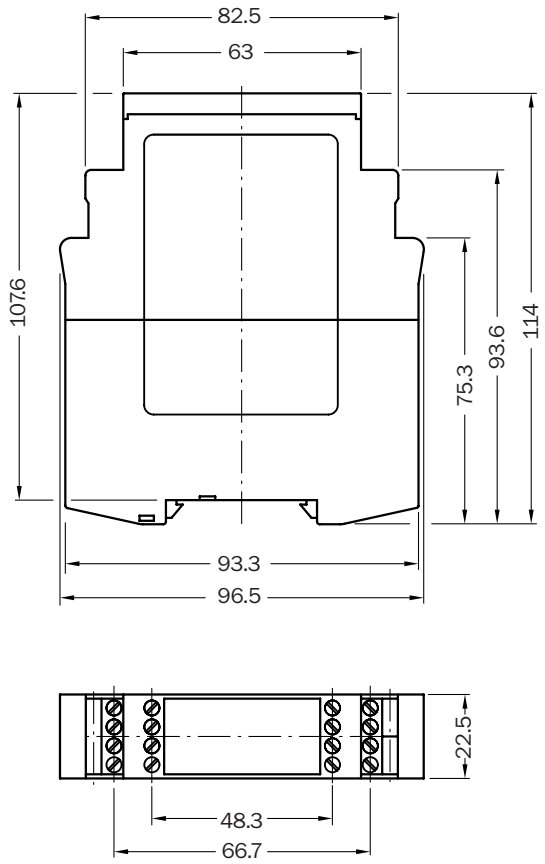
**External device monitoring (EDM)**

Category 3 or 4 according to EN 954-1 requires monitoring of contactors. This is provided in the connected protective device, for example in the C4000 or S3000. The normally closed contact (Y1 -Y2) in the UE10-3OS unit is, however, a part of this contactor monitoring system.

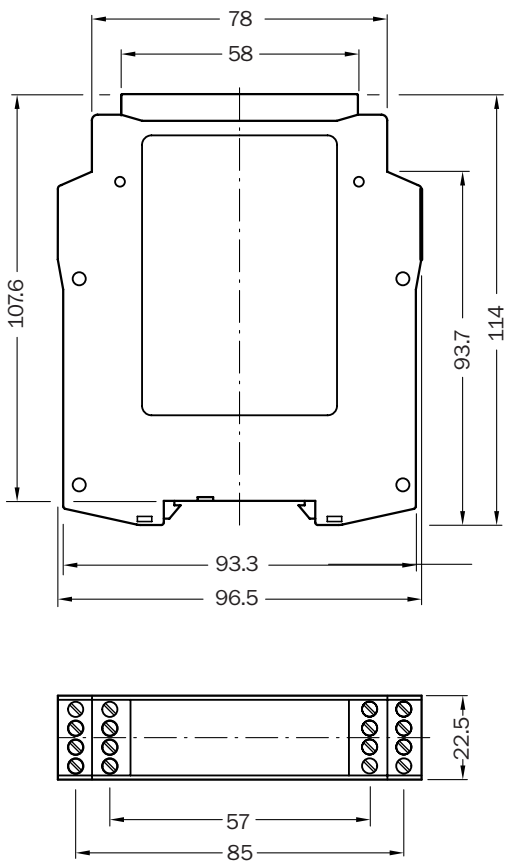
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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

Dimensions in mm

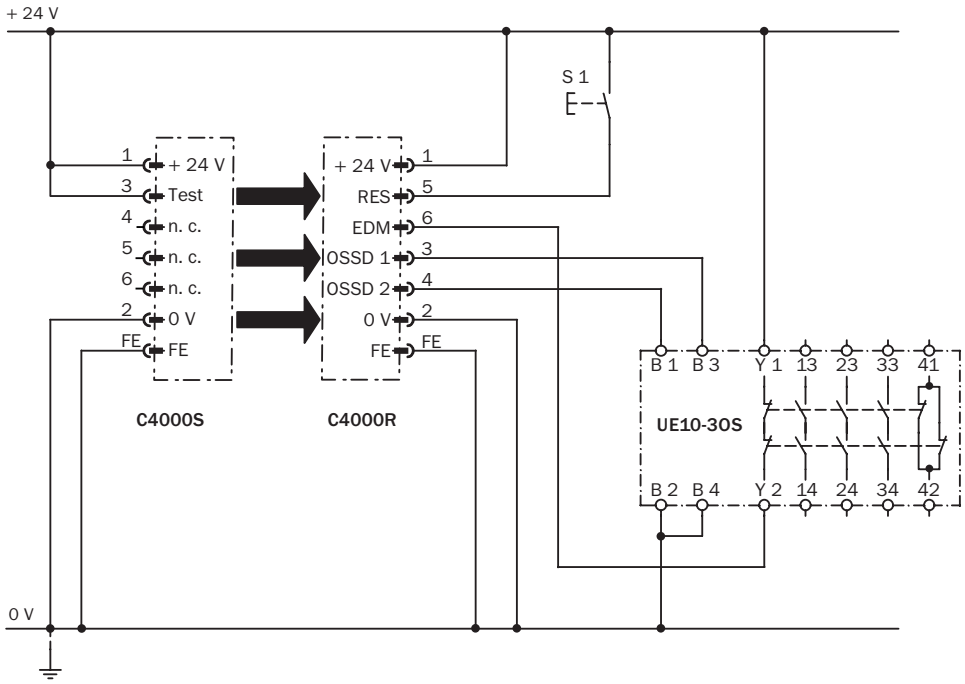
N



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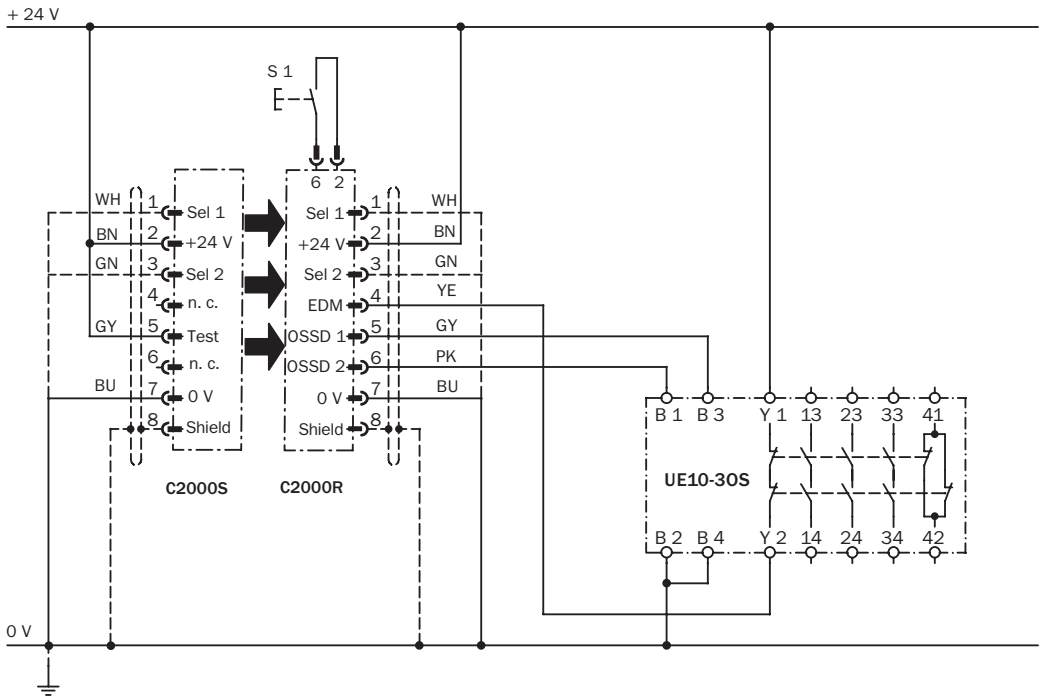
# Connection diagrams

## Safety light curtain C4000 Standard/Advanced connected to UE10-3OS safety relay




Operating mode: with manual reset and external device monitoring (active)

## Safety light curtain C2000 (EDM/RES) connected to UE10-3OS safety relay



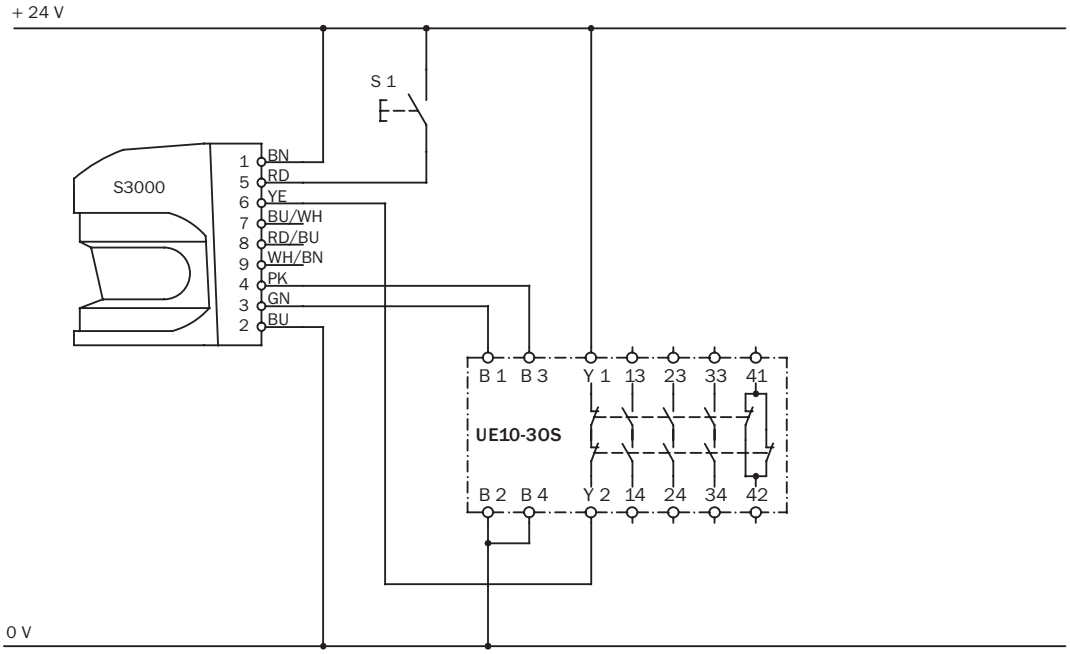

Operating mode: with manual reset and external device monitoring

Continued on next page

N

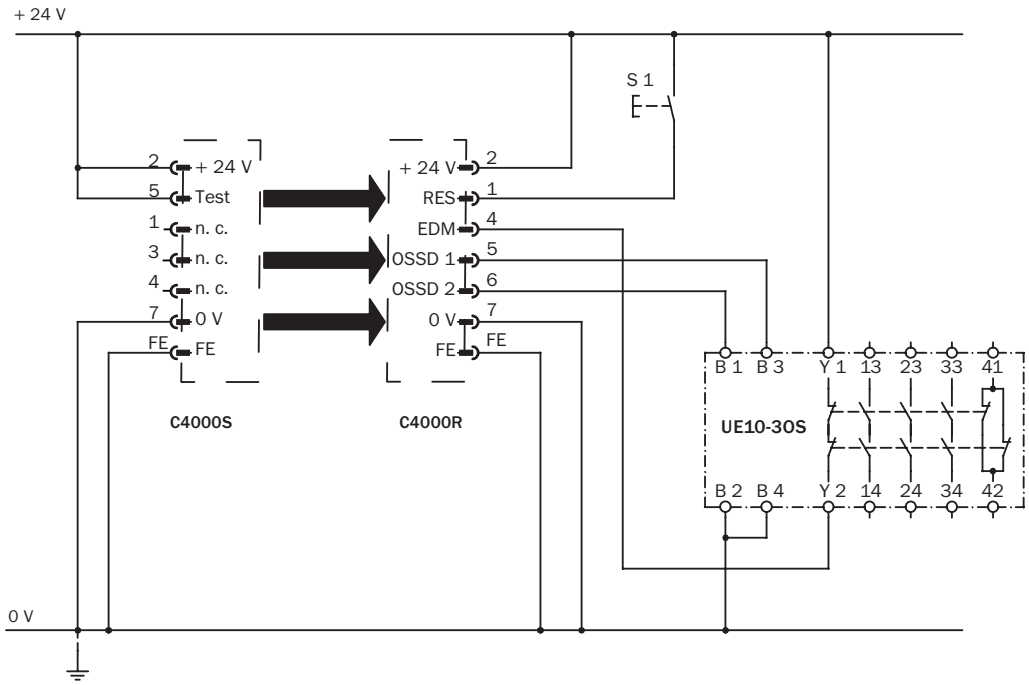

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## Safety laser scanner S3000 Standard connected to UE10-3OS safety relay




Operating mode: with manual reset and external device monitoring

## Safety light curtain C4000 Micro connected to UE10-3OS safety relay




Operating mode: with manual reset and external device monitoring

N



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## Overview of technical specifications

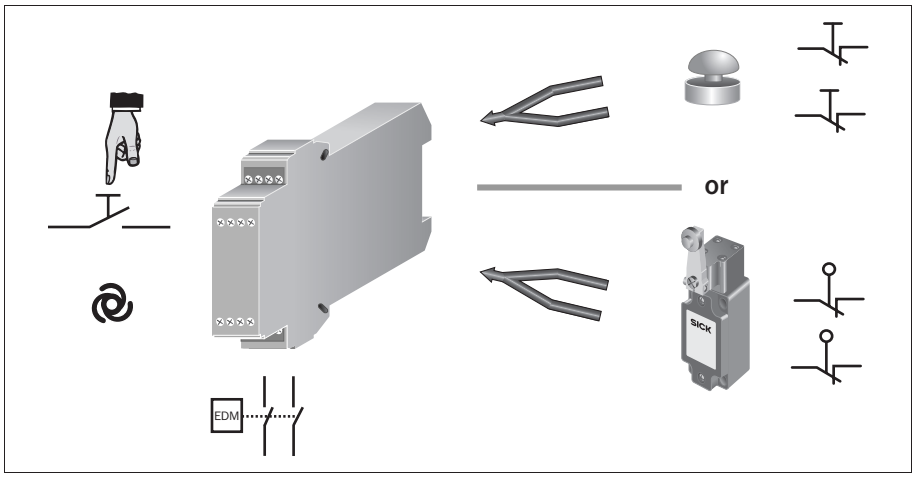
| | |
|---|---|
| **Category according to EN 954-1** | 4 [1] |
| **Number of enable current paths/signalling current paths** | 2 / 1 |
| **Input circuit** | Single-channel |
| **Housing width** | 22.5 mm |

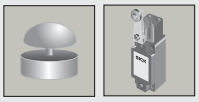
[1] The wires for the input and output signals shall be routed outside the control cabinet according to the category to be used.

## Product description

- 2 LEDs:
  - Supply voltage
  - Relay K1, K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Screw-type terminals

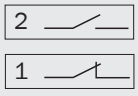
## Applications






- For emergency stops
- For safety switches




## Ordering information

| Supply voltage | Type | Part number |
|---|---|---|
| 24 V DC | UE23-2MF2D3 | 6026146 |
| 115 ... 120 V AC | UE23-2MF2A4 | 6026147 |
| 230 V AC | UE23-2MF2A3 | 6026148 |

| Further information | Page |
|---|---|
| → Symbols | N-2 |
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| → Dimensional drawings | N-12 |
| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |

N



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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Protection class according to EN 50178** | II, double insulated |
| **Category according to EN 954-1** | 4 [1] |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage/Input circuit $V_S$ (A1 - A2)** | |
| **UE23-2MF2D2** | 24 V DC (20.4 V DC ... 26.4 V DC) |
| **UE23-2MF2A4** | 115/120 V AC (98 V AC ... 132 V AC) |
| **UE23-2MF2A3** | 230 V AC (196 V AC ... 253 V AC) |
| **Power consumption** | |
| **AC** | 2.7 VA |
| **DC** | 1.6 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **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 N/O, enable current paths, safety relevant<br>1 N/C, signalling current path, not safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h)<br>AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |

[1] The wires for the input and output signals shall be routed outside the control cabinet according to the category to be used

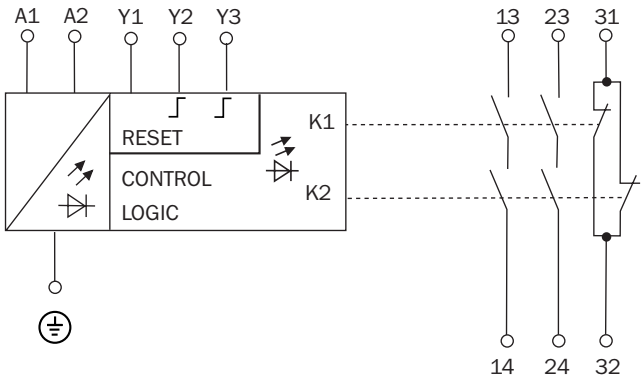
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| | |
|---|---|
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | DIN EN 61000-6-4 |
| **Screening against interference** | DIN EN 61000-6-2 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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** | 0.27 kg |

## Internal circuitry




**Function**

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the open 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“ illuminates). In the case of manual reset, this only occurs after pressing the reset button.

**External device monitoring (EDM)**

The unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays through their normally closed contacts.

**Manual reset**

For manual resetting a pushbutton must be connected to terminals Y1 and Y3. This reset is monitored.

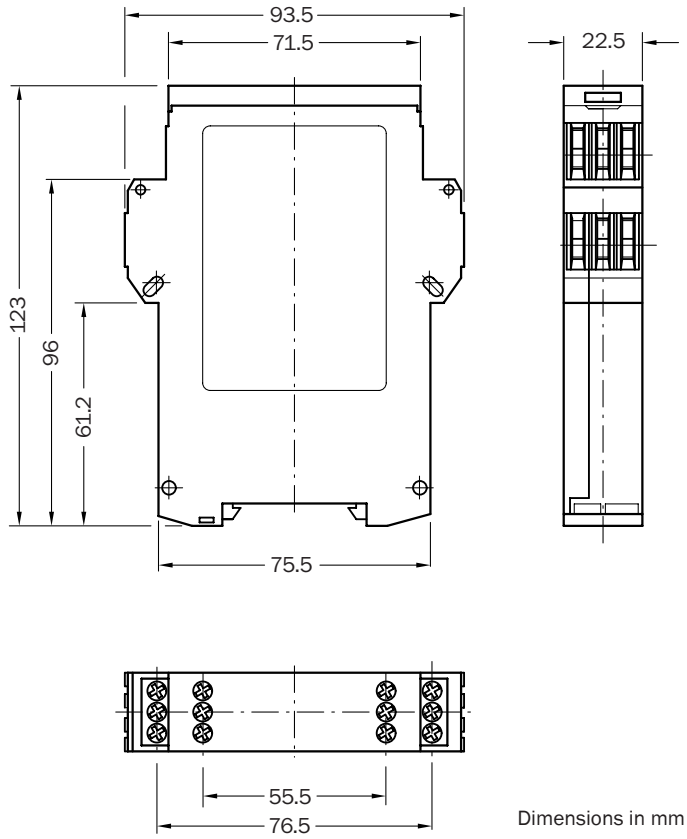
**Automatic reset**

For automatic resetting, Y1 - Y2 must be linked.

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## Dimensional drawings




Dimensions in mm

Housing with screw-type terminals

N


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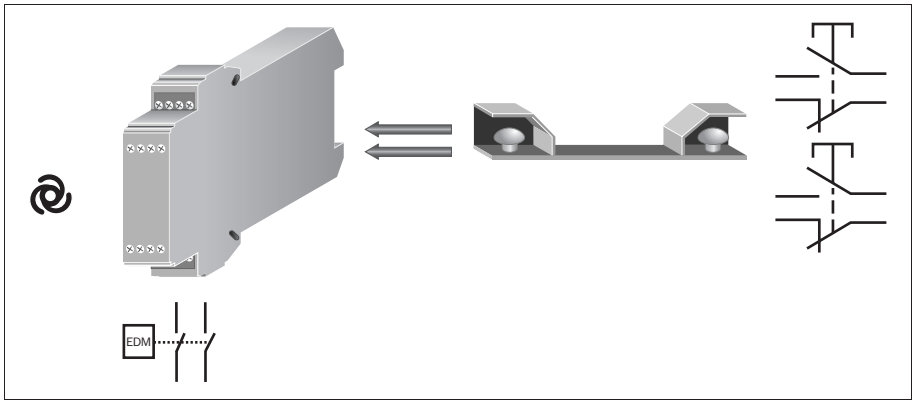
## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Requirements in accordance with EN 574** | Type III C |
| **Number of enable current paths/signalling current paths** | 2 / 1 |
| **Input circuit** | Dual-channel |
| **Housing width** | 22.5 mm |

## Product description

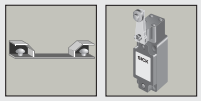
- 3 LEDs for:
  - Supply voltage
  - Relay K1
  - Relay K2
- Automatic start
- Increase in the number of outputs by way of the expansion unit UE10-4XT
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications



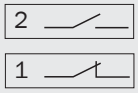

## Ordering information

| Connection type | Type | Part number |
|---|---|---|
| Screw-type terminals | UE42-2HD2D2 | 6024878 |
| Plug-in terminals | UE42-2HD3D2 | 6024881 |






- For two-hand controls Typ III C in accordance with EN 574
- For safety switches




| Further information | Page |
|---|---|
| → Symbols | N-2 |
| → Technical specifications | N-14 |
| → Internal circuitry | N-15 |
| → Dimensional drawings | N-16 |
| → Connection diagrams | N-17 |
| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |

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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 |
| **Category according to EN 954-1** | 4 |
| **Supply voltage $V_S$ (A1 / A2)** | 24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC) |
| **Power consumption** | |
| **AC** | 2.7 VA |
| **DC** | 1.5 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **Nominal frequency in AC mode** | 50 Hz ... 60 Hz |

## Control voltage (Y11 - Y21)

| | |
|---|---|
| **Control voltage** | 24 V DC |
| **Control current** | 60 mA |
| **Short-circuit current 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 Ω |
| **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 N/O, enable current paths, safety relevant<br>1 N/C, signalling current path, not safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h)<br>AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

N

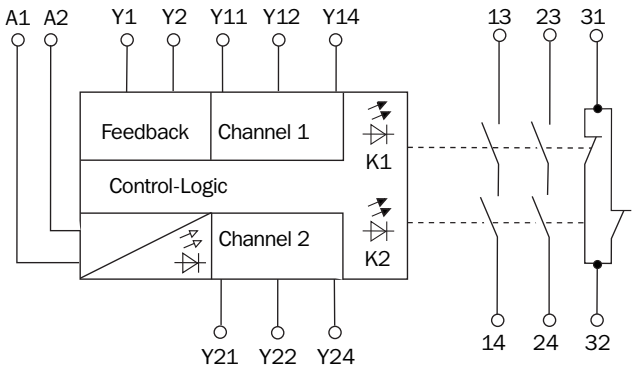

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### Operating data

| | |
|---|---|
| Surge voltage rating ($U_{Imp.}$) | 4 kV |
| Excess voltage category | III |
| Contamination rating of the unit (EN 50178) | |
| External | 3 |
| Internal | 2 |
| Voltage rating | 300 V AC |
| Test voltage $U_{eff}$ (50 Hz) EN 60439-1 | 2.0 kV |
| Enclosure rating | |
| Housing | IP 40 |
| Terminals | IP 20 |
| Radio interference | EN 60947-1 02/99 |
| Screening against interference | EN 60947-1 02/99 |
| Ambient operating temperature | –25 °C ... +55 °C |
| Storage temperature | –25 °C ... +75 °C |
| Wire cross-sections | |
| 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 (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 |

## Internal circuitry




**Function**

The UE42-2HD 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 (see page N-17 – connection diagrams) 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 UE42-2HD can take over the function of external device monitoring. The normally closed contacts of the external relays are switched in series, connected to the terminals Y1 - Y2.

**Automatic start**

The UE42-2HD has an automatic start facility.

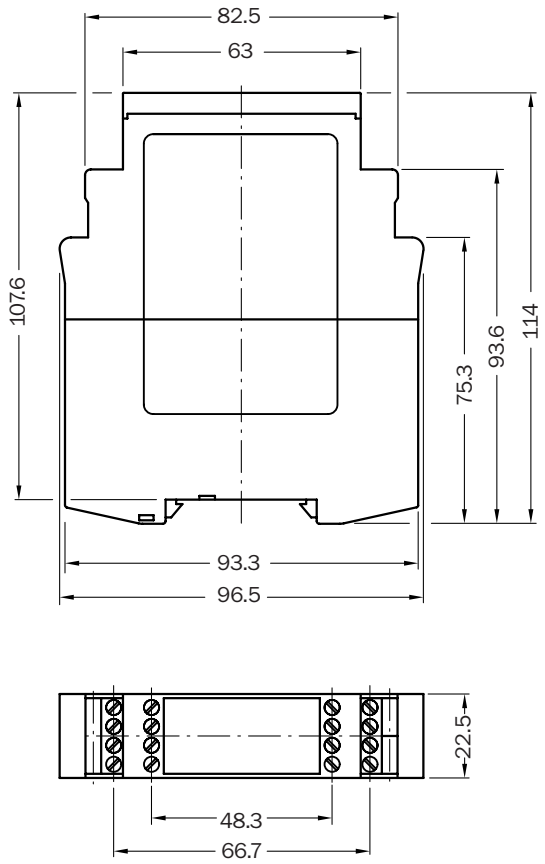
**Monitoring of simultaneous activation**

The pressing of the start buttons at the same time is monitored. Only when both start buttons are activated within 0.5 sec do normally open contacts close and the normally closed contact opens.

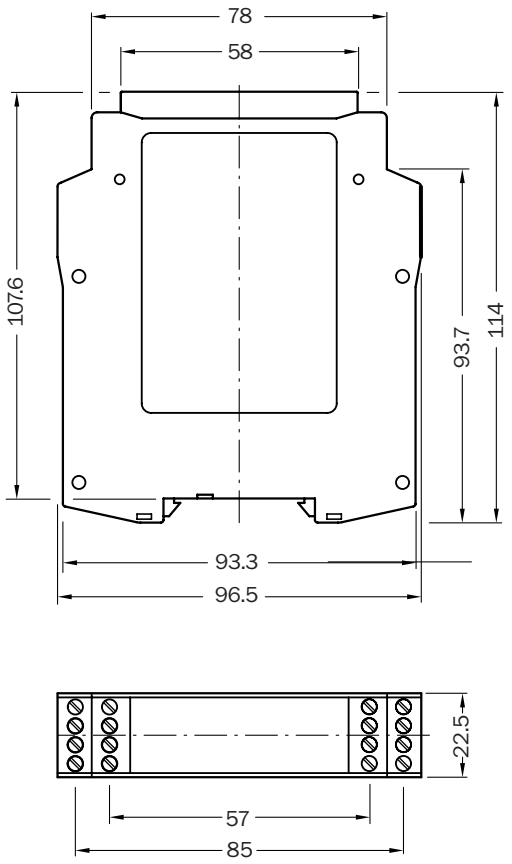
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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

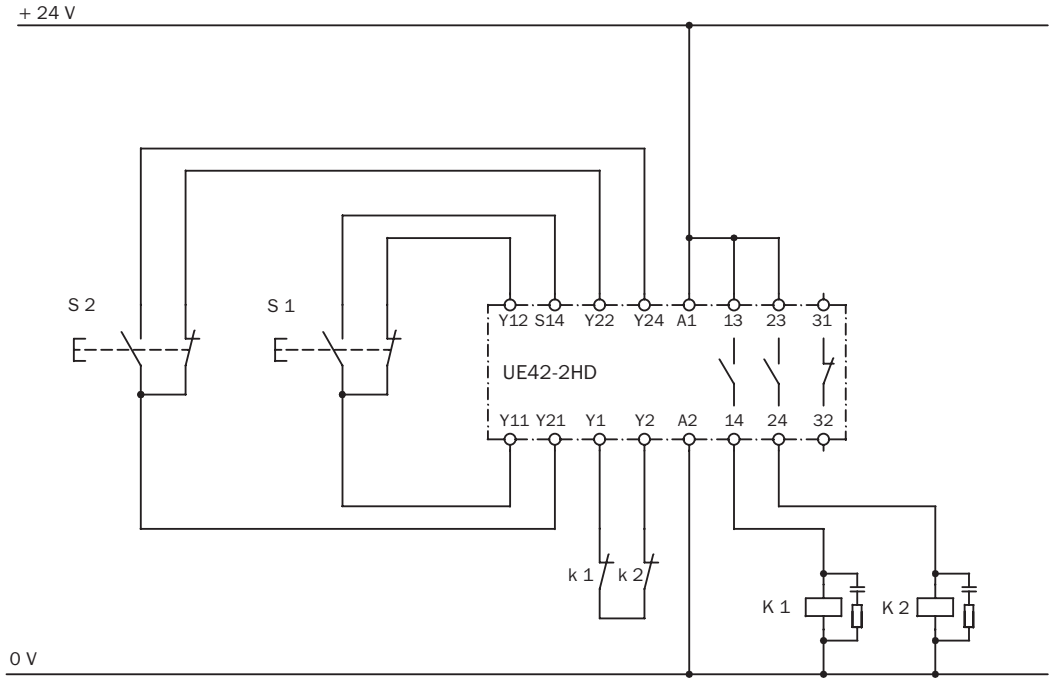
Dimensions in mm

N


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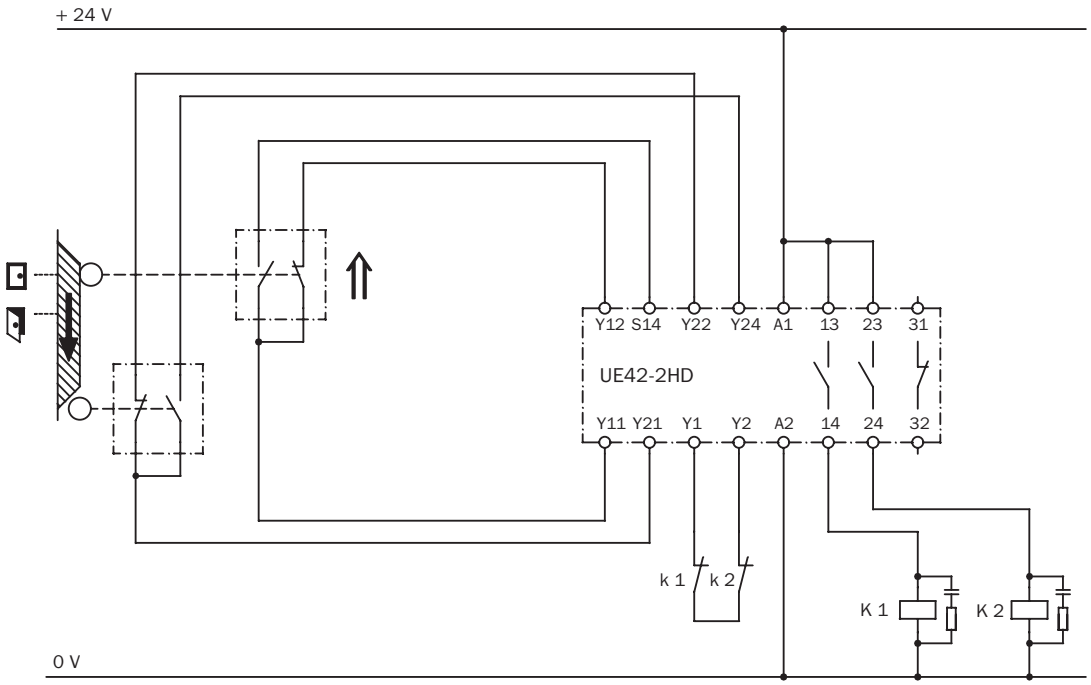
# Connection diagrams

## Two-hand control with UE42-2HD safety relay, dual-channel system




Operating mode: with automatic start and external device monitoring (EDM)

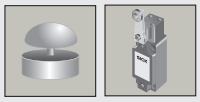
## Two saftey switches connected to UE42-2HD safety relay, dual-channel system




Operating mode: with automatic reset and external device monitoring (EDM)

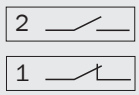
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- For emergency stops
- For safety switches



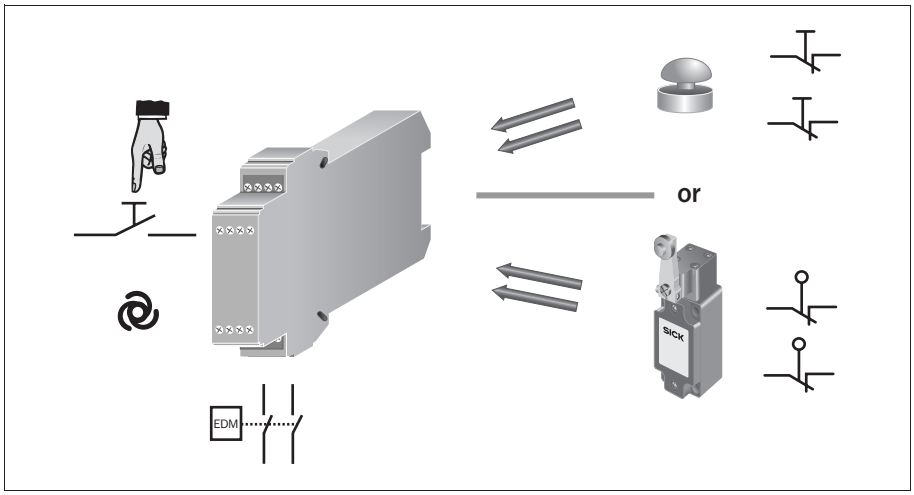

## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 2 / 1 |
| **Input circuit** | Dual-channel |
| **Housing width** | 22.5 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K1
  - Relay K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications




## Ordering information

| Connection type | Type | Part number |
|---|---|---|
| Screw-type terminals | UE43-2MF2D2 | 6024893 |
| Plug-in terminals | UE43-2MF3D2 | 6024894 |

N


| Further information | Page |
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| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |




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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 |
| **Category according to EN 954** | 4 |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage $V_S$ (A1 / A2)** | 24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC) |
| **Power consumption** | |
| **AC** | 4.6 VA |
| **DC** | 2.1 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **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 |
| **Short-circuit current between S33 / S11 and S21** | 2000 mA |
| **Fuse** | PTC resistor |
| **Reaction time by cross connection** | 3 s |
| **Activation time upon detection of cross connection** | 3 s |
| **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 Ω |
| **Synchronisation 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 N/O, enable current paths, safety relevant<br>1 N/C, signalling current path, not safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h)<br>AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h) |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 1 x $10^5$ switching cycles |

Continued on next page

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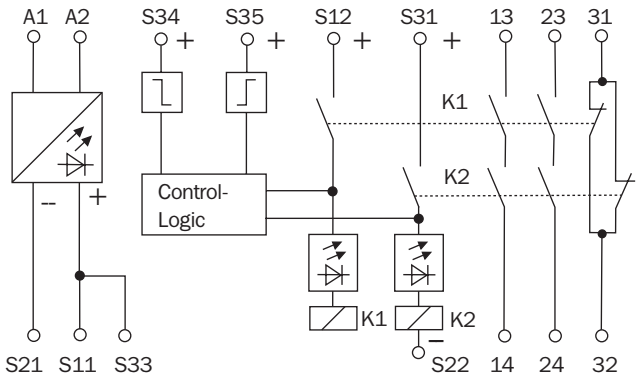

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## Operating data

| | |
|---|---|
| Surge voltage rating ($U_{Imp.}$) | 4 kV |
| Excess voltage category | III |
| Contamination rating of the unit (EN 50178) | |
| External | 3 |
| Internal | 2 |
| Voltage rating | 300 V AC |
| Test voltage $U_{eff}$ (50 Hz) EN 60439-1 | 2.0 kV |
| Enclosure rating | |
| Housing | IP 40 |
| Terminals | IP 20 |
| Radio interference | DIN EN 61000-6-4 |
| Screening against interference | DIN EN 61000-6-2 |
| Ambient operating temperature | –25 °C ... +55 °C |
| Storage temperature | –25 °C ... +75 °C |
| Wire cross-sections | |
| 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 (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 |

# Internal circuitry




**Function**

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 and 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) effects the opening of the normally open outputs.

**External device monitoring (EDM)**

The UE43-2MF 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.

**Manual reset**

For manual resetting a pushbutton must be connected to terminals S33 - S34. Reset is monitored.

**Automatic reset**

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.

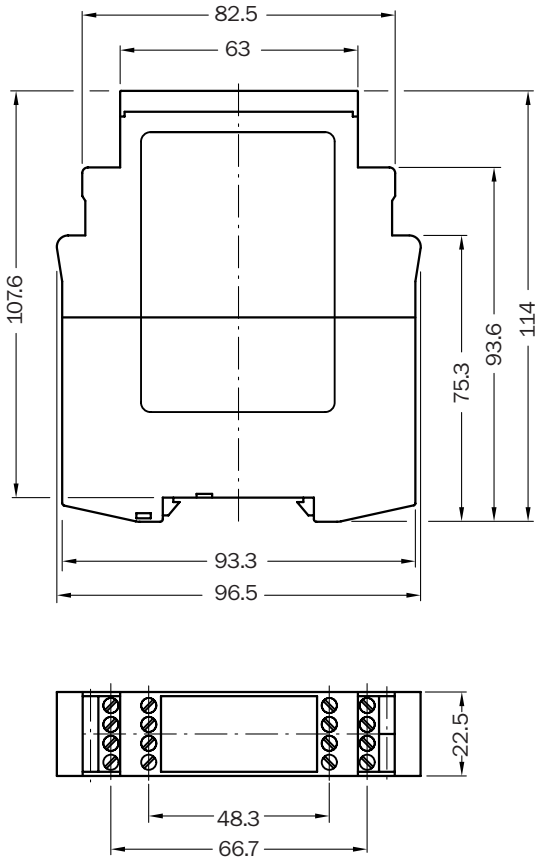
**Monitoring of synchronisation**

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

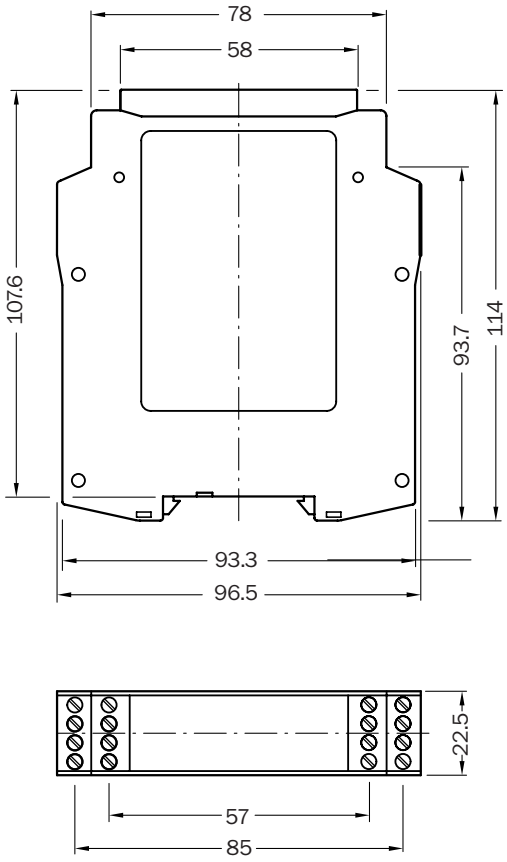
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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

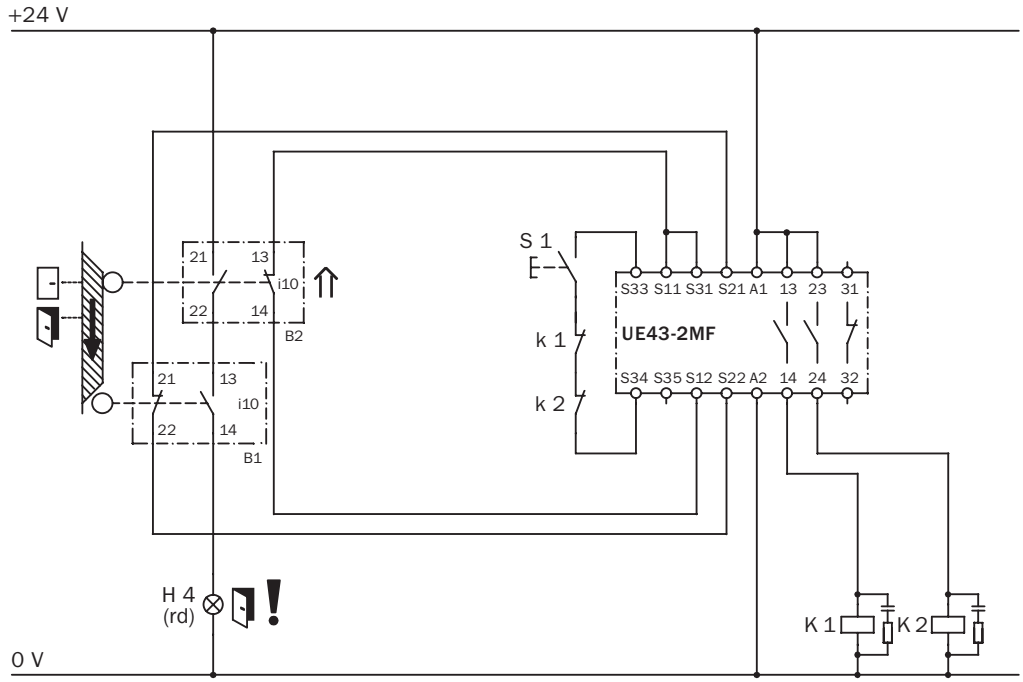
Dimensions in mm

N


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# Connection diagram

## Two safety switches i10 to UE43-2MF safety relay, dual-channel system




Operating mode: with manual reset and external device monitoring (EDM)

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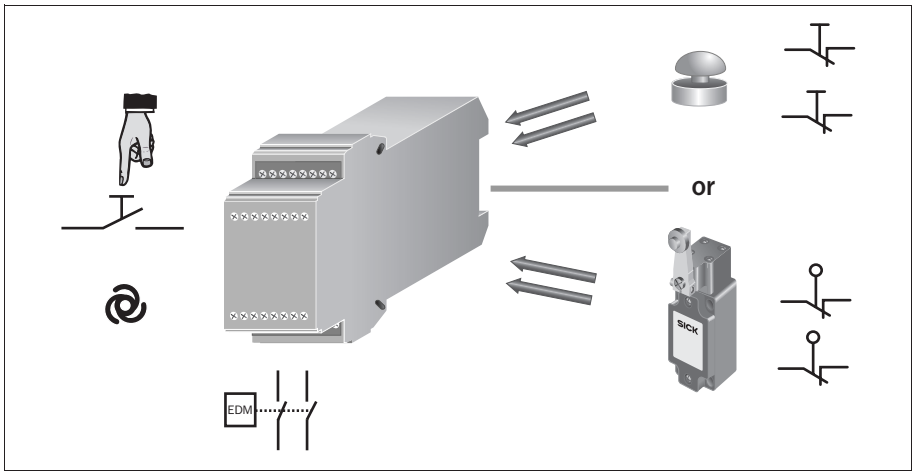
## Overview of technical specifications

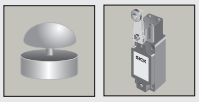
| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 3 / 1 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 45 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K2
  - Relay K3
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)

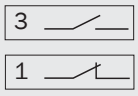
## Applications






- For emergency stops
- For safety switches




## Ordering information

| Supply voltage | Type | Part number |
|---|---|---|
| 24 V DC | UE43-3MF2D3 | 6024897 |
| 24 V AC | UE43-3MF2A0 | 6024898 |
| 115 V AC | UE43-3MF2A1 | 6024899 |
| 120 V AC | UE43-3MF2A2 | 6024900 |
| 230 V AC | UE43-3MF2A3 | 6024901 |

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| → Connection diagram | N-27 |
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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 units** | Use of earth conductor terminal |
| **Category according to EN 954-1** | 4 |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage $V_S$** | |
| **UE43-3MF2D3** | 24 V DC (20.4 V DC ... 26.4 V DC) |
| **UE43-3MF2A0** | 24 V AC (20.4 V AC ... 26.4 V AC) |
| **UE43-3MF2A1** | 115 V AC (97.75 V AC ... 126.5 V AC) |
| **UE43-3MF2A2** | 120 V AC (102.0 V AC ... 132.0 V AC) |
| **UE43-3MF2A3** | 230 V AC (195.5 V AC ... 253.0 V AC) |
| **Power consumption** | |
| **AC** | 2.5 W / 3.2 VA |
| **DC** | 1.0 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **Nominal frequency in AC mode** | 50 Hz ... 60 Hz |

## 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 s |
| **Galvanic separation between A1 / A2 and Y11 - Y21 - PE (only on AC units)** | Yes |

## Input circuits (Y12 and Y31 - Y22)

| | |
|---|---|
| **Input current Y12 and Y31** | 15 mA |
| **Input current Y13 and Y14 (reset circuit)** | 40 mA |
| **Reset time** | |
| **Manual (Y13)** | 150 ms ... 250 ms |
| **Automatic (Y14)** | 0.8 s ... 1.2 s |
| **Synchronisation time** | 500 ms |
| **Line resistance at the input circuit** | < 70 Ω |
| **Input time upon applying supply voltage** | 100 ms |

## Output circuits (13 - 14, 23 - 24, 33 - 34, 41 - 42)

| | |
|---|---|
| **Response time (K2 / K3)** | 50 ms |
| **Relay contacts** | 3 N/O, enable current paths, safety relevant<br>1 N/C, signalling current path, not safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 18 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 6 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h) |

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| | |
|---|---|
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

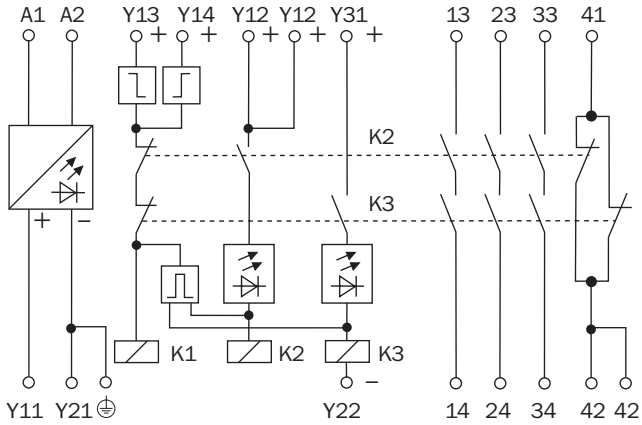
| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | DIN EN 61000-6-4 |
| **Screening against interference** | DIN EN 61000-6-2 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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** | |
| **AC units** | 0.36 kg |
| **DC units** | 0.30 kg |

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# Internal circuitry




**Function**

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 in automatic reset (LED K2 and K3 illuminate). In the case of manual resetting, this is only effected upon pressing and releasing the reset button.

Activation of the sensor (opening of one or both input circuits) effects the opening of the normally open contacts (LED K2 and K3 off).

**External device monitoring (EDM)**

The UE43-3MF 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 resetting a pushbutton must be connected to terminals Y12 and Y13. Reset is monitored.

**Automatic reset**

For automatic resetting Y12 - Y14 must be linked.

**Cross circuit detection**

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

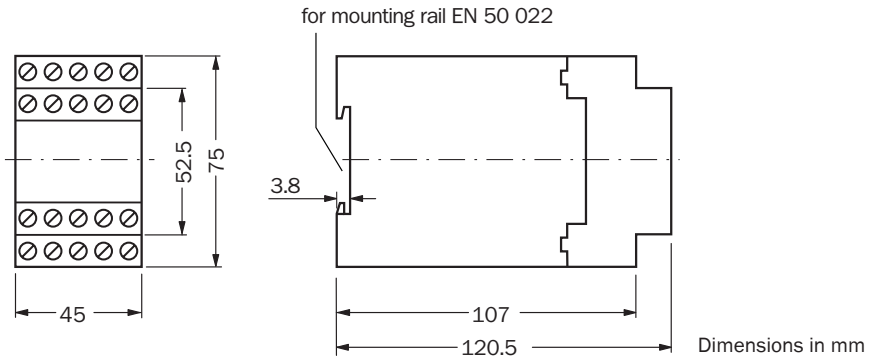
**Monitoring of synchronisation**

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

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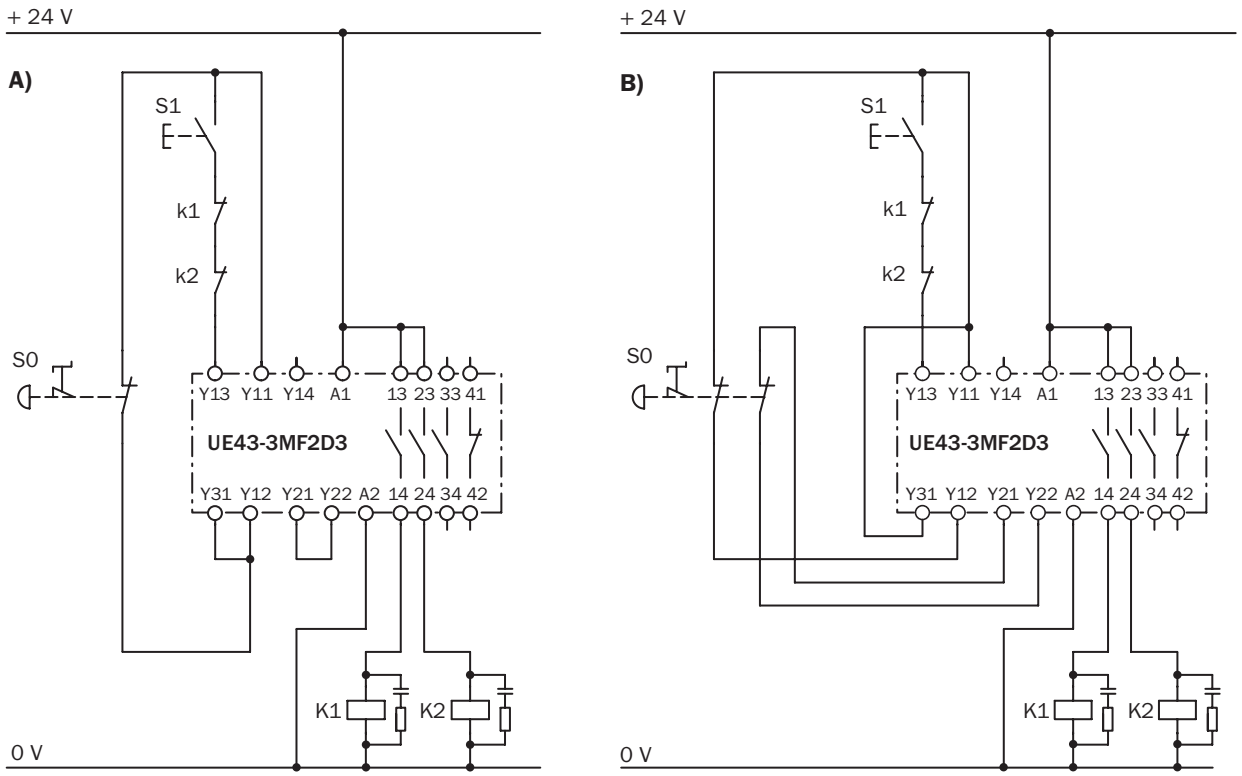
## Dimensional drawings




Housing with screw-type terminals

## Connection diagram

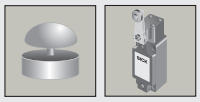
### Emergency stop switch connected to UE43-3MF2D3 safety relay

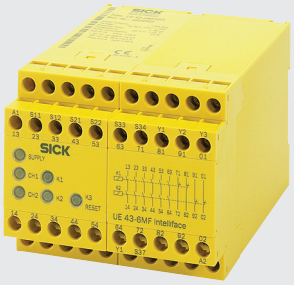



Operating mode: with manual reset and external device monitoring
A) single-channel system
B) dual-channel system

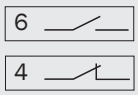
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- For emergency stops
- For safety switches



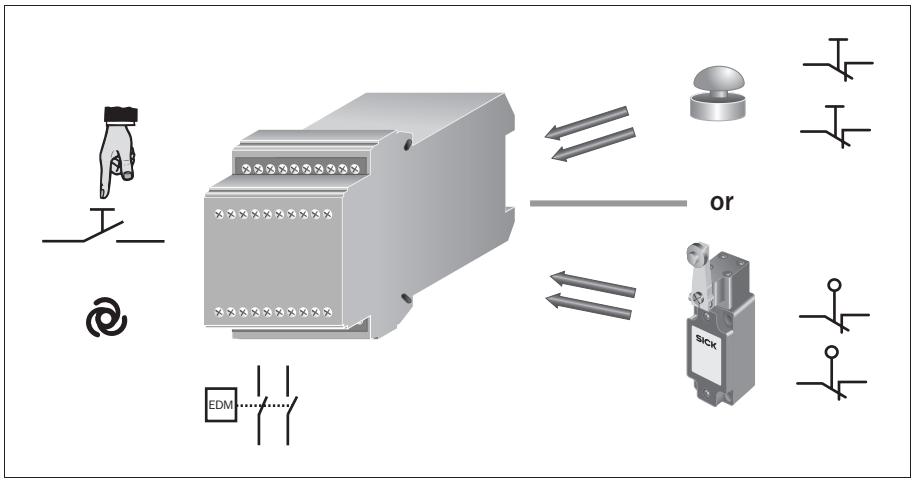

## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 6 / 4 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 90 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- 6 LEDs:
  - Supply voltage
  - Input circuit CH1
  - Input circuit CH2
  - Relay K1
  - Relay K2
  - Relay K3 RESET
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)

## Applications




## Ordering information

| Supply voltage | Type | Part number |
|---|---|---|
| 24 V DC | UE43-6MF2D3 | 6024902 |
| 120 V AC | UE43-6MF2A2 | 6024905 |
| 230 V AC | UE43-6MF2A3 | 6024906 |

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| → Services | A-2 |



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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 units** | Use of earth conductor terminal |
| **Category according to EN 954-1** | 4 |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage $V_S$ (A1 / A2)** | |
| **UE43-6MF2D3** | 24 V DC (20.4 V DC ... 26.4 V DC) |
| **UE43-6MF2A2** | 120 V AC (102.0 V AC ... 132.0 V AC) |
| **UE43-6MF2A3** | 230 V AC (195.5 V AC ... 253.0 V AC) |
| **Power consumption** | |
| **AC** | 4.2 W / 4.5 VA |
| **DC** | 2.4 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **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 current (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 s |
| **Galvanic separation between A1 - 2 and Y11 - Y21 - PE (only on AC units)** | Yes |

## Input circuits (S12 - S22 and Y3 - S22)

| | |
|---|---|
| **Input current** | 40 mA |
| **Reset time** | |
| **Manual** | 350 ms |
| **Automatic** | 500 ms |
| **Synchronisation time** | 500 ms |
| **Line resistance at the input circuit** | < 85 Ω |
| **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 N/O, enable current paths, safety relevant<br>4 N/C, signalling current paths, not safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 24 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

Continued on next page



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## Operating data

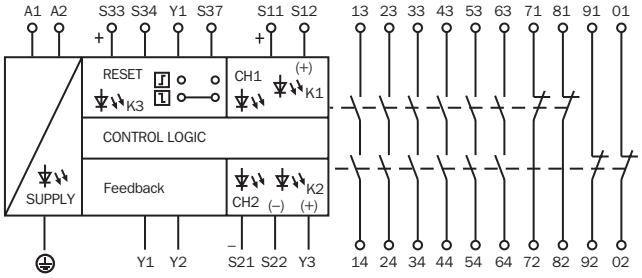
| | |
|---|---|
| Surge voltage rating ($U_{Imp.}$) | 4 kV |
| Excess voltage category | III |
| Contamination rating of the unit (EN 50178) | |
| External | 3 |
| Internal | 2 |
| Voltage rating | 300 V AC |
| Test voltage $U_{eff}$ (50 Hz) EN 60439-1 | 2.0 kV |
| Enclosure rating | |
| Housing | IP 40 |
| Terminals | IP 20 |
| Radio interference | DIN EN 61000-6-4 |
| Screening against interference | DIN EN 61000-6-2 |
| Ambient operating temperature | –25 °C ... +55 °C |
| Storage temperature | –25 °C ... +75 °C |
| Wire cross-sections | |
| 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 |

N


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## Internal circuitry




**Function**

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated, the LEDs CH1 and CH2 illuminate. In the case of automatic resetting, the normally open contacts close immediately (LEDs K1 and K2 illuminate). With manual resetting the normally open contacts only close upon pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of the normally open contacts (LEDs K1 and K2 off).

**External device monitoring (EDM)**

The UE43-6MF 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 is to be connected between contacts S12 and S34 and Y1 - S37 must be jumpered. This reset is monitored.

**Automatic reset**

S12 - S34 must be jumpered. Y1 - Y37 is not jumpered.

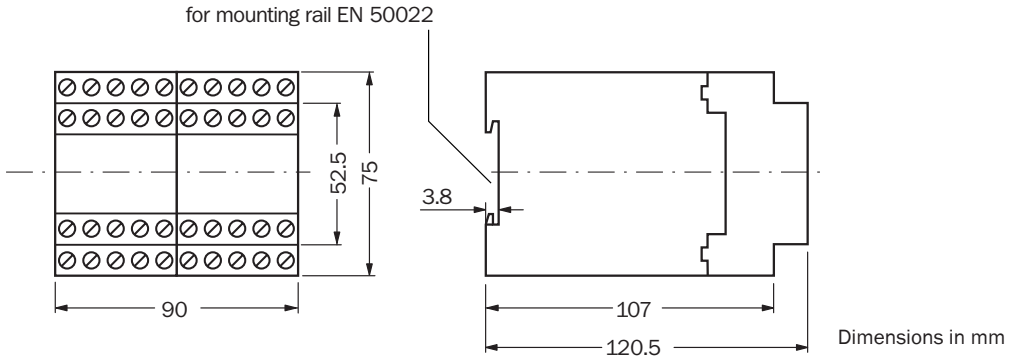
**Cross circuit detection**

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

**Monitoring of synchronisation**

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

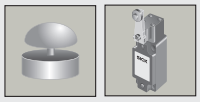
## Dimensional drawings




Housing with screw-type terminals

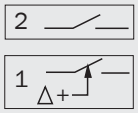
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- For emergency stops
- For safety switches



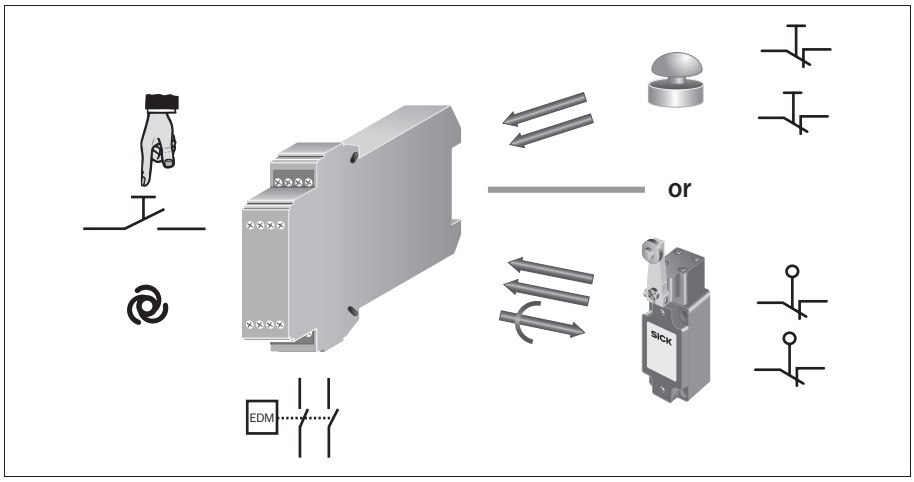

## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 2 / 0 |
| **Number of off-delayed normally open contacts** | 1 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 22.5 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- Outputs:
  - 2 normally open contacts
  - 1 normally open contact with off-delay, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
  - Supply voltage
  - Relay K1 / K2 (without delay)
  - Relay K3 / K4 (delayed)
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications




## Ordering information

| Off-delay time | Connection type | Type | Part number |
|---|---|---|---|
| 0.15 s ... 3 s | Screw-type terminals | UE45-3S12D33 | 6024911 |
| | Plug-in terminals | UE45-3S13D33 | 6024912 |
| 1.5 s ... 30 s | Screw-type terminals | UE45-3S12D330 | 6024913 |
| | Plug-in terminals | UE45-3S13D330 | 6024914 |

N


| Further information | Page |
|---|---|
| → Symbols | N-2 |
| → Technical specifications | N-33 |
| → Internal circuitry | N-34 |
| → Dimensional drawings | N-35 |
| → Connection diagram | N-36 |
| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |




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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 |
| **Category according to EN 954-1** | 4 |
| **Stop category according to EN 60204** | 0/1 |
| **Supply voltage $V_S$** | 24 V DC (20.4 V DC ... 26.4 V DC) |
| **Power consumption** | 2.6 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |

## Control voltage S11 / S33 and S21

| | |
|---|---|
| **Control voltage** | 24 V DC |
| **Control current** | 60 mA |
| **Short-circuit current between S11 and A2** | 2200 mA |
| **Fuse** | PTC resistor |
| **Reaction time by cross connection** | 2 s |
| **Galvanic separation between A1 / A2 and S11 / S21** | No |

## Input circuits (S12 and S31)

| | |
|---|---|
| **Input current S12 and S31** | 25 mA ... 100 mA |
| **Input current S34 / S35 (reset circuit)** | 40 mA ... 50 mA |
| **Reset time** | |
| **Manual (S34)** | 30 ms |
| **Automatic (S35)** | 600 ms |
| **Synchronisation time** | 500 ms |
| **Activation time of reset button** | 200 ms |
| **Line resistance at the input circuit** | < 85 Ω |

## Output circuits (13 - 14, 23 - 24, 37 - 38)

| | |
|---|---|
| **Response time (K1 / K2)** | 25 ms |
| **Off-delay time (K3 / K4)** | |
| **UE45-3S1 xD3 3** | 0.15 s ... 3 s |
| **UE45-3S1 xD3 30** | 1.5 s ... 30 s |
| **Relay contacts** | 2 N/O, enable current paths, Category 4<br>1 N/O, enable current path, off-delayed, Category 3 |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 5 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 5 x $10^6$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

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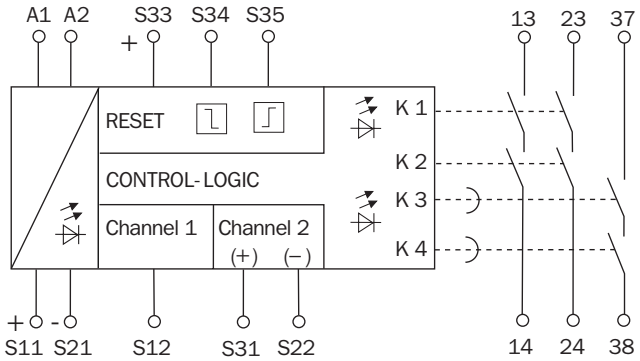

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### Operating data

| | |
|---|---|
| Surge voltage rating ($U_{Imp.}$) | 4 kV |
| Excess voltage category | III |
| Contamination rating of the unit (EN 50178) | |
| External | 3 |
| Internal | 2 |
| Voltage rating | 300 V AC |
| Test voltage $U_{eff}$ (50 Hz) EN 60439-1 | 2.0 kV |
| Enclosure rating | |
| Housing | IP 40 |
| Terminals | IP 20 |
| Radio interference | EN 60947-1 02/99 |
| Screening against interference | EN 60947-1 02/99 |
| Ambient operating temperature | –25 °C ... +55 °C |
| Storage temperature | –25 °C ... +75 °C |
| Wire cross-sections | |
| 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 (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 |

## Internal circuitry




**Function**

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 during 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) effects 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.

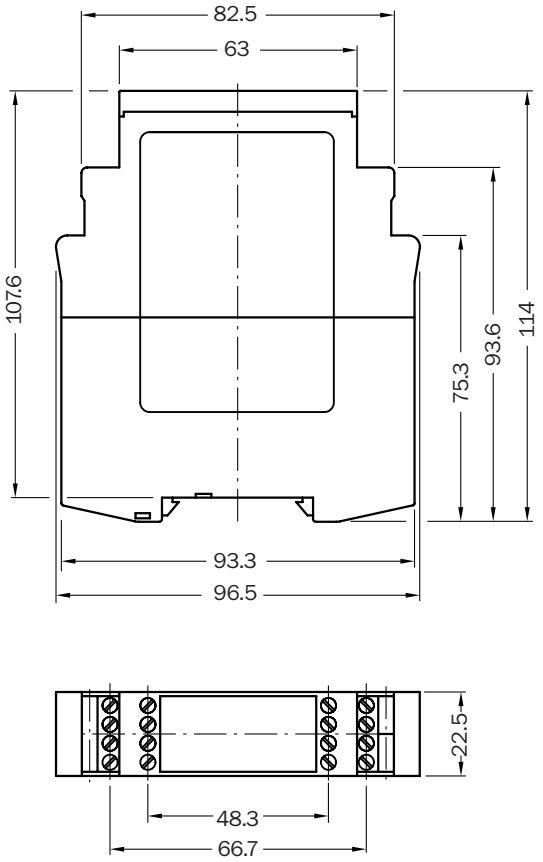
**Monitoring of synchronisation**

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

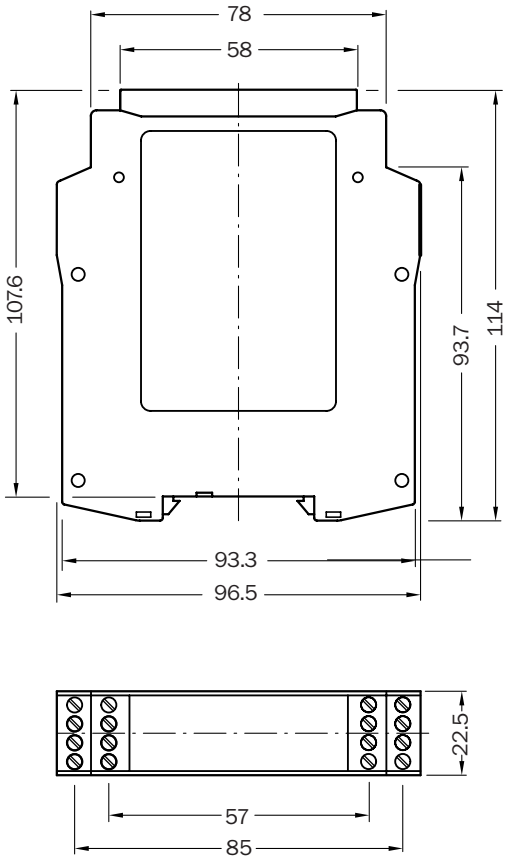
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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

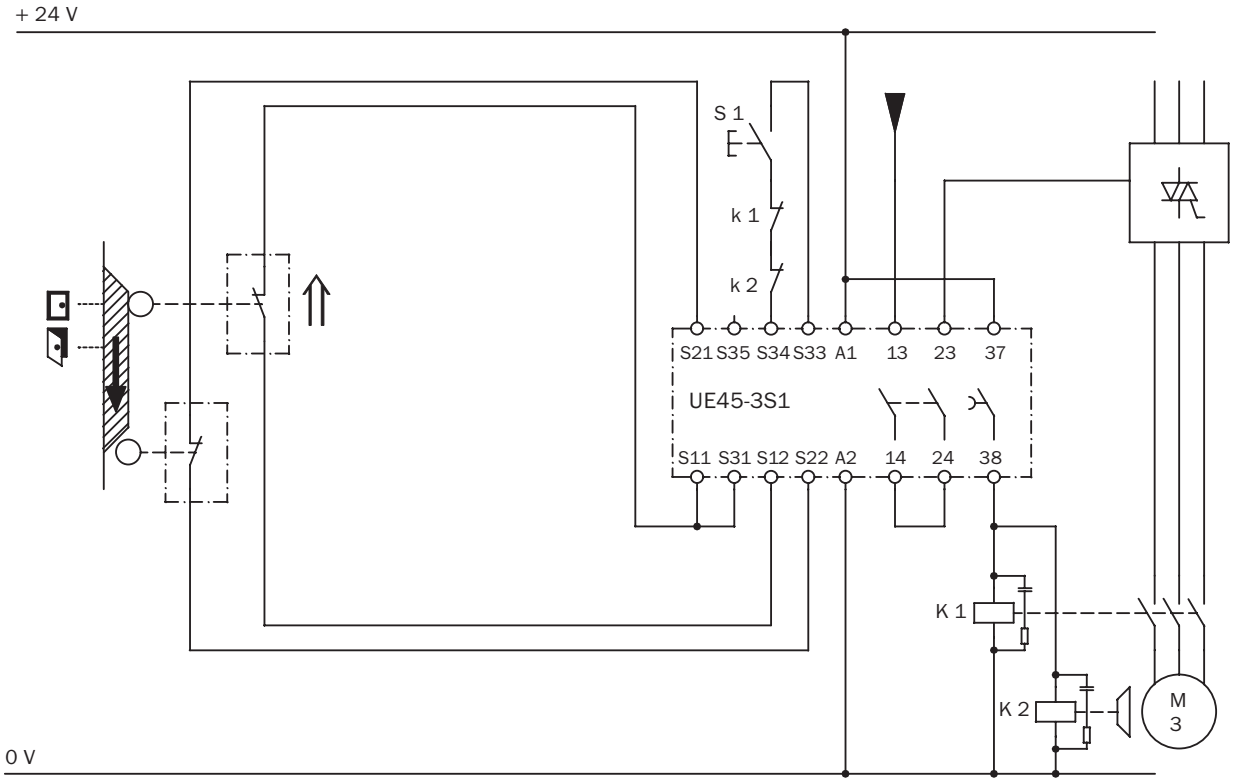
Dimensions in mm

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# Connection diagram

## Two safety switches connected to UE45-3S1 safety relay




Operating mode: with manual reset and external device monitoring (EDM)

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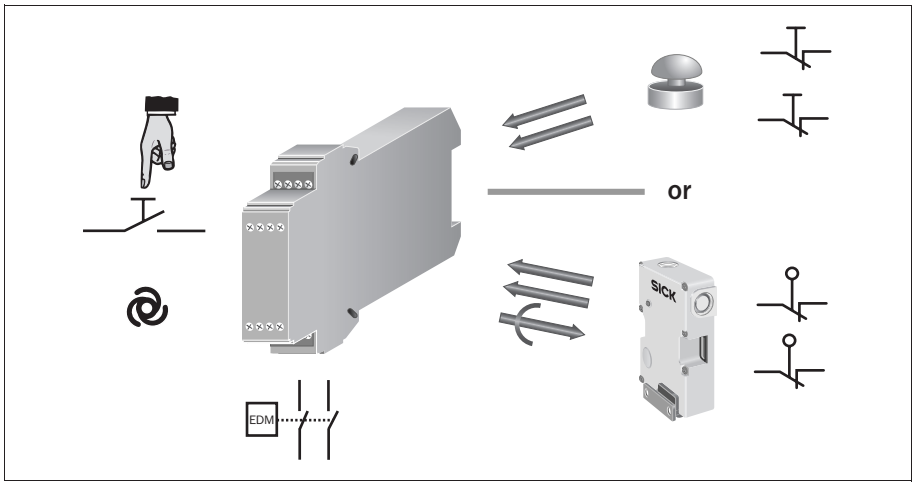
## Overview of technical specifications

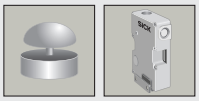
| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 2 / 0 |
| **Number of on-delayed response time enable current paths** | 1 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 22.5 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- Outputs:
  - 2 normally open contacts
  - 1 on-delayed response time enable current path, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
  - Supply voltage
  - Relay K1 / K2 (without delay)
  - Relay K3 / K4 (delayed)
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

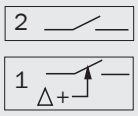
## Applications






- For emergency stops
- For safety switches
- For safety switches with mechanical locking




## Ordering information

| On-delay time | Connection type | Type | Part number |
|---|---|---|---|
| 0.15 s ... 3 s | Screw-type terminals | UE44-3SL2D33 | 6024907 |
| | Plug-in terminals | UE44-3SL3D33 | 6024908 |
| 1.5 s ... 30 s | Screw-type terminals | UE44-3SL2D330 | 6024909 |
| | Plug-in terminals | UE44-3SL3D330 | 6024910 |

| Further information | Page |
|---|---|
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| → Internal circuitry | N-39 |
| → Dimensional drawings | N-40 |
| → Connection diagram | N-41 |
| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |

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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 |
| **Category according to EN 954-1** | 4 |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage $V_S$** | 24 V DC (20.4 V DC ... 26.4 V DC) |
| **Power consumption** | 1.8 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |

## Control voltage S 11 - S33 and S21

| | |
|---|---|
| **Control voltage** | 22 V DC |
| **Control current** | 60 mA |
| **Short-circuit current between S 11 and A2** | 2200 mA |
| **Fuse** | PTC resistor |
| **Reaction time by cross connection** | 2 s |
| **Galvanic separation between A1 / A2 and S 11 - S21** | No |

## Input circuits (S 12 and S31)

| | |
|---|---|
| **Input current S 12 and S31** | 25 mA ... 100 mA |
| **Input current S34 / S35 (reset circuit)** | 40 mA ... 50 mA |
| **Reset time** | |
| **Manual (S34)** | 30 ms |
| **Automatic (S35)** | 750 ms |
| **Synchronisation time** | 500 ms |
| **Activation time of reset button** | 250 ms |
| **Line resistance at the input circuit** | < 85 Ω |

## Output circuits (13 - 14, 23 - 24, 37 - 38)

| | |
|---|---|
| **Response time (K1 / K2)** | 25 ms |
| **On-delay time (K3 / K4)** | |
| **UE44-3SL xD3 3** | 0.15 s ... 3 s |
| **UE44-3SL xD3 30** | 1.5 s ... 30 s |
| **Relay contacts** | 2 N/O, enable current paths, Category 4<br>1 N/O, enable current path, on-delayed, Category 3 |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 5 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 5 x $10^6$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |

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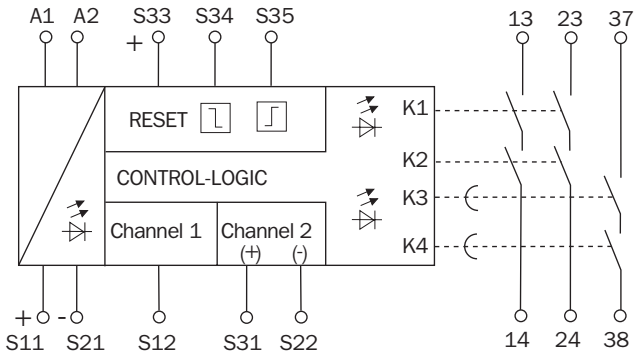


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| | |
|---|---|
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | EN 60947-1 02/99 |
| **Screening against interference** | EN 60947-1 02/99 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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 |

## Internal circuitry




**Function**

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 immedi-ately 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) effects the opening of both normally open contacts (13 - 14 / 23 - 24), with LED 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 S 12 - 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.

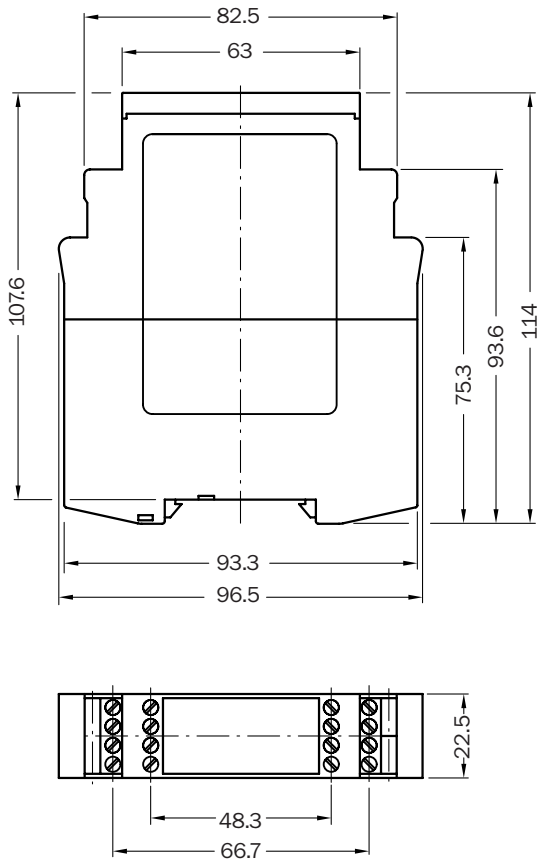
**Monitoring of synchronisation**

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

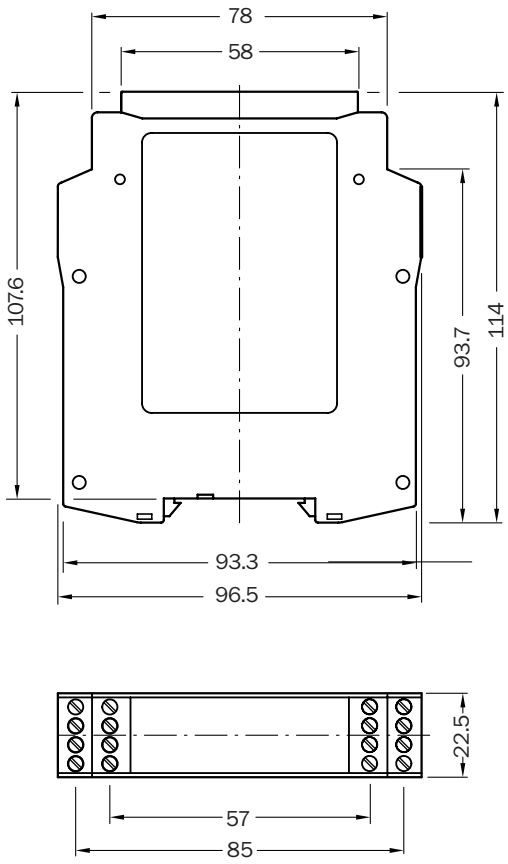
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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

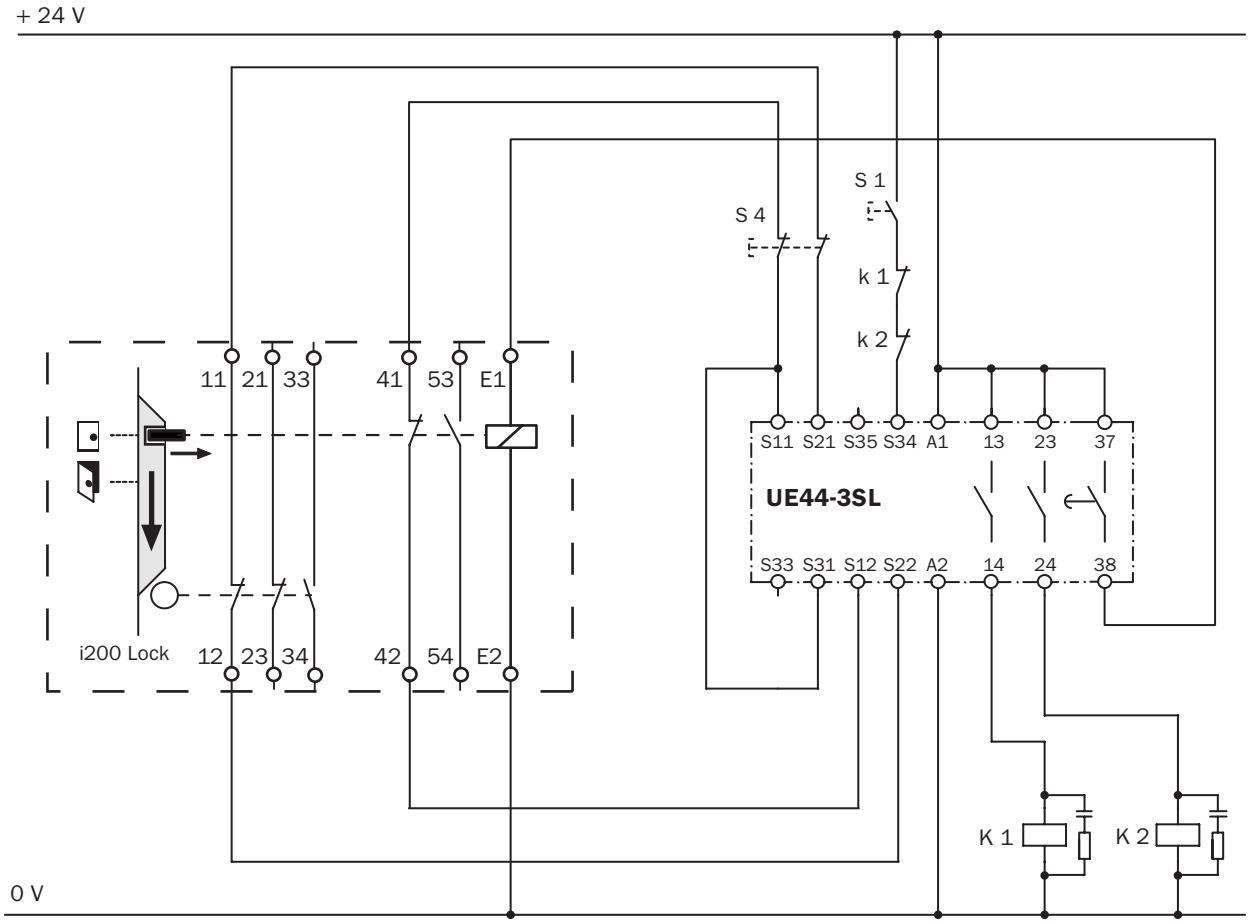
Dimensions in mm

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# Connection diagram

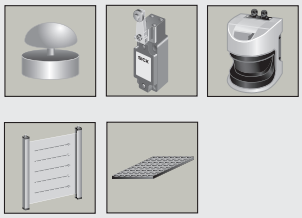
## i200 Lock safety switch (with mechanical locking) connected to UE44-3SL safety relay




Operating mode: with manual reset and external device monitoring (EDM)

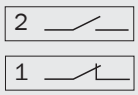
N


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- For emergency stops
- For safety switches
- For safety laser scanners
- For safety light curtains
- For non-contact safety switches
- For pressure sensitive mats in accordance with EN 1760 using 4-wire technology




N


| Further information | Page |
|---|---|
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| → Internal circuitry | N-44 |
| → Dimensional drawings | N-45 |
| → Connection diagrams | N-46 |
| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |

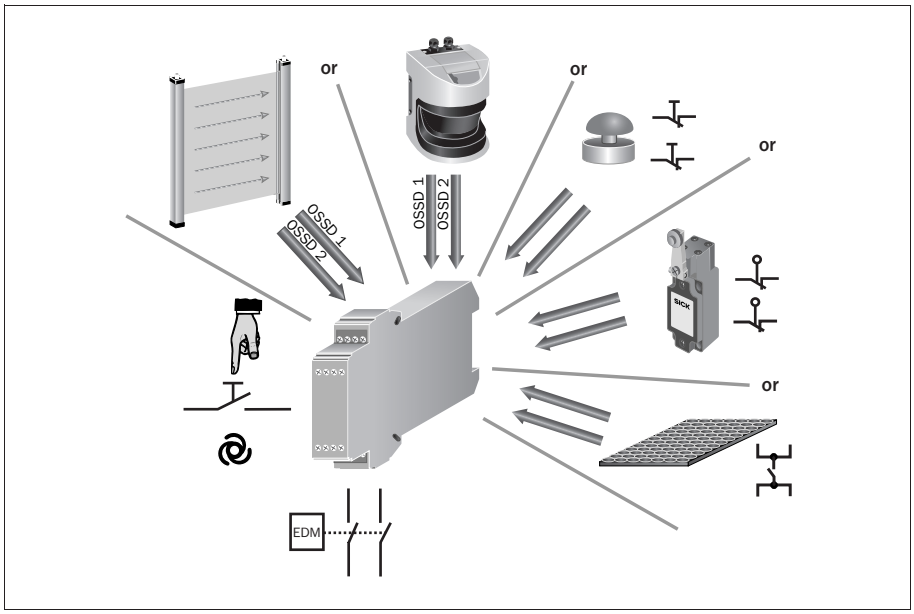

## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 2 / 1 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 22.5 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K1
  - Relay K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications




## In-system added value

Units employing monitored semiconductor outputs (OSSD), such as

- FGS
- PLS
- C2000
- M2000
- C4000
- S3000
- LSI
- M4000
- T4000 Compact

## Ordering information

| Connection type | Type | Part number |
|---|---|---|
| Screw-type terminals | UE48-20S2D2 | 6024915 |
| Plug-in terminals | UE48-20S3D2 | 6024916 |

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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 |
| **Category according to EN 954** | 4 |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage $V_S$ (A1 / A2)** | 24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC) |
| **Power consumption** | |
| **AC mode** | 4.6 VA |
| **DC mode** | 2.1 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **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 |
| **Short-circuit current between S33 / S11 and S21** | 300 mA |
| **Fuse** | Electronic fuse |
| **Reaction time by cross connection** | 50 ms |
| **Activation time upon detection of cross connection** | 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 S12 and S31 / S22** | 40 mA ... 100 mA |
| **Input current S34 / S35** | 5 mA ... 50 mA |
| **Reset time** | |
| **Manual (S34)** | 40 ms |
| **Automatic (S35)** | 80 ms |
| **Activation time of 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 Ω |

## Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

| | |
|---|---|
| **Response time (K1 / K2)** | 25 ms |
| **Minimum time outputs will stay off** | 70 ms ... 130 ms |
| **Relay contacts** | 2 N/O, enable current paths, safety relevant<br>1 N/C, signalling current path, not safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h)<br>AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h) |

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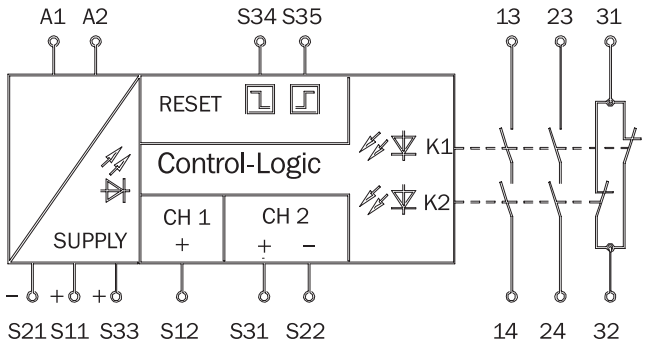
| | |
|---|---|
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | DIN EN 61000-6-4 |
| **Screening against interference** | DIN EN 61000-6-2 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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 |

# Internal circuitry




**Function**

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 optoelectronic protective device 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) effects the opening of the normally open contacts (LED K1 and K2 off).

**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**

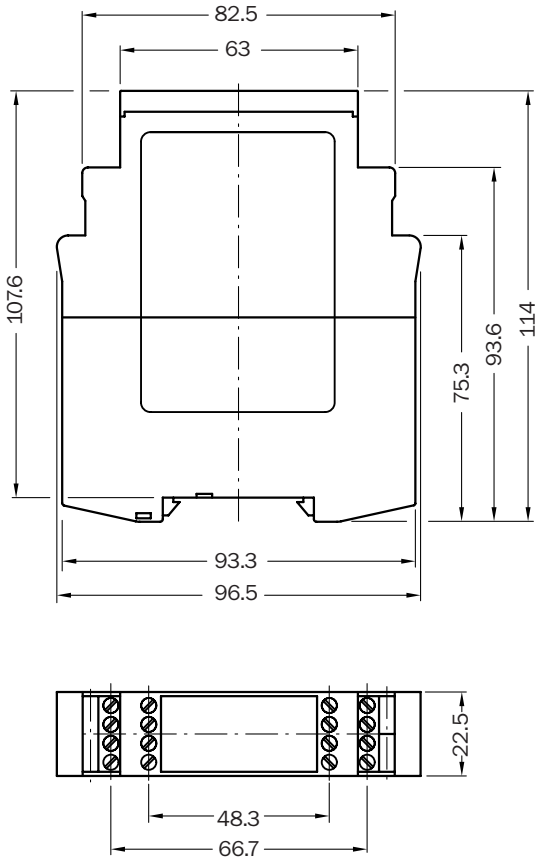
- For ESPEs: S33 - S35 must be linked
- For applications with potential free contacts on the input circuit S12 - S35 must be linked.

**Cross circuit detection**

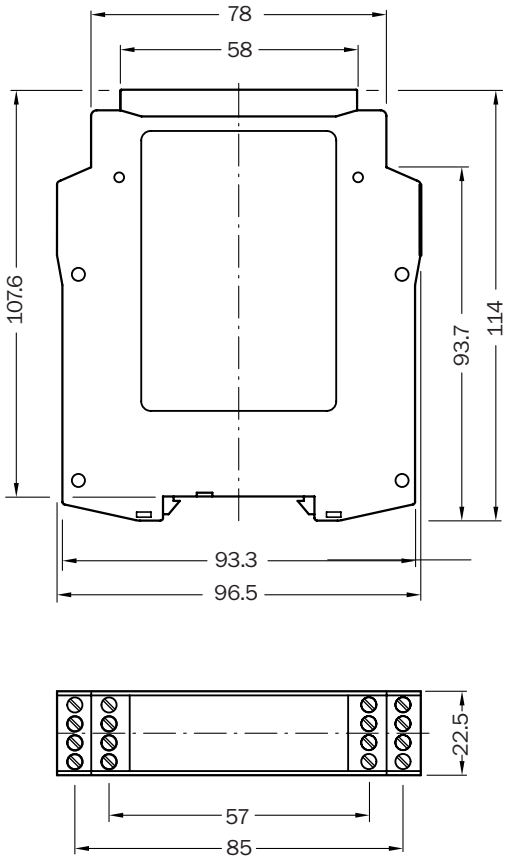
Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.


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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

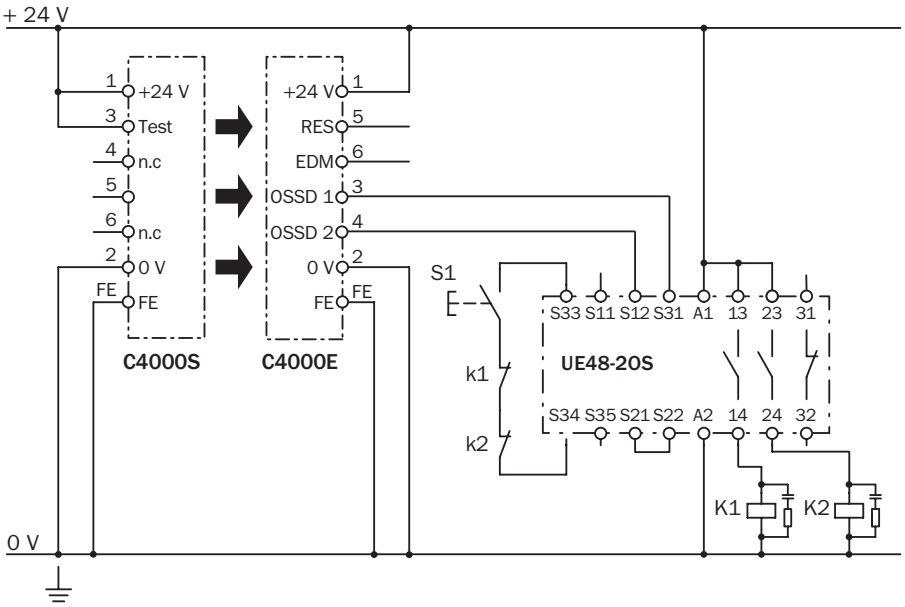
Dimensions in mm

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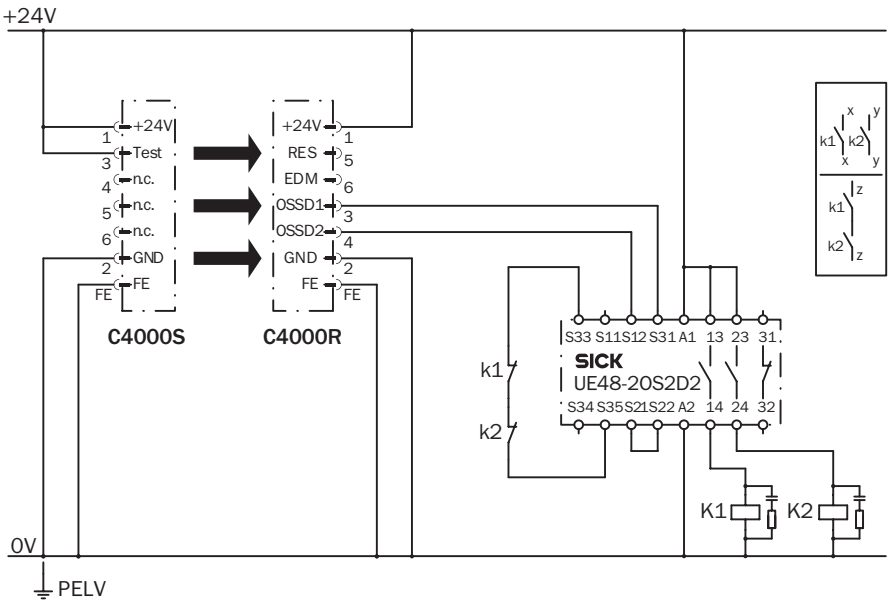
# Connection diagrams

## Safety light curtain C4000 Basic to UE48-20S safety relay




Operating mode: with manual reset and external device monitoring (EDM)

## Safety light curtain C4000 Standard / Advanced light curtain connected to UE48-20S safety relay



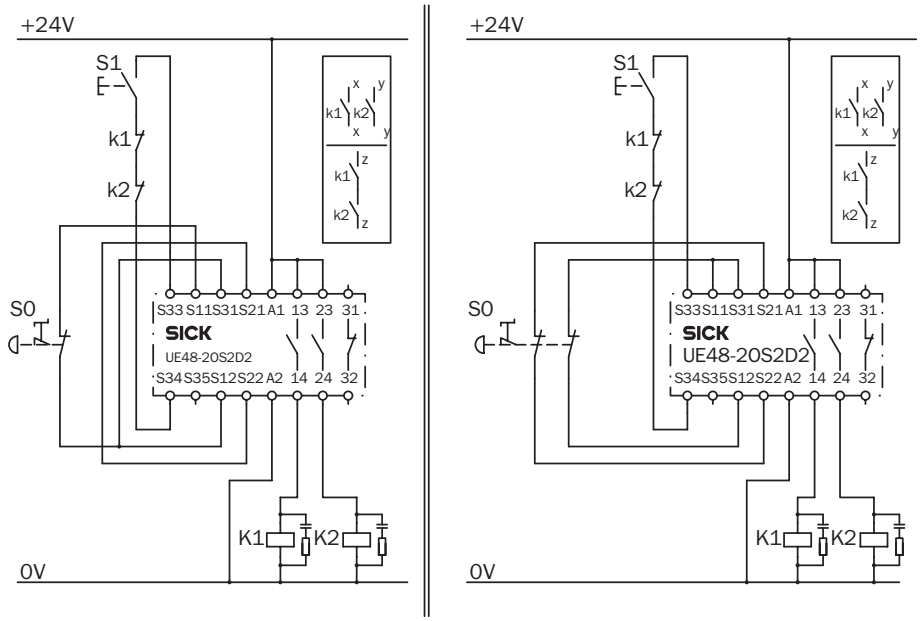

Operating mode: with manual reset and external device monitoring (EDM)

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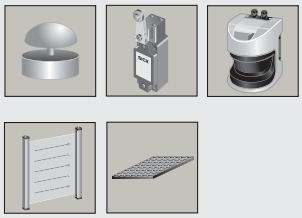
## Emergency stop circuit with UE48-20S safety relay




Operating mode: with manual reset and external device monitoring (EDM)

N


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- For emergency stops
- For safety switches
- For safety laser scanners
- For safety light curtains
- For non-contact safety switches
- For pressure sensitive mats in accordance with EN 1760 using 4-wire technology

3

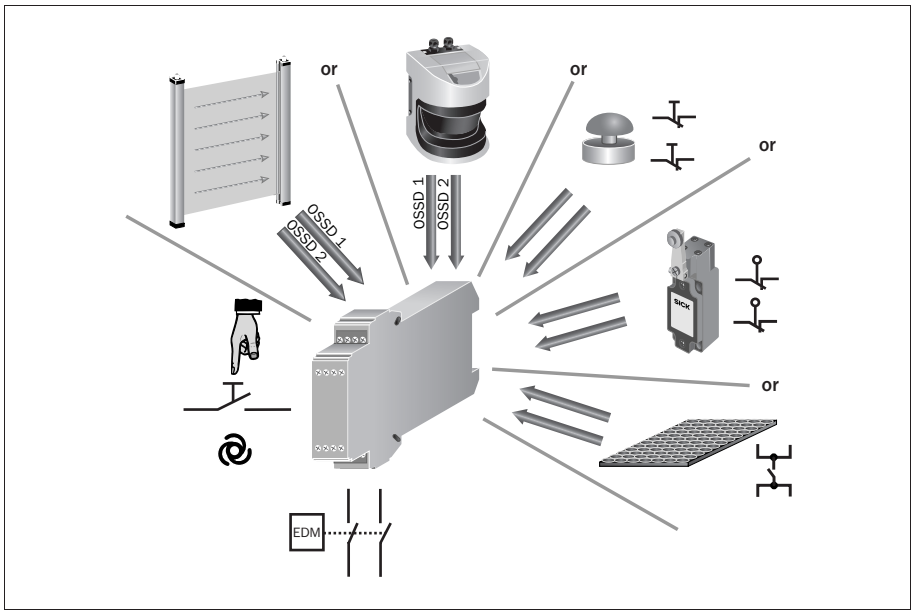
## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 4 |
| **Number of enable current paths/signalling current paths** | 3 / 0 |
| **Input circuit** | Single- or dual-channel |
| **Housing width** | 22.5 mm |

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K1
  - Relay K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications




## In-system added value

Units employing monitored semiconductor outputs (OSSD), such as

- FGS
- PLS
- C2000
- M2000
- C4000
- S3000
- LSI
- M4000
- T4000 Compact

N


| Further information | Page |
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| → Symbols | N-2 |
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| → Expansion modules | N-71<br>N-74 |
| → Services | A-2 |




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# Ordering information

| Connection type | Type | Part number |
|---|---|---|
| Screw-type terminals | UE48-3OS2D2 | 6025089 |
| Plug-in terminals | UE48-3OS3D2 | 6025097 |

# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 |
| **Category according to EN 954** | 4 |
| **Stop category according to EN 60204** | 0 |
| **Supply voltage $V_S$ (A1 / A2)** | 24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC) |
| **Power consumption** | |
| **AC mode** | 4.6 VA |
| **DC mode** | 2.1 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **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 |
| **Short-circuit current between S33 / S11 and S21** | 300 mA |
| **Fuse** | Electronic fuse |
| **Reaction time by cross connection** | 50 ms |
| **Activation time upon detection of cross connection** | 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 S12 and S31 / S22** | 40 mA ... 100 mA |
| **Input current S34 / S35** | 5 mA ... 50 mA |
| **Reset time** | |
| **Manual (S34)** | 40 ms |
| **Automatic (S35)** | 80 ms |
| **Activation time of 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 Ω |

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## Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

| | |
|---|---|
| **Response time (K1 / K2)** | 25 ms |
| **Minimum time outputs will stay off** | 70 ms ... 130 ms |
| **Relay contacts** | 3 N/O, enable current paths, safety relevant |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching current** | 10 mA ... 6 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h)<br>AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | DIN EN 61000-6-4 |
| **Screening against interference** | DIN EN 61000-6-2 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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 $mm^2$ |

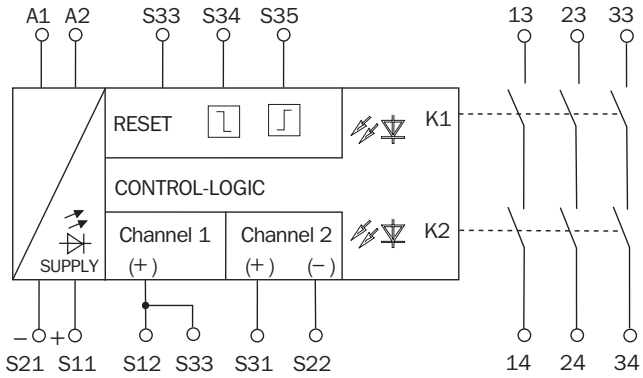
| | |
|---|---|
| **Weight** | 0.2 kg |

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# Internal circuitry




**Function**

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 optoelectronic protective device 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) effects the opening of the normally open contacts (LED K1 and K2 off).

**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 ESPEs: S33 - S35 must be linked.
- For applications with potential free contacts on the input circuit S12 - S35 must be linked.

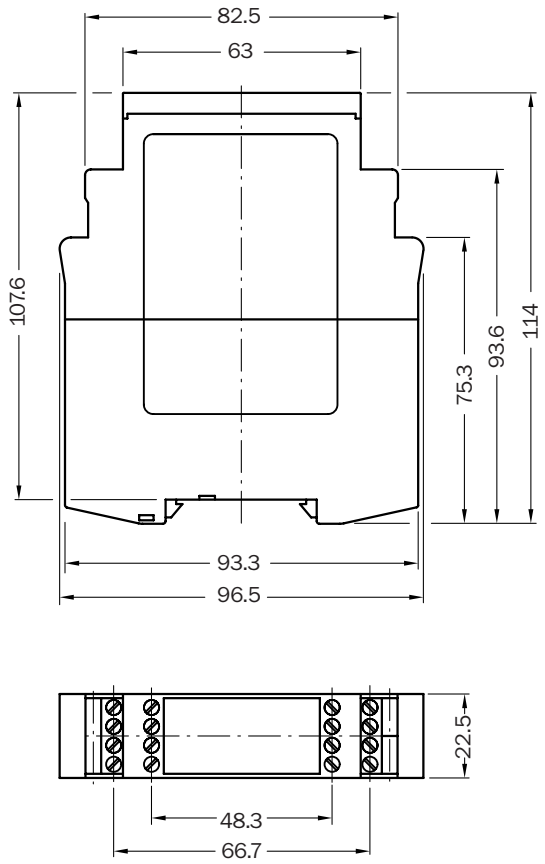
**Cross circuit detection**

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

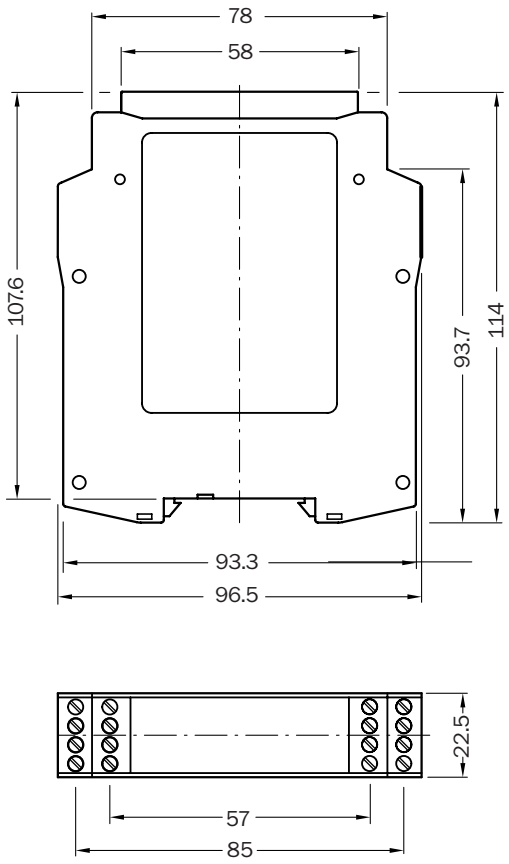
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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

Dimensions in mm

## Connection diagrams

➜ Connection diagrams see safety relay UE48-2OS starting on page N-46

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## Overview of technical specifications

| | |
|---|---|
| **Category** | 4 (EN 954-1) |
| **Number of enable current paths (depending on type)** | 2 / 3 |
| **Number of signalling current paths** | 1 / 0 |
| **Muting** | ✔ |
| **Number of muting sensors** | 2, 4 |
| **Supply voltage** | 24 V DC |
| **Enclosure rating** | IP 20 |






- Muting module for electrosensitive protective equipment (ESPE)
- Meets requirements up to category 4 according to EN 954-1
- Connection of 2 resp. 4 muting sensors
- Integrated override function
- Automatic reset
- Manual reset
- Muting functions by operating mode selector switch

## Product description

UE49 muting modules are intended for use on: Electrosensitive protective equipments (ESPE) with monitored active switching outputs (OSSD), two-channel, complying with EN 61496-1.
They enable protective operation with or without the muting function.
In protective operation with muting, the muting module differentiates between conveyed goods and persons. The ESPE permits certain objects to penetrate into the hazardous area without the dangerous movement being switched off, whereas persons are excluded.
The operating modes are selected using a rotary switch. In all operating modes, there is detection of wire breakage at the ESPE connections, and detection, with visual signal, of over and low voltage is also available. In addition, there is a connection for a monitored reset button.

## In-system added value

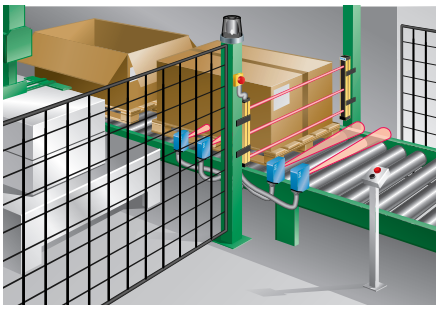
Devices employing monitored semiconductor outputs (OSSD), such as

- M2000
- MSL
- C4000
- C2000
- FGS
- S3000

## Applications

➜ You can find more applications using the application finder at www.sickusa.com/applications

- Automotive industry
- Robotic
- Machining centres
- Palletizers
- Packaging machinery
- Stone setting machinery
- Stackers
- Timber industry
- Textile industry



Access protection with differentiation between man and material (muting)

N

| Further information | Page |
|---|---|
| ➜ Ordering information | N-54 |
| ➜ Technical specifications | N-54 |
| ➜ Internal circuitry | N-55 |
| ➜ Dimensional drawings | N-56 |



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## Ordering information

| Number of enable current paths | Number of signalling current paths | Model Name | Part number |
|---|---|---|---|
| 2 | 1 | UE49-2MM3D3 | 6025098 |
| 3 | – | UE49-3MM3D3 | 6025099 |

## Detailed technical specifications

| | UE49-2MM3D3 | UE49-3MM3D3 |
|---|---|---|
| **Category** | 4 (EN 954-1) | |
| **Voltage supply to A1 / A2**<br>**Output circuit > 25 V AC / 60 V DC**<br>**Output circuit < 25 V AC / 60 V DC** | <br>PELV<br>PELV or SELV | |
| **Supply voltage $V_S$** | 24 V DC (20.4 V DC ... 27.6 V DC) | |
| **Ripple** | ±10 % (within limits of $V_S$) | |
| **Maximum power consumption** | 4 W (signal outputs not loaded) | |
| **Reset time (manual reset)** | Max. 55 ms | |
| **Reset time (automatic reset)** | Max. 65 ms | |
| **Concurrence monitoring time** | Max. 220 ms | |
| **Maximum cable length** | 100 m | |
| **Maximum cable resistance** | 25 Ω | |
| **Number of enable current paths** | 2 | 3 |
| **Number of signalling current paths** | 1 | – |
| **Maximum response time** | 70 ms | |
| **Maximum switching current** | 5 A | |
| **Maximum total current** | 15 A | |
| **Usage category** | AC-15/DC-13 | |
| **Rated operating current (voltage)**<br>**N/C contacts**<br>**N/O contacts** | <br>2 A (230 V AC), 8 A (24 V DC) 0.1 Hz<br>3 A (230 V AC), 8 A (24 V DC) 0.1 Hz | <br>–<br>3 A (230 V AC), 8 A (24 V DC) 0.1 Hz |
| **Maximum switching sequence** | 1200 switching cycles/h | |
| **Short-circuit protection** | 6A GL (EN 60947-5-1), C 8 A | |
| **Mechanical life (relay contacts)** | 1 x $10^7$ switching cycles | |
| **Electrical life (relay contacts)** | 1 x $10^5$ switching cycles (to AC 15 at 2 A, 230 V AC) | |
| **Overvoltage category** | III | |
| **Enclosure rating**<br>**terminals**<br>**housing** | <br>IP 20<br>IP 40 | |
| **Interference emission** | EN 61000-6-2 | |
| **Interference resistance** | EN 55011, Class B | |
| **Ambient operating temperature from ... to** | 0 °C ... +50 °C | |
| **Storage temperature from ... to** | –20 °C ... +70 °C | |
| **Connection type** | Screw-terminal connector | |
| **Dimensions (W x H x D)** | 45 mm x 74 mm x 121 mm | |

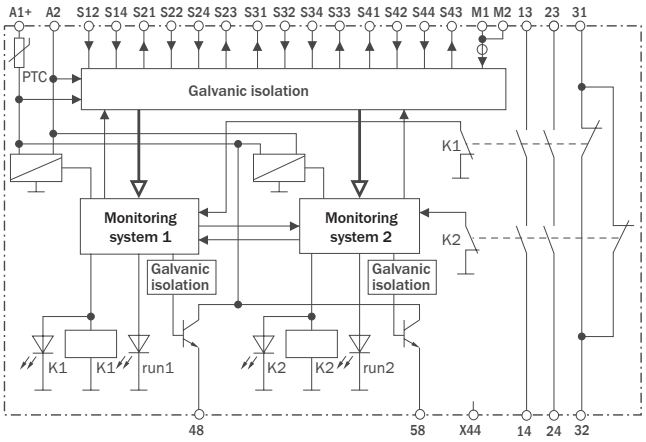
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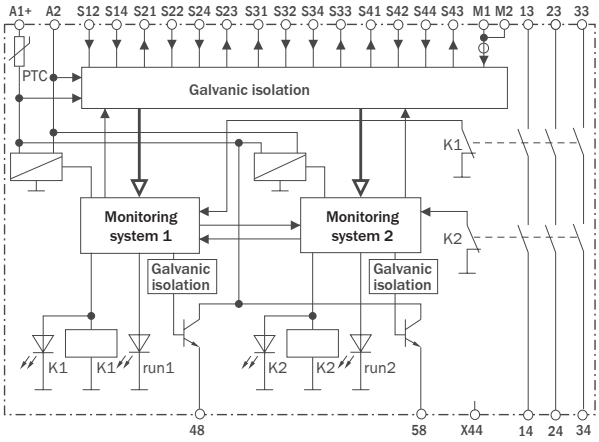
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# Internal circuitry

### UE49-2MM3D3




### UE49-3MM3D3




**Function**

UE49-2MM and UE49-3MM muting modules meet safety-specific requirements up to category 4 (EN 954). Connected command units and safety sensors, subsequent controls, their wiring and installation must also comply with this category as defined in EN 954.

The muting function is employed when certain objects, e.g. material pallets, are permitted to pass into the hazardous area. For the duration of this transport through the safety light beams, it suppresses monitoring by the ESPE.

For the period during which the material is being transported, muting sensors detect its presence. By careful choice of the type of sensors and their arrangement, it is possible to distinguish between objects and persons. To this end, two or four muting sensors can be connected to the muting module.

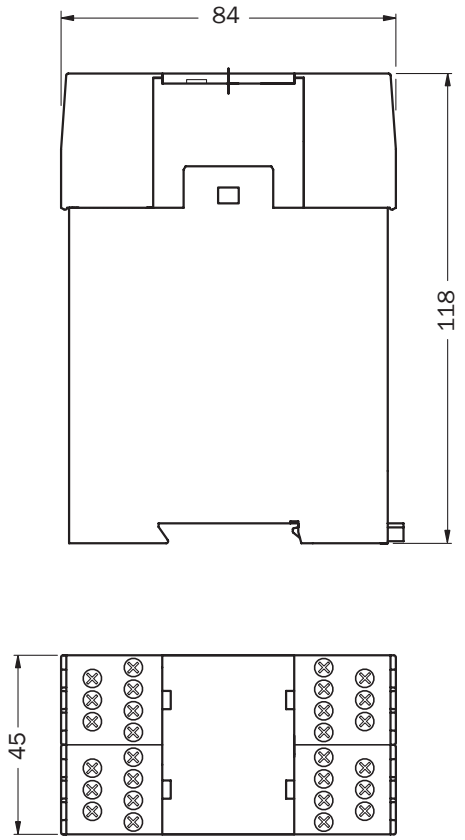
As it interacts with the muting sensors and ESPE, the conveyed object produces a precisely-defined signal sequence as it passes the hazardous area. So as to ensure that the entry of a person to the ESPE will always result in the dangerous movement being switched off, it must not be possible for a person to generate the same signal sequence as a conveyed object.

During the muting condition, the muting lamp, which is monitored by the device, is illuminated. The maximum permitted duration of the muting condition can be set in steps between 10 seconds and 8 hours, or be completely deactivated. During the muting cycle, an error in the sequence of muting signals or exceeding the permissible muting duration results in a FAULT. A release by pressing the reset button is only permitted when the muting sensors are quiescent, the muting lamp is not defective, and the ESPE that is to be bypassed is free.

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## Dimensional drawings




Dimensions in mm

N


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## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 2 |
| **Type of connectable optoelectronic protective devices** | C2000, M2000, single-beam photoelectric safety switches |
| **Number of connectable C2000, M2000 systems** | 3 (cascaded) |
| **Number of connectable single-beam photoelectric safety switches** | 1 ... 6 |
| **Number of safe outputs (OSSDs)** | 2 |
| **Maximum switching current** | 500 mA |
| **Response time** | 14 ms |

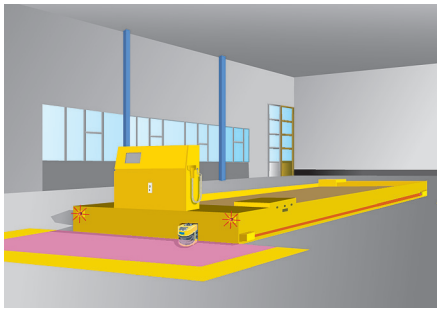
## Product description

- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable

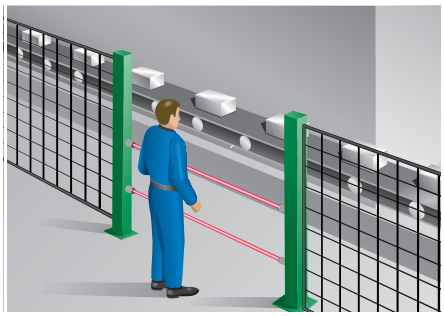
## In-system added value

Evaluation unit for:
- C2000
- M2000
- Up to 6 testable single-beam photoelectric safety switch pairs

## Applications



Hazardous area protection using the VS/VE18 and the LE20 on an automated guided vehicle (AGV)



Access protection with VS/VE18 and LE20

## Ordering information

| Connection type | Enclosure rating | Type | Part number |
|---|---|---|---|
| Screw terminal connector | IP 20 | LE20-2612 | 1016503 |
| | IP 65 | LE20-1612 | 1016500 |
| Spring clamp terminal connector | IP 20 | LE20-2614 | 1016505 |
| | IP 65 | LE20-1614 | 1016499 |






- Restart interlock
- External device monitoring (EDM)
- Self testing
- 7-segment diagnostic display

N

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# Detailed technical specifications

## Electrical data

| | |
|---|---|
| **Supply voltage $V_S$** | 24 V DC –30 %/+20 %, 5 % ripple [1)] |
| **Power-up delay (after power On)** | 2 s approx. |
| **Current consumption $I_{max}$** | 100 mA |
| **Power consumption** | 4 W |
| **Response time** | 5 ms |
| **Response time of entire system (dependent on system configuration)** | To be calculated from the following values:<br>▪ C2000/M2000: approx. 7 ms to 25 ms, dependent on protective field height and resolution<br>▪ Single-beam photoelectric safety switches: max. 9 ms<br>▪ LE20: 5 ms<br>▪ Relay module: 5 ms |
| **Response time for test input** | Max. 30 ms |
| **Reset time** | Max. 50 ms |
| **Connecting cables** | 0.5 $mm^2$, length max. 30 m<br>2.5 $mm^2$, length max. 150 m |
| **Inputs: signal level on/off** | HIGH: 15 V ... $V_S$<br>LOW: 0 V ... 10 V |
| **Test extern** | HIGH: external test inactive<br>LOW: external test active<br>Pulse duration > 30 ms |
| **Self-test cycle time** | 2 s |

## Outputs

| | |
|---|---|
| **Outputs OSSD 1, OSSD 2 (the levels refer to connection to the system connector)** | PNP, monitored and short-circuit-proof |
| **Switching current $I_{max}$** | 500 mA |
| **Switching voltage $V_{max}$** | $V_S$ – 2.0 V at 500 mA |
| **Switching capacity $P_{max}$** | 13.2 W |
| **Inductive switching capacity $P_{max\ ind}$** | 1 VA |
| **Protective field free V** | $V_{max}$ |
| **Protective field interrupted V** | 0 V |
| **Residual current at signal level "0" I** | 0.1 mA |
| **Max. capacitive load** | 200 nF at I: 50 mA<br>2.5 µF at I: 500 mA |
| **Test period test rate** | 2 s |
| **Test pulse width** | 150 µs approx. |
| **Test A, Test B (inactive/active)** | $V_S$ – 2.65 V/0 V<br>Total current Test A + Test B < 10 mA<br>Max. capacitive load 10 µF |

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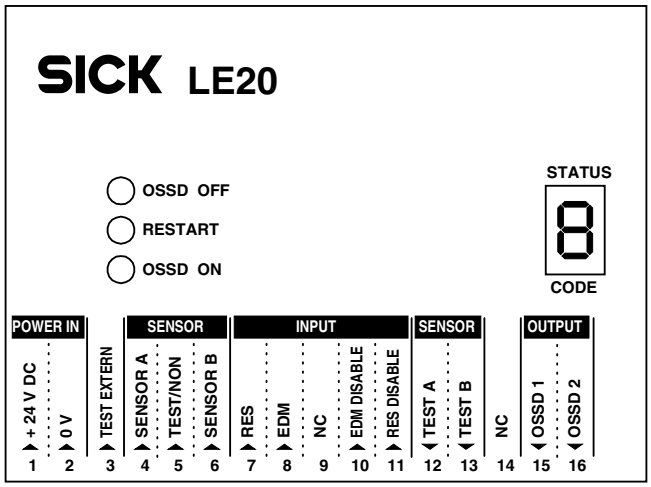
### Operating data

| | |
|---|---|
| **Protection class** | III [2] |
| **Enclosure rating** | IP 20, IP 65 optional |
| **Type according to EN 61496** | Type 2 |
| **Ambient operating temperature** | –20 °C ... +60 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Air humidity (non condensing)** | 15 % ... 95 % |
| **Vibration resistance** | 5g, 10 Hz ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |

[1] The upper and lower supply voltage limits must not be infringed.
The external voltage supply to the devices must be capable of withstanding a short-term power failure of 20 ms in accordance with EN 60204.
Suitable power supply units are available from SICK as accessories

[2] The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

## Internal circuitry

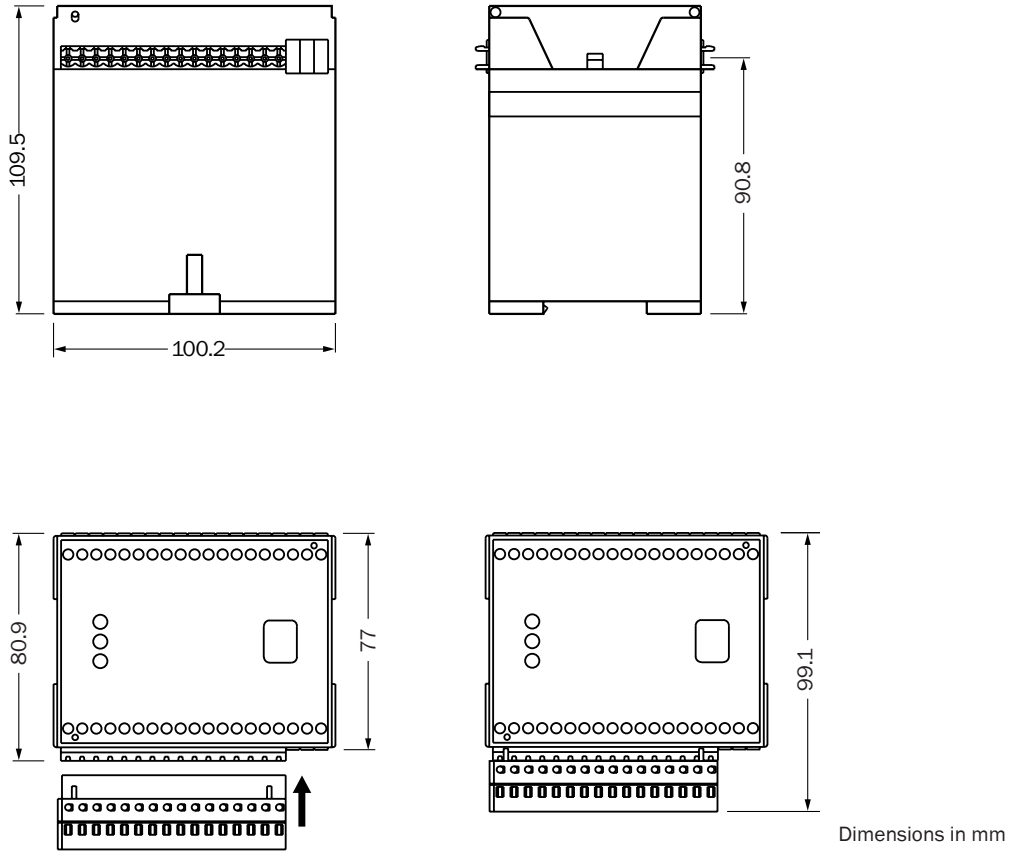



The LE20 safety evaluation unit is able to carry out a periodic safety test of the connected photoelectric switches, and provides the photoelectric switch system with the additional reset interlock and external device monitoring safety functions.

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## Dimensional drawings

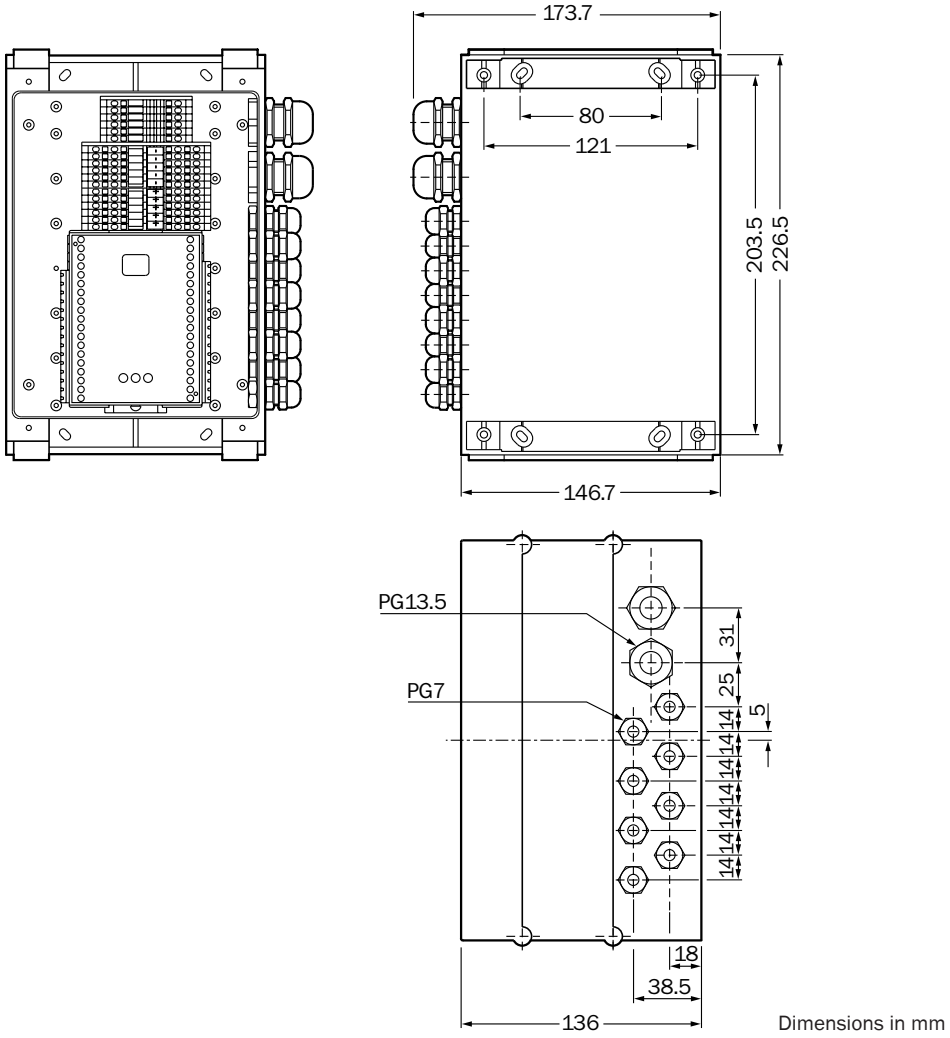



Dimensions in mm

Mechanical dimensions, LE20 with screw clamps, IP 20

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Dimensions in mm

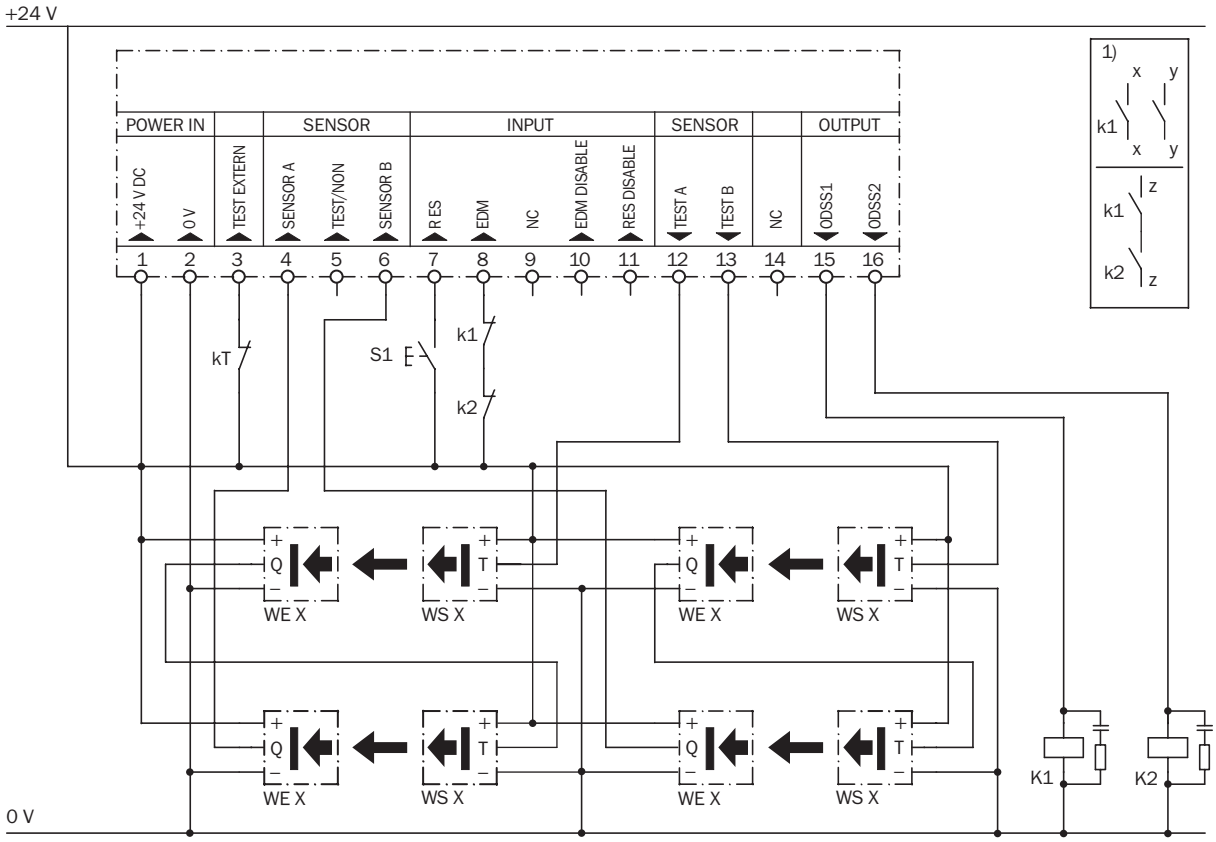
Mechanical dimensions, IP 65 housing for LE20

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# Connection diagrams

## Safety relay LE20 with 4 single-beam photoelectric safety switches WS/WE27-2, WS/WE18-2 or WS/WE12-2




These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

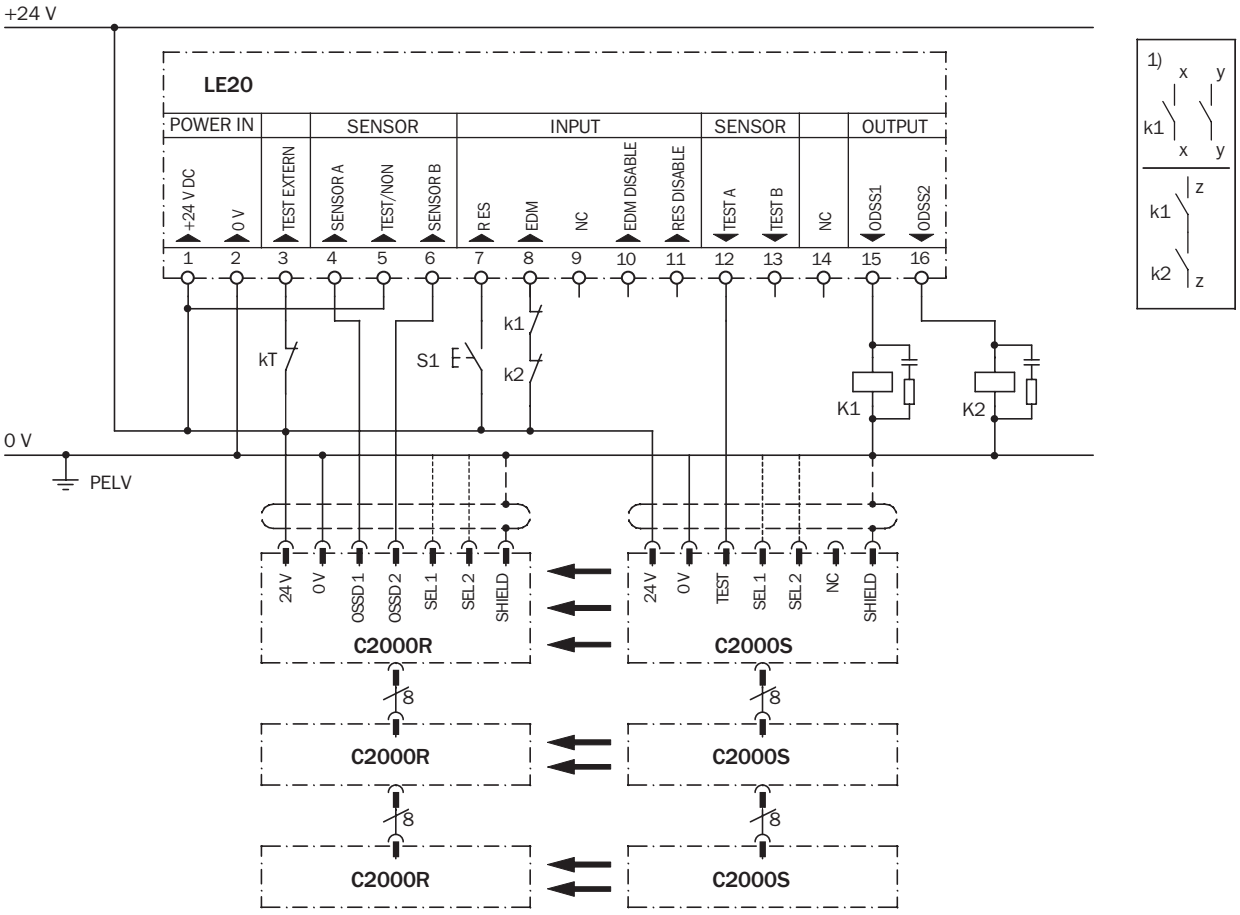
In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

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## Safety relay LE20 with a cascade: C2000 - C2000 - C2000




These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

# Ordering information accessories

**Interfaces**

| Description | Connection type | Type | Part number |
|---|---|---|---|
| Safety relay UE10-2OS | With screw terminal connector | UE10-2OS2D0 | 2019772 |
| | With spring clamp terminal connector | UE10-2OS4D0 | 2019771 |

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- Muting
- Restart interlock
- External device monitoring (EDM)
- Self testing
- 7-segment diagnostic display

## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | 2 |
| **Type of connectable optoelectronic protective devices** | C2000, M2000, single-beam photoelectric safety switches |
| **Number of connectable C2000, M2000 systems** | 3 (cascaded) |
| **Number of connectable single-beam photoelectric safety switches** | 1 ... 6 |
| **Number of safe outputs (OSSDs)** | 2 |
| **Maximum switching current** | 500 mA |
| **Response time** | 14 ms |

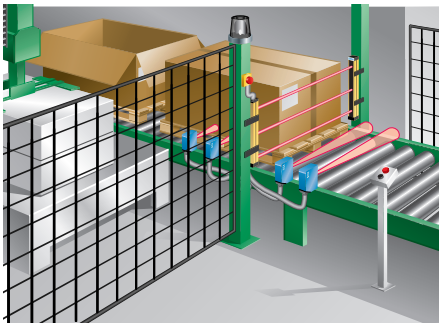
## Product description

- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable
- Up to 4 muting inputs, sensor or PLC signals possible
- Muting monitoring functions: sequence and concurrence operation possible
- Integrated override function

## In-system added value

Evaluation unit for:
- C2000
- M2000
- Up to 6 testable single-beam photoelectric safety switch pairs

## Applications



Access protection with differentiation between man and material (muting)

## Ordering information

| Connection type | Enclosure rating | Type | Part number |
|---|---|---|---|
| Screw terminal connector | IP 20 | LE20-2622 | 1016502 |
| | IP 65 | LE20-1622 | 1016498 |
| Spring clamp terminal connector | IP 20 | LE20-2624 | 1016501 |
| | IP 65 | LE20-1624 | 1016497 |

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# Detailed technical specifications

## Electrical data

| | |
|---|---|
| **Supply voltage $V_S$** | 24 V DC –30 %/+20 %, 5 % ripple [1)] |
| **Power-up delay (after power On)** | 2 s approx. |
| **Current consumption $I_{max}$** | 150 mA |
| **Power consumption** | 4 W (without muting and override lamps) |
| **Response time** | 5 ms |
| **Response time of entire system (dependent on system configuration)** | To be calculated from the following constants:<br>▪ C2000/M2000: approx. 7 ms to 25 ms, dependent on protective field height and resolution<br>▪ Single-beam photoelectric safety switches: max. 9 ms<br>▪ LE20: 5 ms<br>▪ Relay module: 5 ms |
| **Response time for test input** | Max. 30 ms |
| **Reset time** | Max. 50 ms |
| **Connecting cables** | 0.5 $mm^2$, length max. 30 m<br>2.5 $mm^2$, length max. 150 m |
| **Inputs: signal level on/off** | HIGH: 15 V ... $V_S$<br>LOW: 0 V ... 10 V |
| **Test extern** | HIGH: external test inactive<br>LOW: external test active<br>Pulse duration > 30 ms |
| **Concurrence monitoring** | Time window selectable: 3 s or ∞ |
| **Self-test cycle time** | 2 s |

## Outputs

| | |
|---|---|
| **Outputs OSSD 1, OSSD 2 (the levels refer to connection to the system connector)** | PNP, monitored and short-circuit-proof |
| **Switching current $I_{max}$** | 500 mA |
| **Switching voltage $V_{max}$** | $V_S$ – 2.0 V at 500 mA |
| **Switching capacity $P_{max}$** | 13.2 W |
| **Inductive switching capacity $P_{max\ ind}$** | 1 VA |
| **Protective field free V** | $U_{max}$ |
| **Protective field interrupted V** | 0 V |
| **Residual current at signal level "0" I** | 0.1 mA |
| **Max. capacitive load** | 200 nF bei I = 50 mA<br>2.5 µF bei I = 500 mA |
| **Test period test rate** | 2 s |
| **Test pulse width** | 150 µs approx. |
| **Test A, Test B (inactive/active)** | $V_S$ – 2.65 V/0 V<br>Total current Test A + Test B < 10 mA<br>Max. capacitive load 10 µF |
| **Override lamp** | 24 V DC, 1 ... 10 W |
| **Lamp 1, 2** | 24 V DC, 1 ... 10 W |

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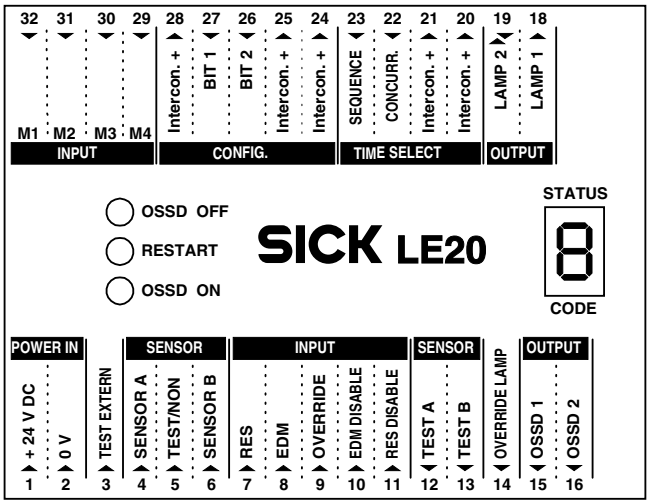
### Operating data

| | |
|---|---|
| **Protection class** | III [2] |
| **Enclosure rating** | IP 20, IP 65 optional |
| **Type according to EN 61496** | Type 2 |
| **Ambient operating temperature** | –20 °C ... +60 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Air humidity (non condensing)** | 15 % ... 95 % |
| **Vibration resistance** | 5g, 10 Hz ... 55 Hz according to IEC 60068-2-6 |
| **Shock resistance** | 10 g, 16 ms according to IEC 60068-2-29 |

[1] The upper and lower supply voltage limits must not be infringed.
The external voltage supply to the devices must be capable of withstanding a short-term power failure of 20 ms in accordance with EN 60204.
Suitable power supply units are available from SICK as accessories

[2] The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

## Internal circuitry



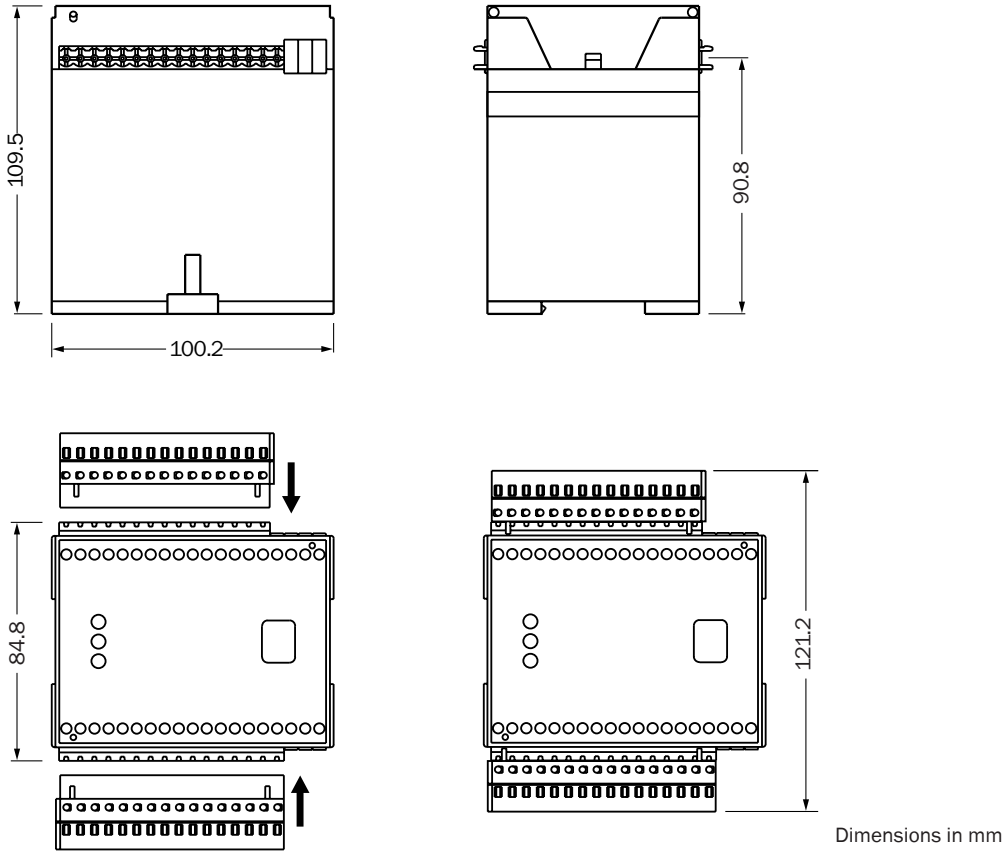

The LE20 safety evaluation unit is able to carry out a periodic safety test of the connected photoelectric switches, and provides the photoelectric switch system with the additional reset interlock and external device monitoring safety functions.

The expanded LE20 Muting version uses additional muting sensors to distinguish objects entering the hazardous area past the photoelectric switches from human beings, and allows the objects to pass without stopping the machine.

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## Dimensional drawings



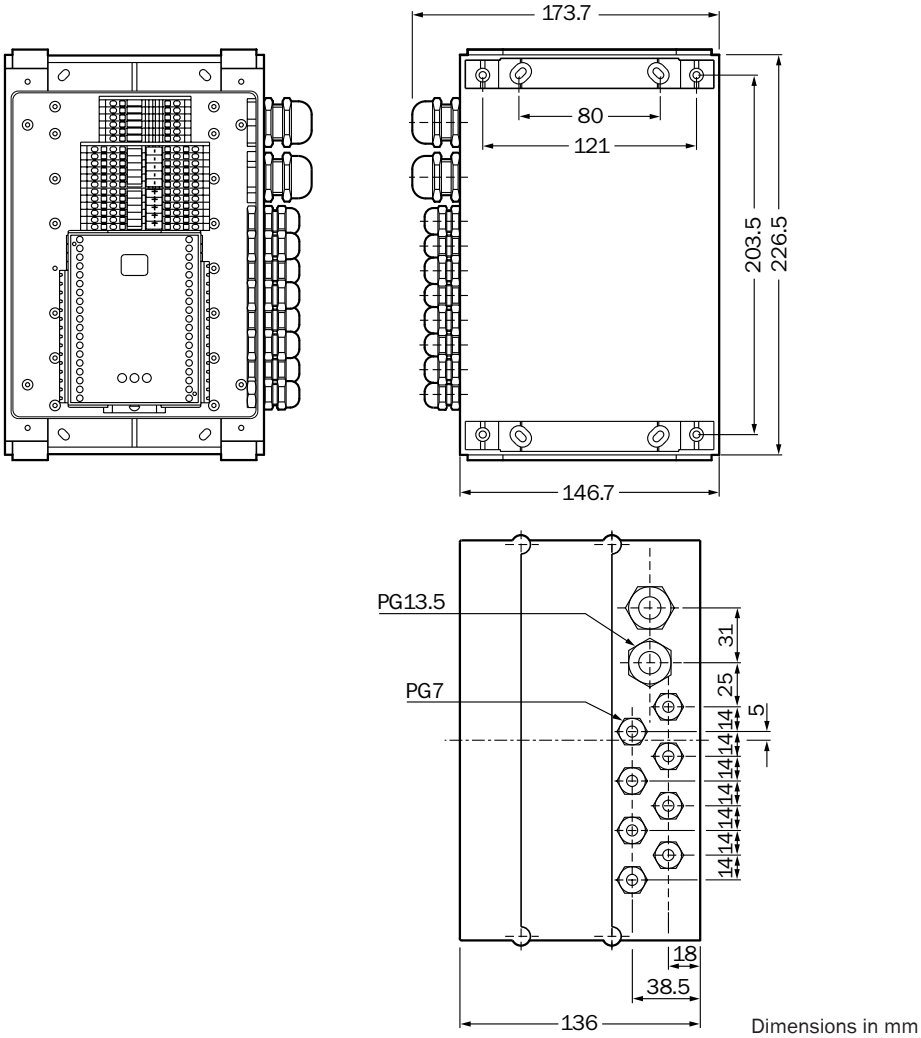

Dimensions in mm

Mechanical dimensions, LE20 Muting with screw clamps, IP 20

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Dimensions in mm

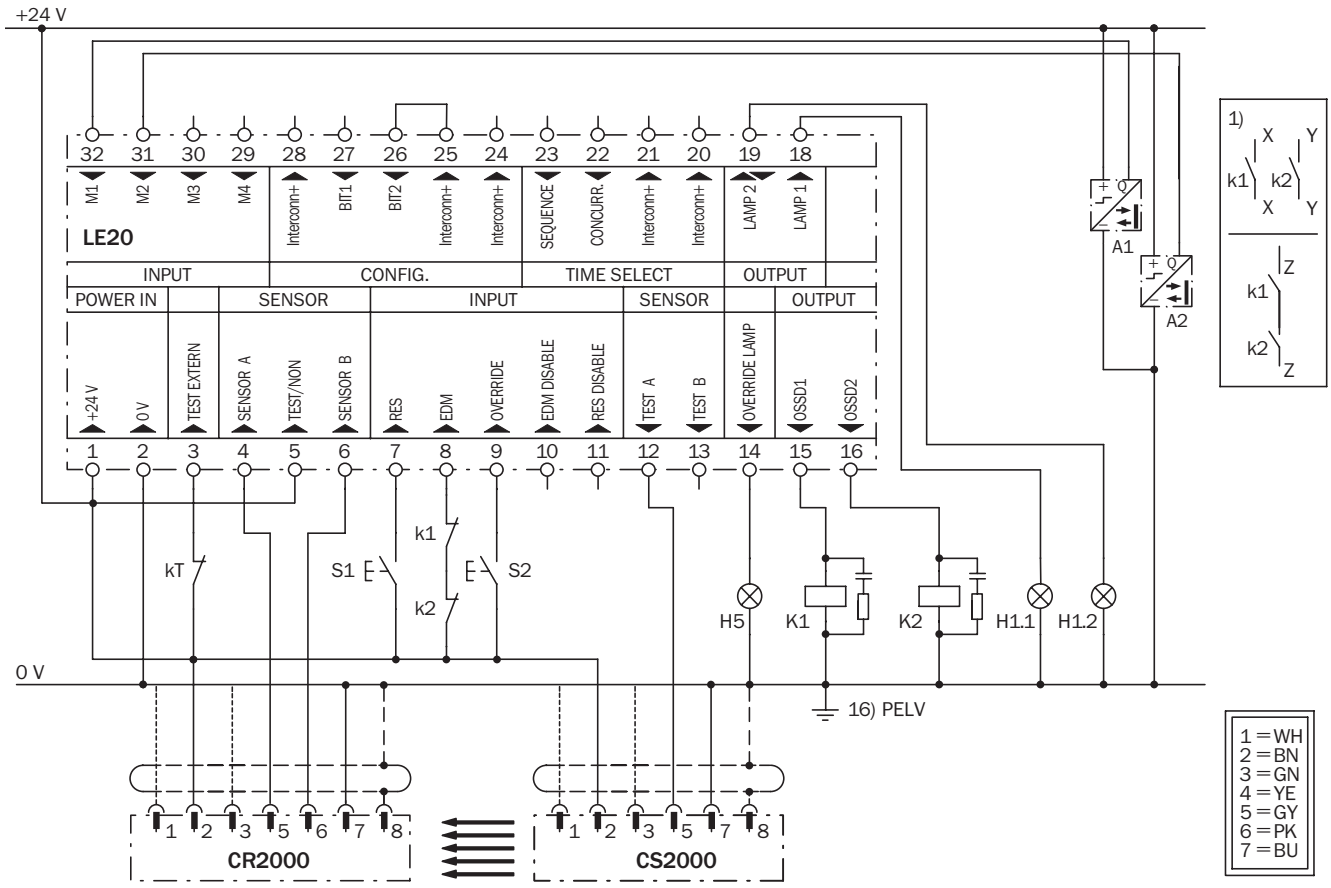
Mechanical dimensions, IP 65 housing for LE20 Muting

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# Connection diagrams

## Safety relay LE20 Muting with C2000, 2 muting sensors and 2 muting indicator lamps




These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

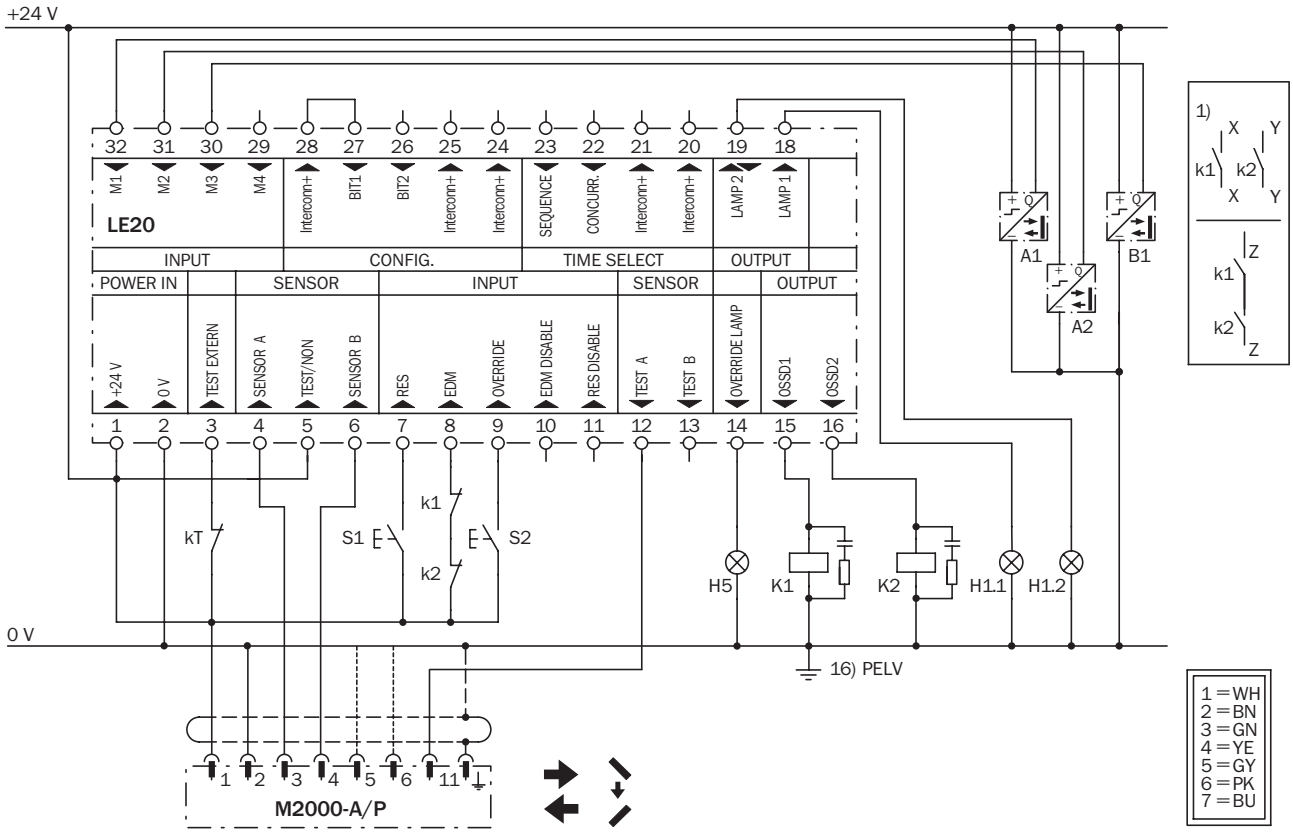
In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

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## Safety relay LE20 Muting with M2000-A/P and 3 muting sensors




These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

# Ordering information accessories

### Interfaces

| Description | Connection type | Type | Part number |
|---|---|---|---|
| Safety relay UE10-2OS | ▪ With screw terminal connector | UE10-2OS2D0 | 2019772 |
| | ▪ With spring clamp terminal connector | UE10-2OS4D0 | 2019771 |

### Muting indicator lamps

| Description | Delivery/cable length | Part number |
|---|---|---|
| Muting indicator lamp, bulp | ▪ Including mounting kit | 2020743 |
| Muting indicator lamp, LED lamp | ▪ Cable length 2 m | 2019909 |
| | ▪ Cable length 10 m | 2019910 |

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## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | Same as main unit |
| **Number of enable current paths** | 4 |
| **Number of signalling current paths** | 2 |
| **Housing width** | 22.5 mm |

## Product description

- The UE10-4XT expansion module serve to:
  - Increase the number of output contacts of a main unit
  - N/C contact for external device monitoring (EDM)
- 2 LEDs:
  - Relay K1
  - Relay K2
- Available with plug-in terminals (key coded)

## In-system added value

- Applicable with UE10–UE48 units

## Ordering information

| Connection type | Type | Part number |
|---|---|---|
| Screw-type terminals | UE10-4XT2D2 | 6024919 |
| Plug-in terminals | UE10-4XT3D2 | 6024920 |




- Expansion module
- External device monitoring (EDM)

4

2

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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 $V_S$ (A1 - A2)** | 24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC) |
| **Power consumption** | |
| **AC mode** | 2.7 VA |
| **DC mode** | 1.5 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **Nominal frequency in AC mode** | 50 Hz ... 60 Hz |
| **Switch-on time (upon 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 N/O, enable current paths, safety relevant<br>2 N/C, signalling current paths, not safety relevant<br>1 N/C, contactor monitoring |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage enable current paths** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching voltage contactor monitoring** | 10 V DC ... 24 V DC |
| **Switching current enable current paths** | 10 mA ... 6 A |
| **Switching current signalling current paths** | 10 mA ... 2 A |
| **Switching current contactor monitoring** | 10 mA ... 0.1 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 6 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | EN 60947-1 02/99 |
| **Screening against interference** | EN 60947-1 02/99 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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 $mm^2$ |

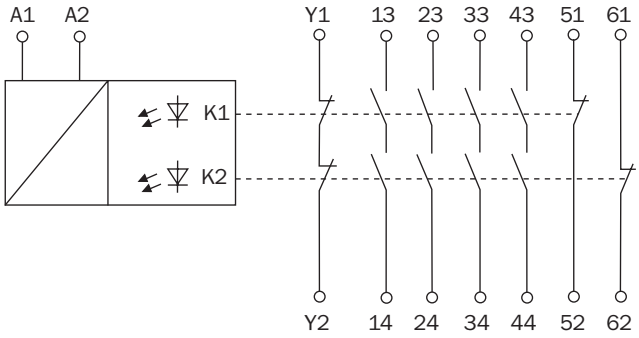
| | |
|---|---|
| **Weight** | 0.2 kg |

N



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## Internal circuitry




**Function**

The supply voltage of the expansion module is linked to an output contact of a main unit.

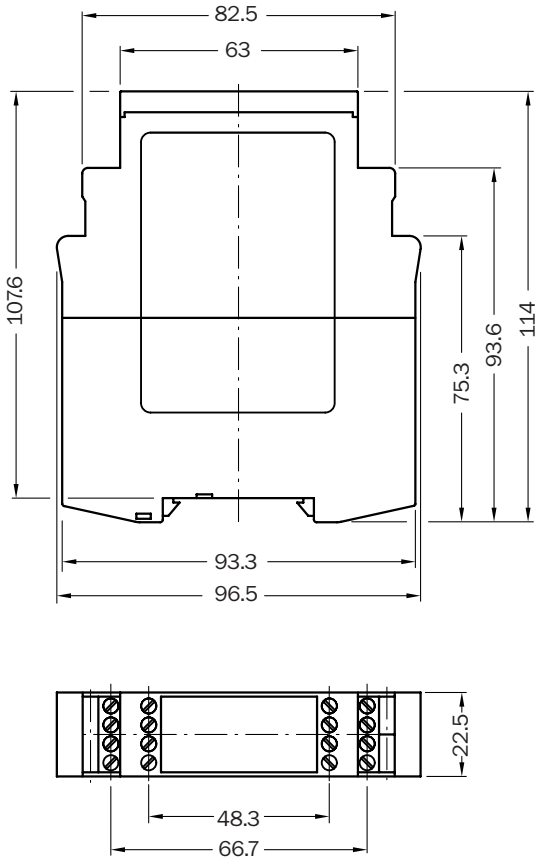
Upon applying the supply voltage to terminals A1 and A2, relays K1 and K2 are energised (the LEDs for both relays illu-minate): The 4 ouput contacts close, the two normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

When the output contacts of the standard unit opens (e.g. by activation of the emergency stop), the relays K1 and K2 de-energise: The normally open contacts open, and the two normally closed contacts close.

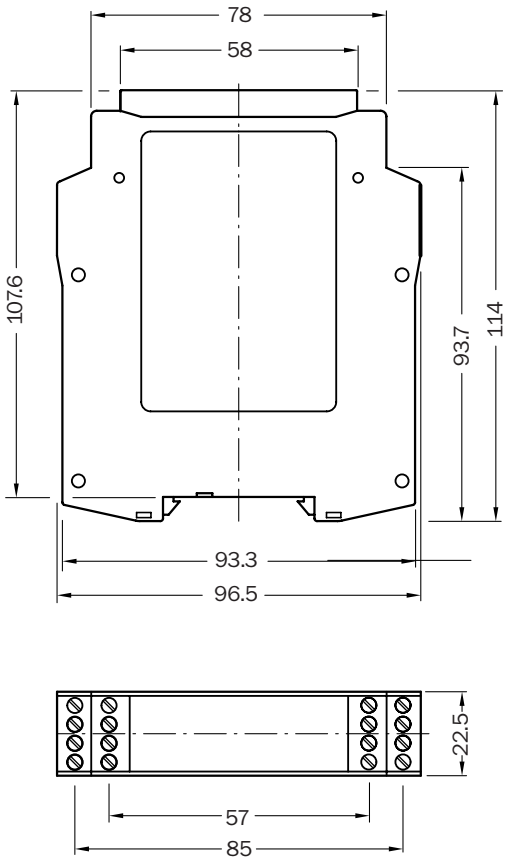
**External device monitoring (EDM)**

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-energise.

## Dimensional drawings




Housing with screw-type terminals

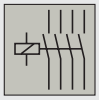



Housing with plug-in terminals

Dimensions in mm

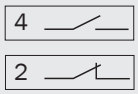
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- Expansion module
- External device monitoring (EDM)




## Overview of technical specifications

| | |
|---|---|
| **Category according to EN 954-1** | Same as main unit |
| **Number of enable current paths** | 4 |
| **Number of off-delayed normally open contacts** | 2 |
| **Housing width** | 22.5 mm |

## Product description

- The UE11-4DX expansion module serve to:
  - Increase the number of output contacts of a main unit
  - UE11-4DX has off-delayed outputs (0.5 s, 1 s, 2 s or 3 s, depending on model)
  - N/C contact for external device monitoring (EDM)
- 2 LEDs:
  - Relay K1
  - Relay K2
- Available with plug-in terminals

## In-system added value

- Applicable with UE10–UE48 units

## Ordering information

| Delay | Connection type | Type | Part number |
|---|---|---|---|
| 0.5 s | Screw-type terminals | UE11-4DX2D30.5 | 6024921 |
| | Plug-in terminals | UE11-4DX3D30.5 | 6024925 |
| 1 s | Screw-type terminals | UE11-4DX2D31 | 6024922 |
| | Plug-in terminals | UE11-4DX3D31 | 6024926 |
| 2 s | Screw-type terminals | UE11-4DX2D32 | 6024923 |
| | Plug-in terminals | UE11-4DX3D32 | 6024927 |
| 3 s | Screw-type terminals | UE11-4DX2D33 | 6024924 |
| | Plug-in terminals | UE11-4DX3D33 | 6024928 |

N


| Further information | Page |
|---|---|
| → Symbols | N-2 |
| → Internal circuitry | N-76 |
| → Dimensional drawings | N-77 |
| → Services | A-2 |




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# Detailed technical specifications

## General system data

| | |
|---|---|
| **Voltage supply 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 $V_S$ (A1 - A2)** | 24 V DC (20.4 V DC ... 26.4 V DC) |
| **Power consumption** | 2.0 W |
| **Residual ripple in DC mode (within the limits of $V_S$)** | 2.4 $V_{SS}$ |
| **Switch-on time (upon applying the supply voltage)** | 75 ms |

## Output circuits (17 - 18, 27 - 28, 37 - 38, 47 - 48, 55 - 56, 65 - 66, Y1 - Y2) off-delayed

| | |
|---|---|
| **Switch-off delay time (depending on type)** | 0.5 s, 1 s, 2 s or 3 s |
| **Influence of the supply voltage** | 0.5 (%/% $\Delta U_N$) |
| **Influence of ambient temperature** | 0.4 (%/K) |
| **Mean value of error (% + ± 10 ms)** | ± 20 |
| **Dispersion (% + ± 10 ms)** | ± 2 |
| **Relay contacts** | 4 N/O, enable current paths, safety relevant<br>2 N/C, signalling current paths, not safety relevant<br>1 N/C, contactor monitoring |
| **Contact type** | Positively guided |
| **Contact material** | Silver alloy; gold-plated |
| **Load capacity of contacts** | |
| **Switching voltage enable current paths** | 10 V AC ... 230 V AC / 10 V DC ... 30 V DC |
| **Switching voltage contactor monitoring** | 10 V DC ... 24 V DC |
| **Switching current enable current paths** | 10 mA ... 6 A |
| **Switching current signalling current paths** | 10 mA ... 2 A |
| **Switching current contactor monitoring** | 10 mA ... 0.1 A |
| **Total current across all contacts** | 12 A |
| **Application category according to EN 60947-5-1** | AC-15 $U_e$ 230 V AC, $I_e$ 6 A (3600 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h)<br>DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h) |
| **Permitted switching frequency** | 3600 c/h |
| **Service life, mechanical (relay contacts)** | 1 x $10^7$ switching cycles |
| **Service life, electrical (dependent on the load)** | 2 x $10^6$ switching cycles |

## Operating data

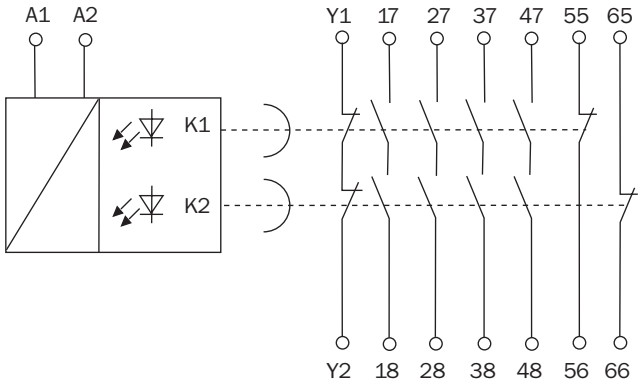
| | |
|---|---|
| **Surge voltage rating ($U_{Imp.}$)** | 4 kV |
| **Excess voltage category** | III |
| **Contamination rating of the unit (EN 50178)** | |
| **External** | 3 |
| **Internal** | 2 |
| **Voltage rating** | 300 V AC |
| **Test voltage $U_{eff}$ (50 Hz) EN 60439-1** | 2.0 kV |
| **Enclosure rating** | |
| **Housing** | IP 40 |
| **Terminals** | IP 20 |
| **Radio interference** | EN 60947-1 02/99 |
| **Screening against interference** | EN 60947-1 02/99 |
| **Ambient operating temperature** | –25 °C ... +55 °C |
| **Storage temperature** | –25 °C ... +75 °C |
| **Wire cross-sections** | |
| **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 (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 |

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## Internal circuitry




**Function**

The supply voltage of the expansion module is switched by way of a output contact of a standard unit.

Upon applying the supply voltage to terminals A1 and A2, relays K1 and K2 are energised (the LEDs for both relays illu-minate): The 4 output contacts close, the two 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 switch), the relays K1 and K2 de-energise after a unit specific delay. These fixed switch-off delay times of 0.5 s, 1 s, 2 s and 3 s are according to the type.

This is achieved by means of capacitors, so that even in the event of power supply failure the off-delay runs it full duration in each instance. Only after the delay period has expired do the relays K1 and K2 return to their neutral rest position. With the combination of UE11-4DX (with off-delayed) and a standard unit, stop category 1 (EN 418) can be realised.

**External device monitoring (EDM)**

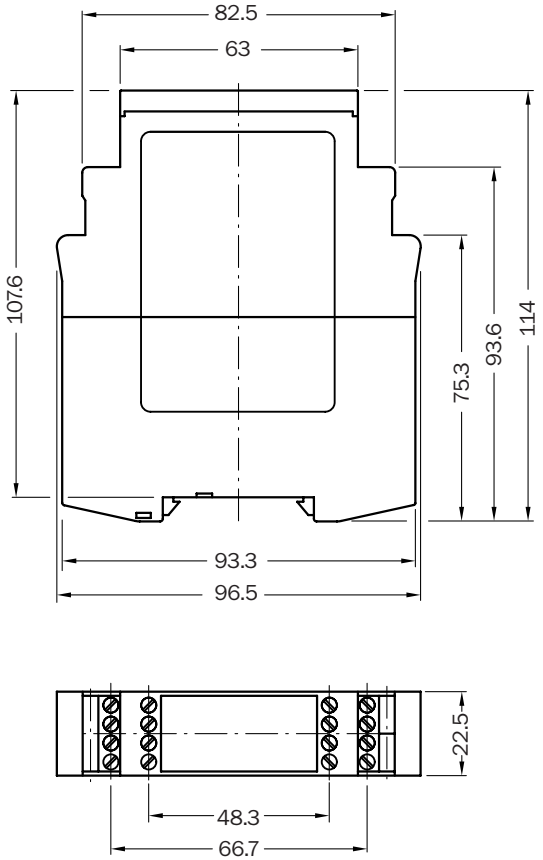
If external device monitoring is implemented in the upstream installed standard unit, then the normally closed contacts (Y1 - Y2) prevents the resetting of the standard unit, when K1 and/or K2 do not de-energise.

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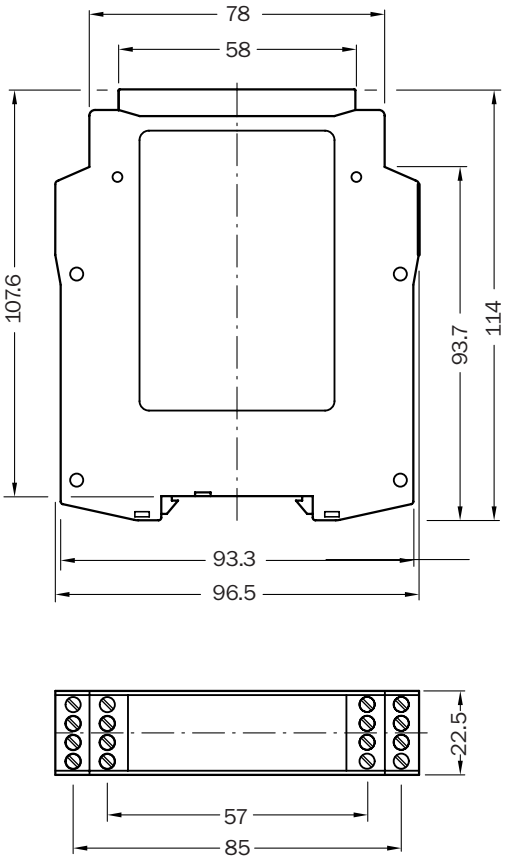


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## Dimensional drawings




Housing with screw-type terminals




Housing with plug-in terminals

Dimensions in mm

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# Product overview



## Modular
**UE410 Flexi**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Configurable
- Can be expanded locally
- Application orientated function modules available



## Compact
**UE440/UE470**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Configurable with application blocks
- Online diagnostics
- Software tool
- Communication interface for intelligent SICK safety sensors



## Flexible
**UE4470**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Programmable with function blocks
- Can be expanded decentrally
- Online diagnostics
- Software tool
- Network enabled



## Decentralized
**UE4427/UE44557**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Decentral controller in robust IP 67 enclosure rating
- For stand-alone use or in a network
- A standard PLC can directly operate the safe outputs on the remote controller using "Safety Enable"
- Quick and consistent shut-down time (<8 ms) even in a network, thanks to "Fast Shut Off" function




## PROFIsafe
**UE4100 series**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Combines safe data with data that is not safe for mixed operation
- Decentralised input modules in IP 20 and IP 67 enclosure rating
- Programming of the safety PLC dependent on the manufacture
- Central configuration and diagnostics down to the sensor level
- Communication interface for intelligent SICK safety sensors




## AS-Interface Safety at Work
**UE4200 series**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Combines safe data with data that is not safe for mixed operation
- Safety monitor
- Decentralised input modules up to IP 67
- Configurable
- Central network configuration and diagnostics as well as local sensor configuration and diagnostics




## DeviceNet Safety ™
**UE4400 series**

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Combines safe controllers and controllers that are not safe in mixed operation
- Fully programmable safety controller solution
- Decentral controllers, input modules and output modules in IP 20 and IP 67
- Central configuration and diagnostics down to sensor level using one tool
- Quick and consistent shut-down times (<8 ms) also in a network thanks to "Fast Shut-Off"
- Standard PLC can directly operate safety outputs on the remote controllers



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# Safety controllers and fieldbus systems

| | | Input/Output Information | | Fieldbus connectivity | | | | | | | | | | Functions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Description | Enclosure Rating | Number of safety inputs Single-/dual-channel | Number of safety outputs Single-/dual-channel | Stand-alone operation | Standard fieldbus connectivity | Safety fieldbus connectivity | DeviceNet | DeviceNet Safety | Profibus | Profisafe | AS-i Safety at Work | Ethernet TCP | CANopen | Freely programmable with function blocks | Signals related to pressing actions[4] | Operating mode selection | Simultaneous protective field evaluation | Diagnostics (control and sensor) | Number of EFI - Safe SICK communication[6] | Product | Page |
| Modular safety controller | IP 20 | 4/2[1] | 4/2[2] | ✔ | ✔ | – | ✔ | – | ✔ | – | – | ✔ | ✔ | –[3] | – | – | – | ✔[5] | – | UE410 Flexi | 0-2 |
| Compact safety controller | IP 20 | 15/7 | –/2 | ✔ | – | – | – | – | – | – | – | – | – | ✔ | – | ✔ | ✔ | ✔ | 2 | UE440 | 0-22 |
| | | | | ✔ | – | – | – | – | – | – | – | – | – | ✔ | | ✔ | ✔ | ✔ | 2 | UE470 | 0-22 |
| Flexible safety controller | IP 20 | 16/8 | 8/4 | ✔ | ✔ | ✔ | ✔ | ✔ | – | – | – | – | – | ✔ | ✔ | ✔ | – | ✔ | – | UE4470 | 0-75 |
| Safety remote I/O | IP 20 | Up to 12/6 | Up to 8/4 | – | ✔ | ✔ | ✔ | ✔ | – | – | – | – | – | – | – | – | – | – | – | UE4421 | 0-49 |
| | IP 67 | Up to 14/8 | –/2 | – | ✔ | ✔ | ✔ | ✔ | – | – | – | – | – | – | – | – | – | ✔ | 2[7] | UE4420 UE4450 UE4455 | 0-58 |
| Combined safety remote I/O and controller | IP 67 | Up to 14/8 | –/2 | ✔ | ✔ | ✔ | ✔ | ✔ | – | – | – | – | – | ✔ | – | ✔ | ✔ | ✔ | 2[7] | UE 4427 UE 4457 | 0-66 |
| Safety monitor | IP 20 | – | Up to –/2 | – | ✔ | ✔ | – | – | – | – | ✔ | – | – | ✔ | – | – | – | – | – | UE4231 UE4232 UE4233 UE4234 | 0-45 |
| Safety remote I/O | IP 65 | –/2 Contact | – | – | ✔ | ✔ | – | – | – | – | ✔ | – | – | – | – | – | – | – | – | UE3212 | 0-37 |
| | IP 67 | –/2 OSSD | – | – | ✔ | ✔ | – | – | – | – | ✔ | – | – | – | – | – | – | – | – | UE4215 | 0-41 |
| Safety remote I/O | IP 67 | 16/8 | – | – | ✔ | ✔ | – | – | ✔ | ✔ | – | – | – | – | – | – | ✔ | ✔ | 2[7] | UE4120 UE4150 UE4155 | 0-30 |
| Diagnostic gateways | IP 20 | – | – | ✔ | ✔ | ✔ | – | – | ✔ | ✔ | – | ✔ | ✔ | – | – | – | – | ✔ | 2 | UE1140 UE1840 UE1940 UE4140 | 0-82 |

[1] Depending on number of input expansion modules (UE410-8DI)

[2] Depending on number of logical expansion modules (UE410-XU)

[3] Configuration of the logic is accomplished via rotary switch. No software required.

[4] Bottom dead center (BDC), Top dead center (TDC), Stop cycle contact (SCC)

[5] Via diagnostics module on the fieldbus

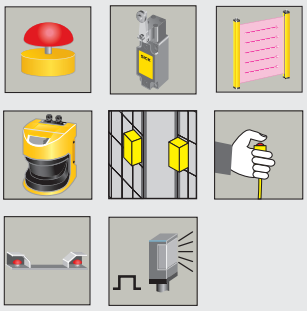
[6] Enhanced Function Interface (EFI) - SICK safe device communication

[7] Model dependent

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CANopen PROFIBUS

DeviceNet Ethernet coming soon



- Optimal integration of SICK safety devices
- Significant reduction in the control cabinet width
- Easy program selection using rotary switches (no software required)
- Significant reduction in the wiring effort
- Relay module
- PROFIBUS, DeviceNet and CANopen integration

CE cULus TÜV

| Further information | Page |
|---|---|
| → In-system added value | 0-3 |
| → Technical specifications | 0-5 |
| → Internal circuitry | 0-14 |
| → Dimensional drawings | 0-16 |
| → Connection diagrams | 0-17 |
| → Accessories | 0-21 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Safety category** | Up to category 4 (EN 954-1) |
| **Safety integrity level (SIL)** | Up to SIL 3 (IEC 61508) |
| **Number of safety capable inputs** | 4 ... 100 depending on modules used |
| **Number of safety capable outputs** | 4 ... 52 depending on modules used |
| **Programming method** | Rotary DIP switch (no software required) |
| **Logical functions** | AND, OR, Bypass, Muting |

## Product description

The UE410 Flexi Controller provides a unique solution for safety-relevant applications. Historically, safety logic has been implemented using either hardwire techniques with safety relays, or via expensive safety programmable logical controllers (safety PLCs). UE410 Flexi Controllers take advantage of the benefits of both technologies.
When you connect safety input devices to the UE410 Flexi Controller system, the logic is implemented using rotary DIP switches. Solid state safety outputs, rated at 1.6 Amps each (3.2 Amps available per module), provide sufficient current capability to drive a variety of actuator loads without using electromechanical relays.
Users also may use diagnostic modules to gain valuable diagnostic and status information regarding the UE410 Flexi Controller system. Diagnostic data includes: input states, output states, module status and fault-specific information. Communication to the standard control system allows this information to be displayed on the operator interface.
For applications involving control voltages other than 24 V DC, for currents greater than 1.6 Amps or require signal isolation using mechanical contacts, relay modules are also available.

The UE410 Flexi Controller system may be composed of the following module types:

| | |
|---|---|
| **UE410-MU** | Main unit |
| **UE410-XU** | Expansion unit for additional logic or output requirements |
| **UE410-8DI** | Input expansion unit |
| **UE410-2RO/-4RO** | Relay modules |
| **UE410-PRO** | PROFIBUS-DP diagnostic module |
| **UE410-DEV** | DeviceNet diagnostic module |
| **UE410-CAN** | CANopen diagnostic module |
| **UE410-ETH** | EtherNet module (in preparation) |



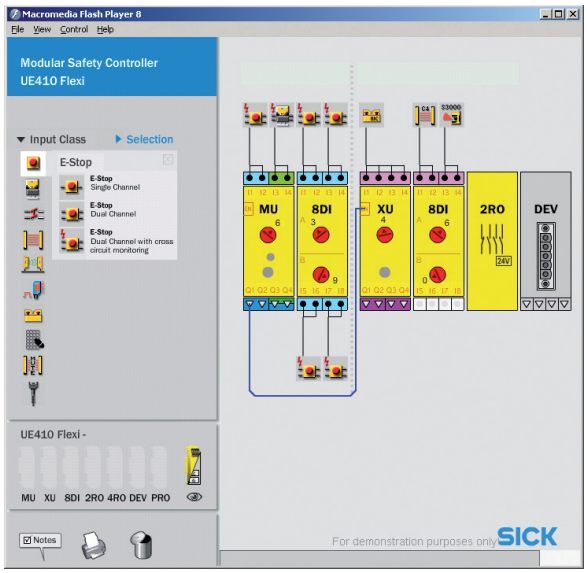
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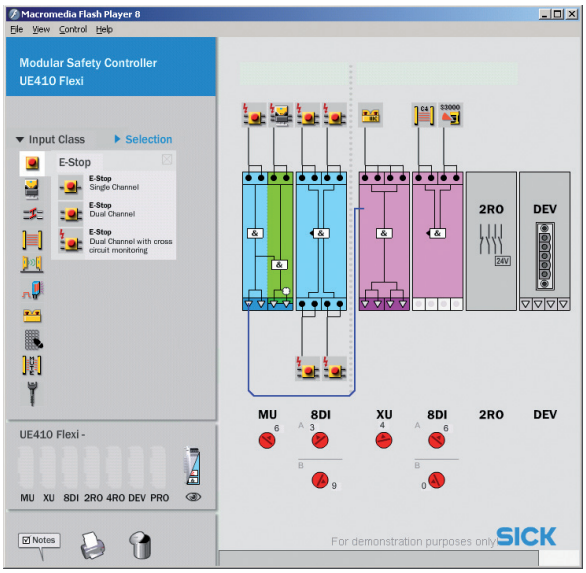
# In-system added value

The UE410 Flexi Controller system consists of a main unit (UE410-MU) and, as required, additional extension units (UE410-XU, UE410-8DI) followed by one diagnostic module (UE410-DEV, UE410-PRO, UE410-CAN, UE410-ETH). Further, relay modules (UE410-2RO, UE410-4RO) can also be added to the system.

Logic is implemented with rotary DIP switches on the front of each module. Logical combinations with multiple modules are easily set based on how the modules are combined.

A visualization tool has been developed to help simplify module selection and to understand the logic configuration possibilities associated with the UE410 Flexi Controller system. This visualization tool is known as Flexi Configuration Planner and is available at www.ue410flexi.com




Flexi Configuration Planner is an ingenius tool that provides a means for selecting modules, connecting safety relevant devices and displaying the logic associated with the rotary DIP switch settings. It is important to note that this software is not required to configure the logic in the UE410 Flexi Controller system, but rather to help understand how the rotary DIP switch settings affect the logic. Any modification to switch settings after the "teach" process is completed will generate a fault condition.

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# Ordering information

## Main unit

| Number of inputs | Number of safety capable outputs | Connector technology | Delay time (adjustable)[1] | Type | Part number |
|---|---|---|---|---|---|
| 2 dual-channel resp. 4 single-channel | 2 dual-channel resp. 4 single-channel | Plug-in terminals | 0 s ... 5 s | UE410-MU3T5 | 6026136 |
| | | | 0 s ... 50 s | UE410-MU3T50 | 6026137 |
| | | | 0 s ... 300 s | UE410-MU3T300 | 6026138 |
| | | Dual level spring clamp terminals | 0 s ... 5 s | UE410-MU4T5 | 6032669 |
| | | | 0 s ... 50 s | UE410-MU4T50 | 6032670 |
| | | | 0 s ... 300 s | UE410-MU4T300 | 6032671 |

[1] Only outputs Q3/Q4

## Extension unit

| Number of inputs | Number of safety capable outputs | Connector technology | Delay time (adjustable)[1] | Type | Part number |
|---|---|---|---|---|---|
| 2 dual-channel resp. 4 single-channel | 2 dual-channel resp. 4 single-channel | Plug-in terminals | 0 s ... 5 s | UE410-XU3T5 | 6032470 |
| | | | 0 s ... 50 s | UE410-XU3T50 | 6032471 |
| | | | 0 s ... 300 s | UE410-XU3T300 | 6032472 |
| | | Dual level spring clamp terminals | 0 s ... 5 s | UE410-XU4T5 | 6032672 |
| | | | 0 s ... 50 s | UE410-XU4T50 | 6032673 |
| | | | 0 s ... 300 s | UE410-XU4T300 | 6032674 |

[1] Only outputs Q3/Q4

## Input expansion unit

| Number of inputs | Connector technology | Type | Part number |
|---|---|---|---|
| 4 dual-channel resp. 8 single-channel | Plug-in terminals | UE410-8DI3 | 6026139 |
| | Dual level spring clamp terminals | UE410-8DI4 | 6032675 |

## Relay module

| Number of normally open contacts | Number of application diagnostic outputs | Connector technology | Type | Part number |
|---|---|---|---|---|
| 2 | 1 | Plug-in terminals | UE410-2RO3 | 6026144 |
| | | Dual level spring clamp terminals | UE410-2RO4 | 6032677 |
| 4 | 2 | Plug-in terminals | UE410-4RO3 | 6026143 |
| | | Dual level spring clamp terminals | UE410-4RO4 | 6032676 |

## Diagnostic module

| Connector technology | Field bus | Type | Part number |
|---|---|---|---|
| Pluggable screw terminals | PROFIBUS-DP | UE410-PRO3 | 6028407 |
| | DeviceNet | UE410-DEV3 | 6032469 |
| | CANopen | UE410-CAN3 | 6033111 |
| | Ethernet | UE410-ETHx3 | In preparation |
| Dual level pluggable spring clamp terminals | PROFIBUS-DP | UE410-PRO4 | 6032678 |
| | DeviceNet | UE410-DEV4 | 6032679 |
| | CANopen | UE410-CAN4 | 6033112 |
| | Ethernet | UE410-ETHx4 | In preparation |





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# Detailed technical specifications

## Main unit

### General data

| | UE410-MU3T5 | UE410-MU3T50 | UE410-MU3T300 | UE410-MU4T5 | UE410-MU4T50 | UE410-MU4T300 |
|---|---|---|---|---|---|---|
| **Category** | Up to category 4 (EN 954-1) | | | | | |
| **Safety integrity level**<br>**PFD**<br>**PFH**<br>**SFF**<br>**DC** | Up to SIL 3 (IEC 61508)<br>1.7 x $10^{-5}$<br>7.9 x $10^{-9}$/h<br>96 %<br>93 % | | | | | |
| **Ambient operating temperature** | –25 °C ... +55 °C | | | | | |
| **Storage temperature** | –25 °C ... +70 °C | | | | | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | | | | | |
| **Climate conditions according to** | EN 61131-2 | | | | | |
| **Vibration resistance** | 5 Hz ... 500 Hz | | | | | |
| **Vibration resistance (checked to)** | EN 60068-2-64, EN 61131-2 | | | | | |
| **Enclosure rating**<br>**Clamps**<br>**Housing** | EN/IEC 60529<br>IP 40<br>IP 20 | | | | | |
| **Electromagnetic compatibility (EMC)** | Class A (EN 61131-2, EN 61000-6-2, EN 55011) | | | | | |
| **Protection class** | III | | | | | |
| **Connection conductor cross-section** | Single-wire or fine-wire conductor: 1 x 0.14 mm² ... 2.5 mm²<br>or 2 x 0.14 mm² ... 0.75 mm² / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm² ... 2.5 mm² or 2 x 0.25 mm² ... 0.5 mm² | | | | | |
| **Connector technology** | Pluggable screw terminals | | | Pluggable spring clamp terminals | | |
| **Dimensions (W x H x D)** | 29 mm x 96.5 mm x 120.8 mm | | | | | |
| **Weight** | 180 g | | | | | |





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## Electrical data

| | UE410-MU3T5 | UE410-MU3T50 | UE410-MU3T300 | UE410-MU4T5 | UE410-MU4T50 | UE410-MU4T300 |
|---|---|---|---|---|---|---|
| **Supply voltage** | 24 V DC (19.2 V DC ... 30 V DC) | | | | | |
| **Type of supply voltage** | PELV (electrical output circuit on UE410-4RO/UE410-2RO > 25 V AC/60 V DC), PELV or SELV (electrical output circuit on UE410-4RO/UE410-2RO < 25 V AC/60 V DC) | | | | | |
| **Power consumption** | 3 W | | | | | |
| **Switch-on time** | 10 s | | | | | |
| **Short-circuit protection** | 4A, fuse characteristic gG | | | | | |
| **Input circuit (I1 - I4, EN, S1 - S3)** | | | | | | |
| **Input voltage HIGH** | 15 V ... 30 V | | | | | |
| **Input voltage LOW** | –5 V DC ... 5 V DC | | | | | |
| **Input current HIGH** | 3 mA (2.3 mA ... 3.6 mA) | | | | | |
| **Input current LOW** | –2.5 mA ... 0.15 mA | | | | | |
| **Switch-on time** | Min. 70 ms | | | | | |
| **Switch-on time ENTER button** | 3 s [1] | | | | | |
| **Number of inputs** | 2 dual-channel resp. 4 single-channel | | | | | |
| **Control outputs (X1, X2)** | | | | | | |
| **Number of outputs** | 2 | | | | | |
| **Type of output** | PNP semiconductors, short-circuit protected, cross-circuit monitored | | | | | |
| **Output voltage** | 18 V DC ... 30 V DC | | | | | |
| **Output current** | Max. 150 mA | | | | | |
| **Test pulse width** | 12 ms (at program 1, 2, 4, 5, 6 on X1 and X2, at program 3.2 on X1)<br>52 ms (at program 3.2 on X2) | | | | | |
| **Test pulse rate** | 5 Hz | | | | | |
| **Load capacity** | Max. 1000 nF | | | | | |
| **Safety outputs (Q1, Q2, Q3, Q4)** | | | | | | |
| **Number of safety capable outputs** | 4 | | | | | |
| **Type of output** | PNP semiconductors, short-circuit protected, cross-circuit monitored | | | | | |
| **Output voltage** | 30 V DC | | | | | |
| **Output current** | 2 A | | | | | |
| **Response time** | 13 ms | | | | | |
| **Test pulse width** | 300 µS | | | | | |
| **Test pulse rate** | 5 Hz | | | | | |
| **Load capacity** | 500 nF | | | | | |
| **Cable length** | 100 m, 1.5 mm² | | | | | |
| **Delay time** [2] | Adjustable 0 s ... 5 s | Adjustable 0 s ... 50 s | Adjustable 0 s ... 300 s | Adjustable 0 s ... 5 s | Adjustable 0 s ... 50 s | Adjustable 0 s ... 300 s |
| **Data interface** | Via field bus | | | | | |

[1] Upon applying the supply voltage

[2] Only outputs Q3/Q4 (configuration dependent)





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### UE410-MU program configuration and response time information

| | | |
|---|---|---|
| **Program 1 - OR Logic (e.g. Contact Mat OR OSSD** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with test outputs X1, X2<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | I1/I2 with contact mat - 130 ms<br>I1/I2 with other devices - 29 ms<br>I3/I4 - 13 ms | Same as Q1/Q2 plus the adjustable delay time setting |
| **Program 2 - OR Logic (e.g. RE300 OR OSSD)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel complementary device with test outputs X1, X2 synchronization monitoring of 800ms (e.g. RE300 non-contact sensor)<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | I1/I2 - 29 ms<br>I3/I4 - 13 ms | Same as Q1/Q2 plus the adjustable delay time setting |
| **Program 3.1 - Simple Muting (e.g. C4000 Muted with Optical Sensors)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with external test pulses<br>Inputs I3/I4 - Two single-channel muting sensors<br>Time between muting condition & valid muting state is 61 ms.<br>Typical switch OFF time at muting sensors 61 ms.<br>Maximum switch OFF time at muting sensors 165 ms.<br>Muting gap suppression of inputs I3 / I4 allowed for up to 100ms. | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 13 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 3.2 - Simple Muting (e.g. IN4000 Muted with Optical Sensors)** | **Input description** | |
| | Inputs I1/I2 - IN4000 inductive proximity sensor (I1-X1) or type 2 testable sensor (I2-X2)<br>Inputs I3/I4 - Two Single-channel muting sensors<br>Time between muting condition & valid muting state is 61 ms.<br>Typical switch OFF time at muting sensors 61 ms.<br>Maximum switch OFF time at muting sensors 165 ms.<br>Muting gap suppression of inputs I3 / I4 allowed for up to 100ms | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | I1-X1 to Q1/Q2 - 79 ms<br>I2-X2 to Q1/Q2 - 29 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 4 - Two Hand Control (Type IIIC)** | **Input description** | |
| | Inputs I1/I2/I3/I4 - Type IIIC two hand control (two dual channel complementary inputs) synchronization monitoring of 500 ms | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | 29 ms | 29 ms |
| **Program 5 - AND Logic (e.g. Safety Interlock AND Type IIIA THC)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with test outputs X1, X2<br>Inputs I3/I4 - Two single-channel N.O. contacts with test outputs X1, X2 (Type IIIA THC) | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | 29 ms | 29 ms |
| **Program 6 - AND Logic (e.g. Safety Interlock AND E-Stop)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with test outputs X1, X2<br>Inputs I3/I4 - Dual-channel equivalent device with test outputs X1, X2 | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 29 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 7 - AND Logic (e.g. C4000 AND S3000)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with external test pulses<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 13 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 8 - Independent Outputs (e.g. C4000 Independent of S3000)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with external test pulses<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 13 ms | Same as Q3 plus the adjustable delay time setting |

Note: When cascading systems together utilizing the EN (Enable) Input, an additional response time of 13 ms must be added to the overall system response time for each cascaded system implemented into the safety chain.





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## Extension unit

### General data

| | UE410-XU3T5 | UE410-XU3T50 | UE410-XU3T300 | UE410-XU4T5 | UE410-XU4T50 | UE410-XU4T300 |
|---|---|---|---|---|---|---|
| **Category** | Up to category 4 (EN 954-1) | | | | | |
| **Safety integrity level**<br>**PFD**<br>**PFH**<br>**SFF**<br>**DC** | Up to SIL 3 (IEC 61508)<br>$1.7 \times 10^{-5}$<br>$7.9 \times 10^{-9}$/h<br>96 %<br>93 % | | | | | |
| **Ambient operating temperature** | –25 °C ... +55 °C | | | | | |
| **Storage temperature** | –25 °C ... +70 °C | | | | | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | | | | | |
| **Climate conditions according to** | EN 61131-2 | | | | | |
| **Vibration resistance** | 5 Hz ... 500 Hz | | | | | |
| **Vibration resistance (checked to)** | EN 60068-2-64, EN 61131-2 | | | | | |
| **Enclosure rating**<br>**Clamps**<br>**Housing** | EN/IEC 60529<br>IP 40<br>IP 20 | | | | | |
| **Electromagnetic compatibility (EMC)** | Class A (EN 61131-2, EN 61000-6-2, EN 55011) | | | | | |
| **Protection class** | III | | | | | |
| **Connection conductor cross-section** | Single-wire or fine-wire conductor: 1 x 0.14 mm² ... 2.5 mm² or 2 x 0.14 mm² ... 0.75 mm² / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm² ... 2.5 mm² or 2 x 0.25 mm² ... 0.5 mm² | | | | | |
| **Connector technology** | Pluggable screw terminals | | | Pluggable spring clamp terminals | | |
| **Dimensions (W x H x D)** | 22.5 mm x 96.5 mm x 120.8 mm | | | | | |
| **Weight** | 180 g | | | | | |





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## Electrical data

| | UE410-XU3T5 | UE410-XU3T50 | UE410-XU3T300 | UE410-XU4T5 | UE410-XU4T50 | UE410-XU4T300 |
|---|---|---|---|---|---|---|
| **Supply voltage** | 24 V DC (19.2 V DC ... 30 V DC) | | | | | |
| **Type of supply voltage** | PELV (electrical output circuit on UE410-4RO/UE410-2RO > 25 V AC/60 V DC), PELV or SELV (electrical output circuit on UE410-4RO/UE410-2RO < 25 V AC/60 V DC) | | | | | |
| **Power consumption** | 3 W | | | | | |
| **Switch-on time** | 10 s | | | | | |
| **Short-circuit protection** | 4A fuse characteristic gG | | | | | |
| **Input circuit (I1 - I4, EN, S1 - S3)** | | | | | | |
| **Input voltage HIGH** | 15 V ... 30 V | | | | | |
| **Input voltage LOW** | –5 V DC ... 5 V DC | | | | | |
| **Input current HIGH** | 3 mA (2.3 mA ... 3.6 mA) | | | | | |
| **Input current LOW** | –2.5 mA ... 0.15 mA | | | | | |
| **Switch-on time** | Min. 70 ms | | | | | |
| **Number of inputs** | 2 dual-channel resp. 4 single-channel | | | | | |
| **Control outputs (X1, X2)** | | | | | | |
| **Number of outputs** | 2 | | | | | |
| **Type of output** | PNP semiconductors, short-circuit protected, cross-circuit monitored | | | | | |
| **Output voltage** | 18 V DC ... 30 V DC | | | | | |
| **Output current** | Max. 150 mA | | | | | |
| **Test pulse width** | 12 ms (at program 1, 2, 4, 5, 6 on X1 and X2, at program 3.2 on X1)<br>52 ms (at program 3.2 on X2) | | | | | |
| **Test pulse rate** | 5 Hz | | | | | |
| **Load capacity** | Max. 1000 nF | | | | | |
| **Safety outputs (Q1, Q2, Q3, Q4)** | | | | | | |
| **Number of safety capable outputs** | 4 | | | | | |
| **Type of output** | PNP semiconductors, short-circuit protected, cross-circuit monitored | | | | | |
| **Output voltage** | 30 V DC | | | | | |
| **Output current** | 2 A | | | | | |
| **Response time** | 13 ms | | | | | |
| **Test pulse width** | 300 µS | | | | | |
| **Test pulse rate** | 5 Hz | | | | | |
| **Load capacity** | 500 nF | | | | | |
| **Cable length** | 100 m, 1.5 mm² | | | | | |
| **Delay time** [1] | Adjustable 0 s ... 5 s | Adjustable 0 s ... 50 s | Adjustable 0 s ... 300 s | Adjustable 0 s ... 5 s | Adjustable 0 s ... 50 s | Adjustable 0 s ... 300 s |
| **Data interface** | Via field bus | | | | | |

[1] Only outputs Q3/Q4 (configuration dependent)





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### UE410-XU program configuration and response time information

| | | |
|---|---|---|
| **Program 1 - OR Logic (e.g. Contact Mat OR OSSD** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with test outputs X1, X2<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | I1/I2 with contact mat - 130 ms<br>I1/I2 with other devices - 29 ms<br>I3/I4 - 13 ms | Same as Q1/Q2 plus the adjustable delay time setting |
| **Program 2 - OR Logic (e.g. RE300 OR OSSD)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel complementary device with test outputs X1, X2 synchronization monitoring of 800ms (e.g. RE300 non-contact sensor)<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | I1/I2 - 29 ms<br>I3/I4 - 13 ms | Same as Q1/Q2 plus the adjustable delay time setting |
| **Program 3.1 - Simple Muting (e.g. C4000 Muted with Optical Sensors)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with external test pulses<br>Inputs I3/I4 - Two single-channel muting sensors<br>Time between muting condition & valid muting state is 61 ms.<br>Typical switch OFF time at muting sensors 61 ms.<br>Maximum switch OFF time at muting sensors 165 ms.<br>Muting gap suppression of inputs I3 / I4 allowed for up to 100ms. | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 13 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 3.2 - Simple Muting (e.g. IN4000 Muted with Optical Sensors)** | **Input description** | |
| | Inputs I1/I2 - IN4000 inductive proximity sensor (I1-X1) or type 2 testable sensor (I2-X2)<br>Inputs I3/I4 - Two Single-channel muting sensors<br>Time between muting condition & valid muting state is 61 ms.<br>Typical switch OFF time at muting sensors 61 ms.<br>Maximum switch OFF time at muting sensors 165 ms.<br>Muting gap suppression of inputs I3 / I4 allowed for up to 100ms | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | I1-X1 to Q1/Q2 - 79 ms<br>I2-X2 to Q1/Q2 - 29 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 4 - Two Hand Control (Type IIIC)** | **Input description** | |
| | Inputs I1/I2/I3/I4 - Type IIIC two hand control (two dual channel complementary inputs) synchronization monitoring of 500 ms | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | 29 ms | 29 ms |
| **Program 5 - AND Logic (e.g. Safety Interlock AND Type IIIA THC)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with test outputs X1, X2<br>Inputs I3/I4 - Two single-channel N.O. contacts with test outputs X1, X2 (Type IIIA THC) | |
| | **Response time Q1/Q2** | **Response time Q3/Q4** |
| | 29 ms | 29 ms |
| **Program 6 - AND Logic (e.g. Safety Interlock AND E-Stop)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with test outputs X1, X2<br>Inputs I3/I4 - Dual-channel equivalent device with test outputs X1, X2 | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 29 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 7 - AND Logic (e.g. C4000 AND S3000)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with external test pulses<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 13 ms | Same as Q1/Q2/Q3 plus the adjustable delay time setting |
| **Program 8 - Independent Outputs (e.g. C4000 Independent of S3000)** | **Input description** | |
| | Inputs I1/I2 - Dual-channel equivalent device with external test pulses<br>Inputs I3/I4 - Dual-channel equivalent device with external test pulses | |
| | **Response time Q1/Q2/Q3** | **Response time Q4** |
| | 13 ms | Same as Q3 plus the adjustable delay time setting |

Note: When cascading systems together utilizing the EN (Enable) Input, an additional response time of 13 ms must be added to the overall system response time for each cascaded system implemented into the safety chain.





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## Input expansion unit

### General data

| | UE410-8DI3 | UE410-8DI4 |
|---|---|---|
| **Category** | Up to category 4 (EN 954-1) | |
| **Safety integrity level**<br>**PFD**<br>**PFH**<br>**SFF**<br>**DC** | Up to SIL 3 (IEC 61508)<br>9.2 x $10^{-6}$<br>6.1 x $10^{-9}$/h<br>96 %<br>93 % | |
| **Ambient operating temperature** | –25 °C ... +55 °C | |
| **Storage temperature** | –25 °C ... +70 °C | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | |
| **Climate conditions according to** | EN 61131-2 | |
| **Vibration resistance** | 5 Hz ... 500 Hz | |
| **Vibration resistance (checked to)** | EN 60068-2-64, EN 61131-2 | |
| **Enclosure rating**<br>**Clamps**<br>**Housing** | EN/IEC 60529<br>IP 40<br>IP 20 | |
| **Electromagnetic compatibility (EMC)** | Class A (EN 61131-2, EN 61000-6-2, EN 55011) | |
| **Protection class** | III | |
| **Connection conductor cross-section** | Single-wire or fine-wire conductor: 1 x 0.14 mm² ... 2.5 mm²<br>or 2 x 0.14 mm² ... 0.75 mm² / fine-wire with terminal crimp according<br>to EN 46288: 1 x 0.25 mm² ... 2.5 mm² or 2 x 0.25 mm² ... 0.5 mm² | |
| **Connector technology** | Pluggable screw terminals | Pluggable spring clamp terminals |
| **Dimensions (W x H x D)** | 22.5 mm x 96.5 mm x 120.8 mm | |
| **Weight** | 150 g | |

### Electrical data

| | UE410-8DI3 | UE410-8DI4 |
|---|---|---|
| **Power consumption** | 2 W | |
| **Input circuit (I1 - I4, EN, S1 - S3)**<br>**Input voltage HIGH**<br>**Input voltage LOW**<br>**Input current HIGH**<br>**Input current LOW**<br>**Switch-on time**<br>**Synchronous time monitoring** | <br>15 V ... 30 V<br>–5 V ... 5 V DC<br>3 mA (2.3 mA ... 3.6 mA)<br>–2.5 mA ... 0.15 mA<br>Min. 70 ms<br>800 ms (at program 3 and 5) | |
| **Number of inputs** | 4 dual-channel resp. 8 single-channel | |
| **Control outputs (X1 - X8)**<br>**Number of outputs**<br>**Type of output**<br>**Output voltage**<br>**Output current**<br>**Test pulse width**<br>**Test pulse rate**<br>**Load capacity** | <br>8<br>PNP semiconductors, short-circuit protected, conditionally cross-circuit monitored<br>18 V DC ... 30 V DC<br>Max. 150 mA<br>12 ms (at program 1, 2, 4, 5 on X1 and X2)<br>5 Hz<br>Max. 1000 nF | |
| **Safety outputs (Q1, Q2, Q3, Q4)**<br>**Response time** | <br>17 ms (for main unit and input expansion unit) mode switch selection 6, 7 on UE410-8DI<br>34 ms (for main unit and input expansion unit)<br>mode switch selection 1, 2, 3, 4, 5 on UE410-8DI<br>134 ms (for main unit and input expansion unit)<br>mode switch selection 2 safety mat on UE410-8DI | |
| **Data interface** | Via field bus | |





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### UE410-8DI Program Configuration

Each UE410-8DI has two rotary DIP switches. The top rotary DIP switch corresponds to Inputs I1...I4 and intermediate logic value QA. The bottom rotary DIP switch corresponds to Inputs I5...I7 and intermediate logic value QB.. Each setting is independent of the other with the exception of Program 9. The input descriptions provided below apply to Inputs I1...I4 or Inputs I5...I7 when the corresponding rotary DIP switch setting is implemented to select the associated Program.

| | Input description | Response time |
|---|---|---|
| **Program 0** | Input connections not monitored - inactive | – |
| **Program 1 - AND Logic** | Single-channel equivalent device with corresponding test outputs | 34 ms |
| **Program 2 - AND Logic** | Dual-channel equivalent device with corresponding test outputs | Safety Mat: 134 ms<br>Other Devices: 34 ms |
| **Program 3 - AND Logic** | Dual-channel equivalent device with corresponding test outputs<br>Synchronization is monitored - 800 ms maximum value. | 34 ms |
| **Program 4 - AND Logic** | Dual-channel complementary device with corresponding test outputs | 34 ms |
| **Program 5 - AND Logic** | Dual-channel complementary device with corresponding test outputs (e.g. RE300)<br>Synchronization is monitored - 800 ms maximum value | 34 ms |
| **Program 6 - AND Logic** | Single-channel normally closed contact externally tested (tied to two inputs); or dual-channel equivalent device with corresponding external testing (e.g. semiconductor OSSDs) | 17 ms |
| **Program 7 - OR Logic** | Dual-channel equivalent device with corresponding external testing (e.g. semiconductor OSSDs) ; or single-channel normally closed contact externally tested (e.g. safety interlock tied to 2 inputs) | 17 ms |
| **Program 8 - BYPASS** | Dual-channel equivalent device with corresponding test outputs and synchronization monitoring of 800ms (e.g. enabling switch or key-operated switch). Maximum duration is 60 s. | – |
| **Program 9 - Mirror mode** | The inputs corresponding to this switch setting will mirror the configuration of the other rotary DIP switch, including which outputs will be affected on the UE410-MU or UE410-XU. | same as mirrored program |

## Relay module

### General data

| | UE410-2RO3 | UE410-2RO4 | UE410-4RO3 | UE410-4RO4 |
|---|---|---|---|---|
| **Galvanised decoupling**<br>**yes**<br>**no** | Supply circuit – output circuit and input circuit – output circuit<br>Supply circuit – input circuit | | | |
| **Ambient operating temperature** | –25 °C ... +55 °C | | | |
| **Storage temperature** | –25 °C ... +70 °C | | | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | | | |
| **Climate conditions according to** | EN 61131-2 | | | |
| **Vibration resistance** | 5 Hz ... 500 Hz | | | |
| **Vibration resistance (checked to)** | EN 60068-2-64, EN 61131-2 | | | |
| **Enclosure rating**<br>**Clamps**<br>**Housing** | EN/IEC 60529<br>IP 40<br>IP 20 | | | |
| **Electromagnetic compatibility (EMC)** | Class A (EN 61131-2, EN 61000-6-2, EN 55011) | | | |
| **Protection class** | III | | | |
| **Connection conductor cross-section** | Single-wire or fine-wire conductor: 1 x 0.14 mm² ... 2.5 mm²<br>or 2 x 0.14 mm² ... 0.75 mm² / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm² ... 2.5 mm² or 2 x 0.25 mm² ... 0.5 mm² | | | |
| **Connector technology** | Pluggable screw terminals | Pluggable spring clamp terminals | Pluggable screw terminals | Pluggable spring clamp terminals |
| **Dimensions (W x H x D)** | 22 mm x 96.5 mm x 120.8 mm | | | |
| **Weight** | 160 g | | 190 g | |





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### Electrical data

| | UE410-2RO3 | UE410-2RO4 | UE410-4RO3 | UE410-4RO4 |
|---|---|---|---|---|
| **Supply voltage** | 24 V DC (19.2 V DC ... 30 V DC) | | | |
| **Type of supply voltage** | PELV (electrical output circuit on UE410-4RO/UE410-2RO > 25 V AC/60 V DC), PELV or SELV (electrical output circuit on UE410-4RO/UE410-2RO < 25 V AC/60 V DC) | | | |
| **Power consumption** | 1 W | | 2 W | |
| **Short-circuit protection** | 6A, fuse characteristic gG (per circuit) | | | |
| **Safety outputs (Q1, Q2, Q3, Q4)** | | | | |
| **Number of normally open contacts** | 2 | | 4 | |
| **Number of application diagnostic outputs** | 1 | | 2 | |
| **Type of output** | Potential free, positively-driven | | | |
| **Switching voltage** | 230 V DC (5 V DC ... 275 V DC)<br>250 V AC (5 V AC ... 275 V AC) | | | |
| **Output current** | 6 A | | | |
| **Total current** | 12 A | | | |
| **Response time** | <30 ms | | | |
| **Contact material** | AgSnO2 | | | |
| **Surface treatment** | Au (1µM) | | | |
| **Usage category** | AC-15/DC-13 | | | |
| **Rated operating current (voltage)** | 3 A (250 V AC), 3 A (24 V DC) | | | |
| **Response time** | <30 ms | | | |
| **Data interface** | Via field bus | | | |

## Diagnosis module

### General data

| | UE410-PRO3 | UE410-PRO4 | UE410-DEV3 | UE410-DEV4 |
|---|---|---|---|---|
| **Ambient operating temperature** | –25 °C ... +55 °C | | | |
| **Storage temperature** | –25 °C ... +70 °C | | | |
| **Air humidity from ... to** | 15 % ... 95 %, non-dewing | | | |
| **Climate conditions according to** | EN 61131-2 | | | |
| **Vibration resistance** | 5 Hz ... 500 Hz | | | |
| **Vibration resistance (checked to)** | EN 60068-2-64, EN 61131-2 | | | |
| **Enclosure rating** | EN/IEC 60529 | | | |
| **Clamps** | IP 40 | | | |
| **Housing** | IP 20 | | | |
| **Electromagnetic compatibility (EMC)** | Class A (EN 61131-2, EN 61000-6-2, EN 55011) | | | |
| **Protection class** | III | | | |
| **Connection conductor cross-section** | Single-wire or fine-wire conductor: 1 x 0.14 mm² ... 2.5 mm²<br>or 2 x 0.14 mm² ... 0.75 mm² / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm² ... 2.5 mm² or 2 x 0.25 mm² ... 0.5 mm² | | | |
| **Connector technology** | Pluggable screw terminals | Pluggable spring clamp terminals | Pluggable screw terminals | Pluggable spring clamp terminals |
| **Dimensions (W x H x D)** | 22.5 mm x 96.5 mm x 120.8 mm | | | |
| **Weight** | 160 g | | | |





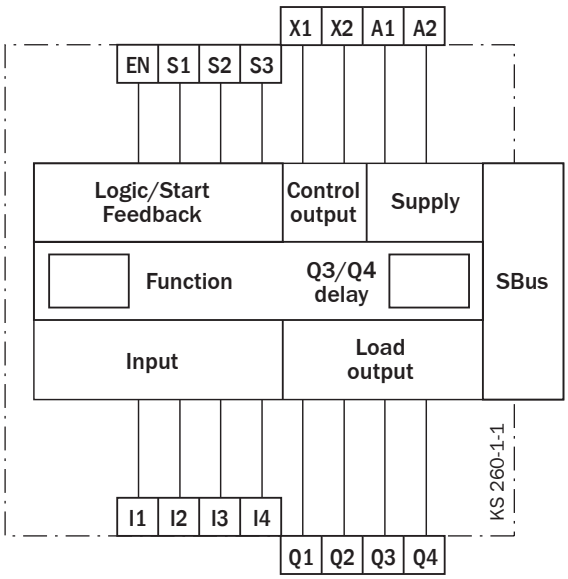
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### Electrical data

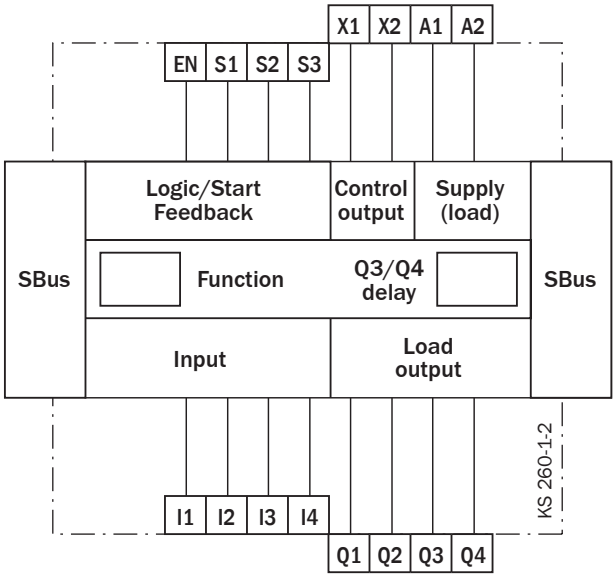
| | UE410-PRO3 | UE410-PRO4 | UE410-DEV3 | UE410-DEV4 |
|---|---|---|---|---|
| **Supply voltage** | 24 V DC (19.2 V DC ... 30 V DC) | | | |
| **Power consumption** | 1.6 W | | | |
| **Control outputs (X1 - X4)** | | | | |
| **Number of outputs** | 4 | | | |
| **Type of output** | PNP semiconductors, short-circuit protected | | | |
| **Output voltage** | 18 V DC ... 30 V DC | | | |
| **Output current** | Max. 100 mA | | | |
| **Load capacity** | Max. 100 nF | | | |
| **Data interface** | RS-485 | | ISO-DIS 11898 | |
| **Field bus** | PROFIBUS-DP | | DeviceNet | |
| **Communication behavior** | V0 | | Group 2 Only Server | |
| **Connector technology** | SUB-D 9 pole, female | | Plug-in terminal 5 pole | |
| **Slave address** | 0 ... 99 | | 0 ... 63 | |
| **Transmission rate** | 12 MBaud | | 125 Kbit/s, 250 Kbit/s, 500 Kbit/s | |
| **Cable length (transmission rate)** | 1200 m (9,6 Kbit/s, 19,2 Kbit/s, 93,75 Kbit/s), 1000 m (187,5 Kbit/s), 400 m (500 Kbit/s), 200 m (1500 Kbit/s), 100 m (12000 Kbit/s) | | – | |

## Internal circuitry

**Main unit UE410-MU**



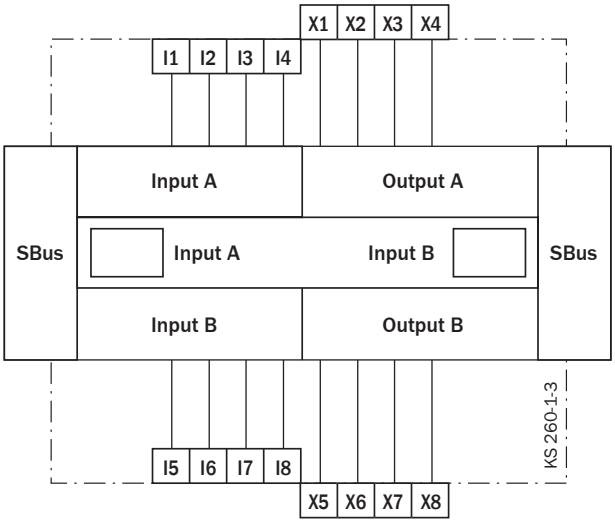

**Extension unit UE410-XU**



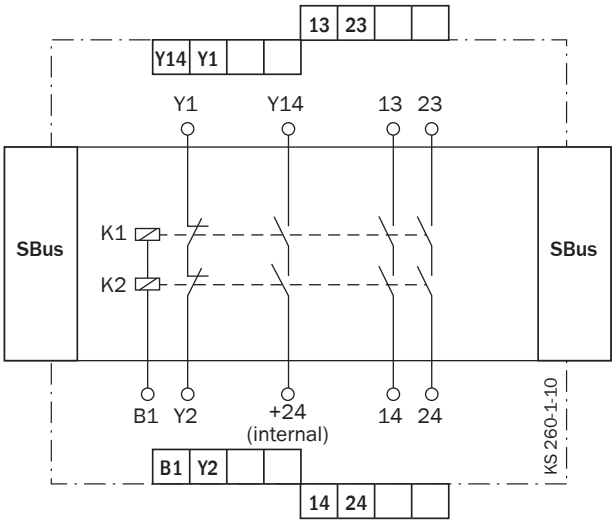


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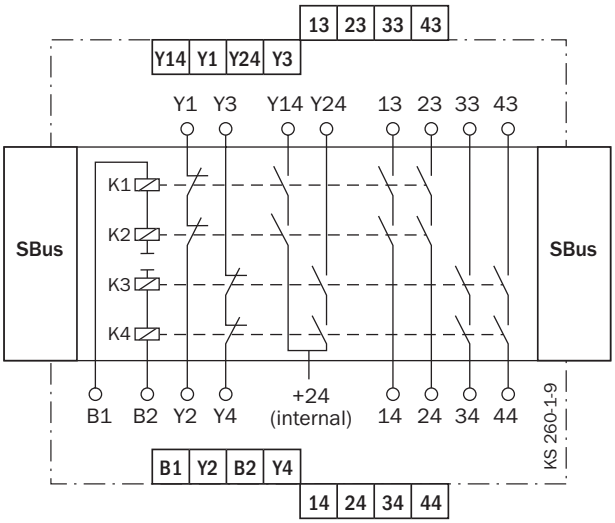
### Input expansion unit UE410-8DI



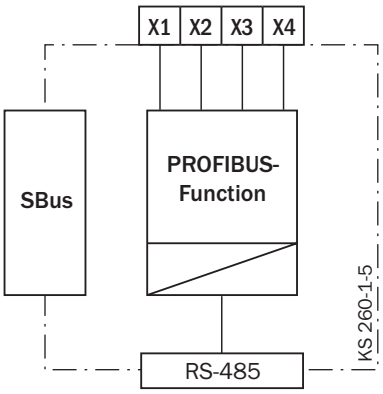

### Relay module UE410-2RO



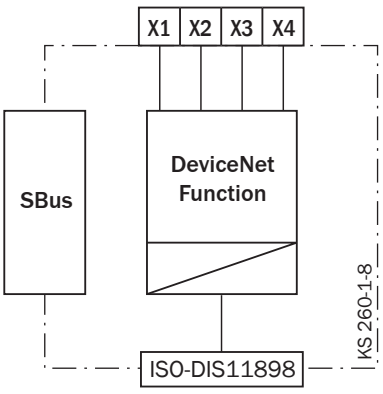

### Relay module UE410-4RO




### Diagnosis module UE410-PRO for PROFIBUS-DP



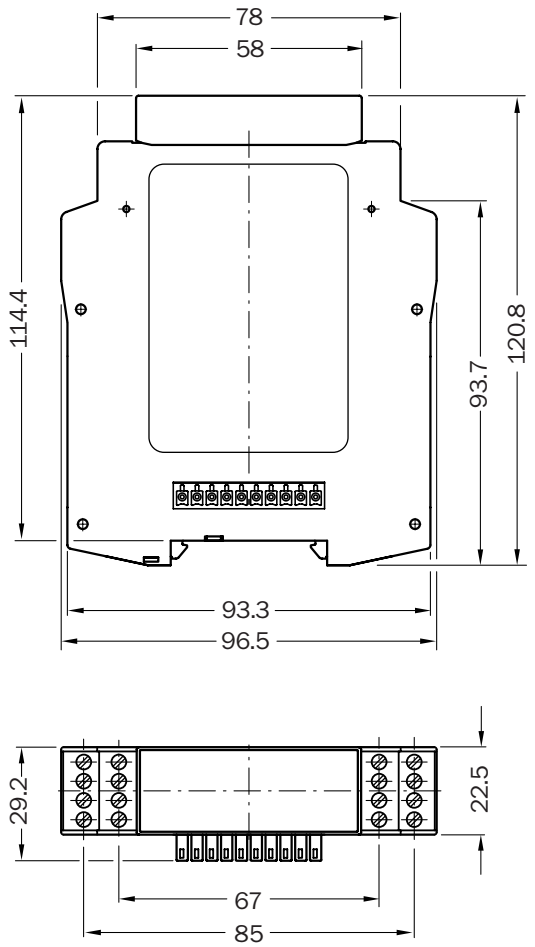

### Diagnosis module UE410-DEV for DeviceNet




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## Dimensional drawings



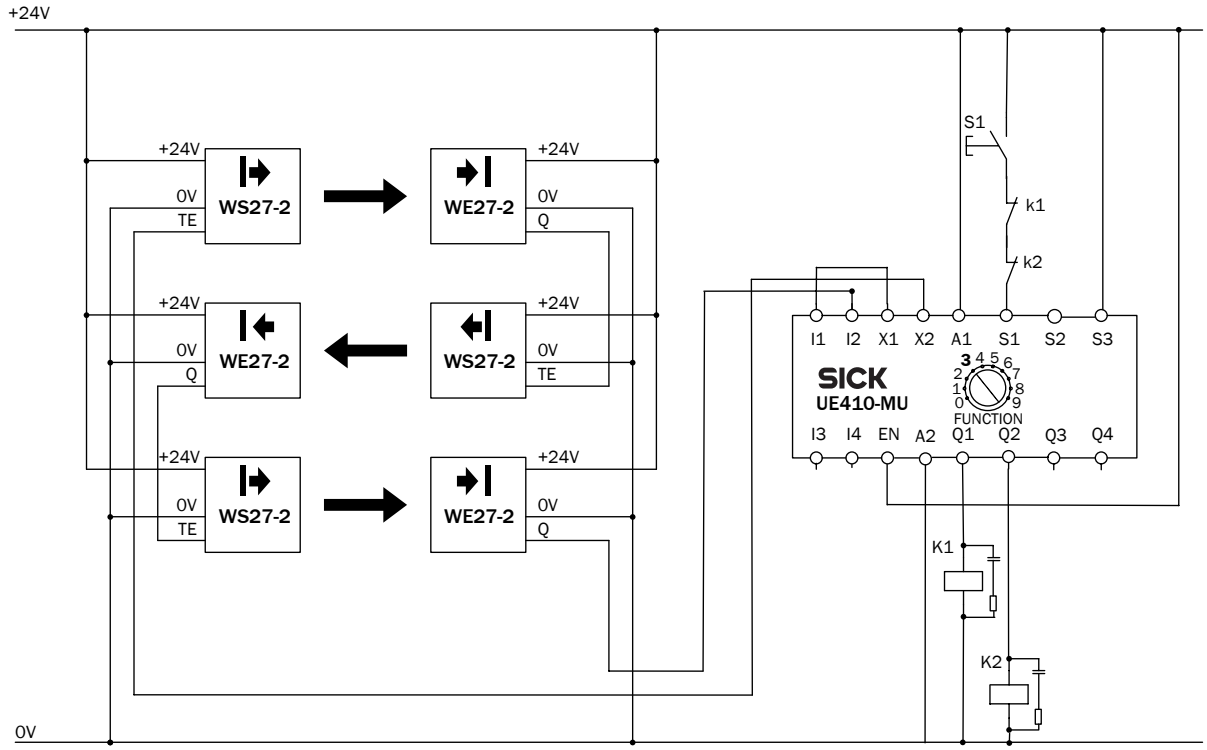

Dimensions in mm


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# Connection diagrams

➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## 3 single-beam photoelectric safety switches WS/WE27-2 on UE410-MU



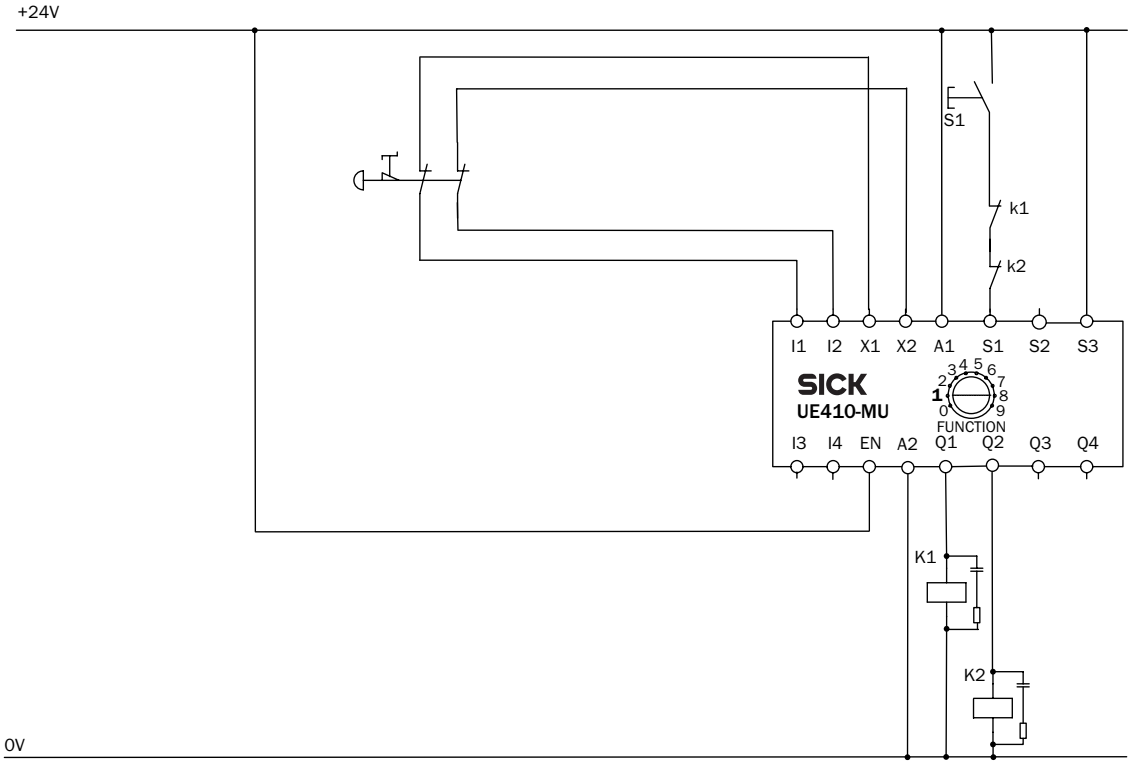

Program 3.2 with restart interlock and external device monitoring (EDM)





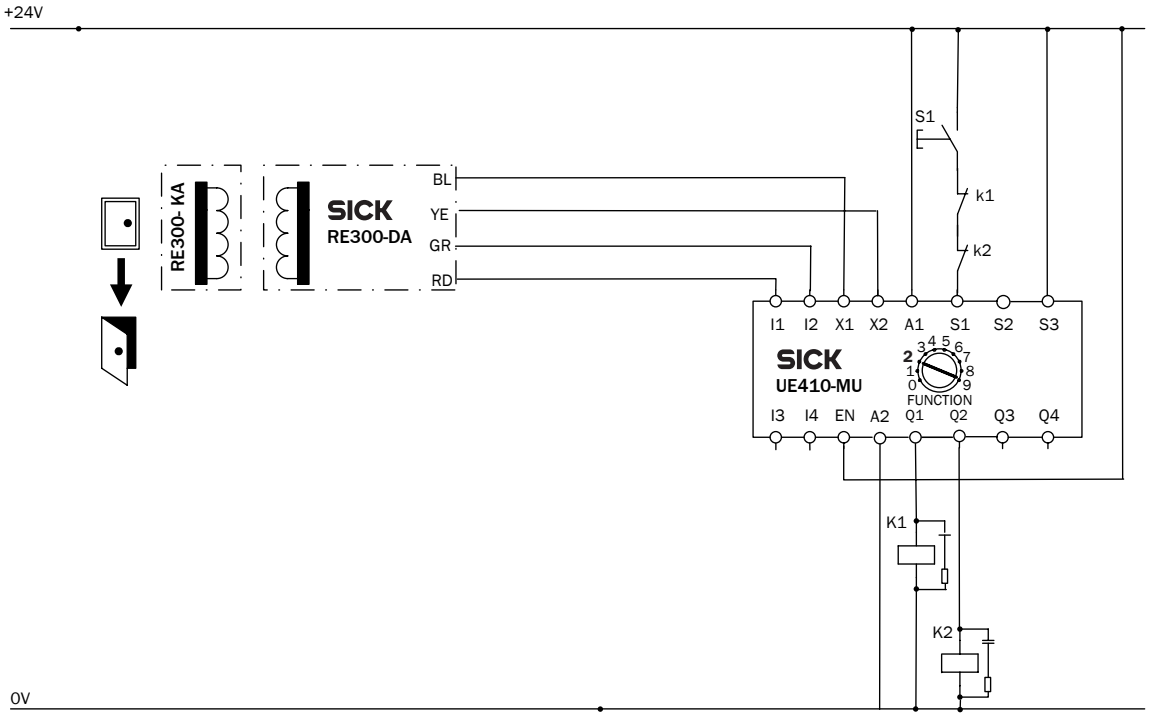
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## Emergency stop on UE410-MU




Program 1 with restart interlock and external device monitoring (EDM)

## Non-contact safety switch RE300 on UE410-MU

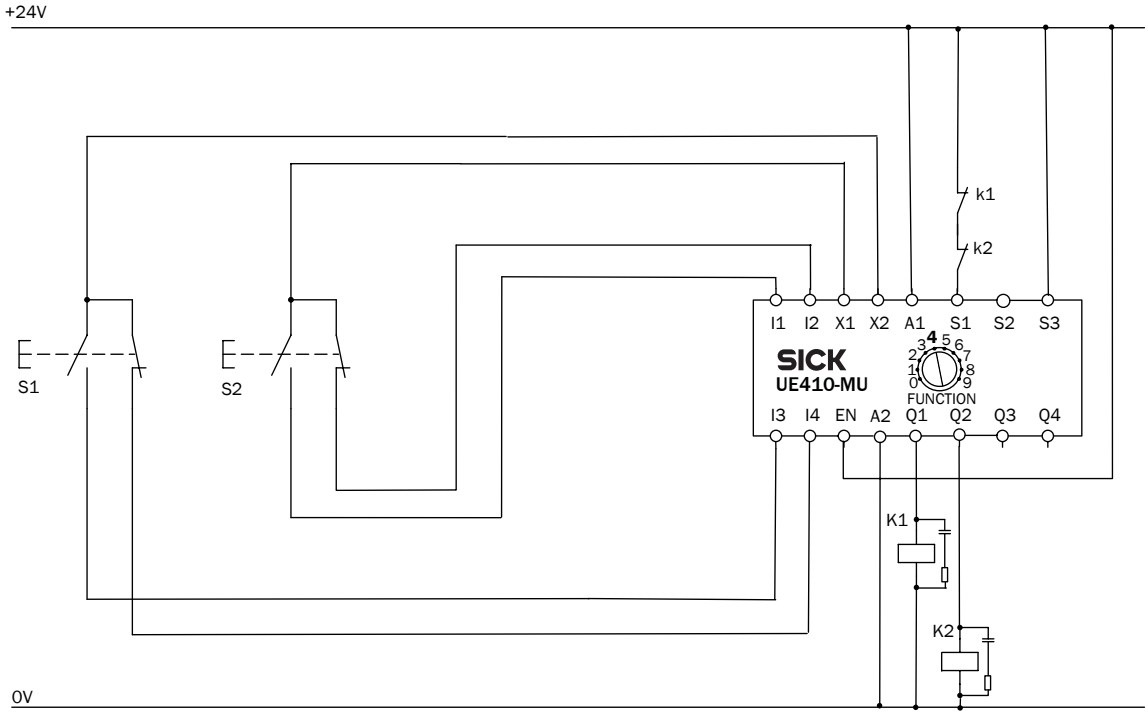



Program 2 with restart interlock and external device monitoring (EDM)

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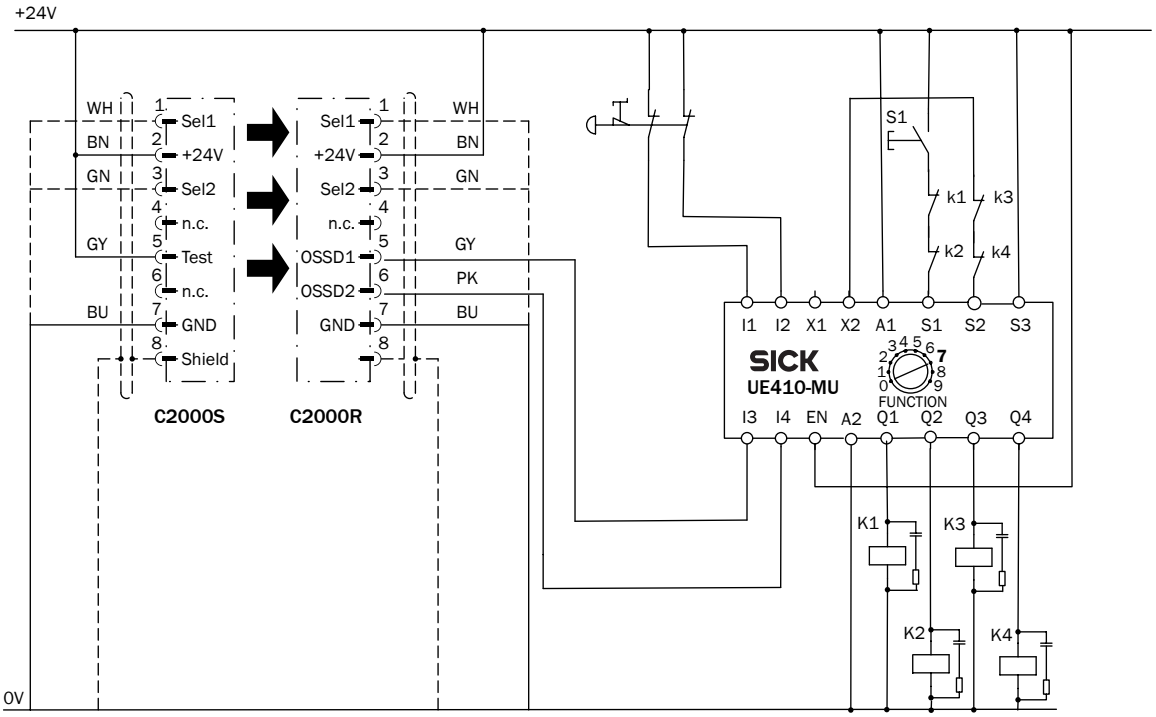

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## Two-hand control type III C on UE410-MU




Program 4 without restart interlock and with external device monitoring (EDM)

## Safety light curtain C2000 and emergency stop on UE410-MU



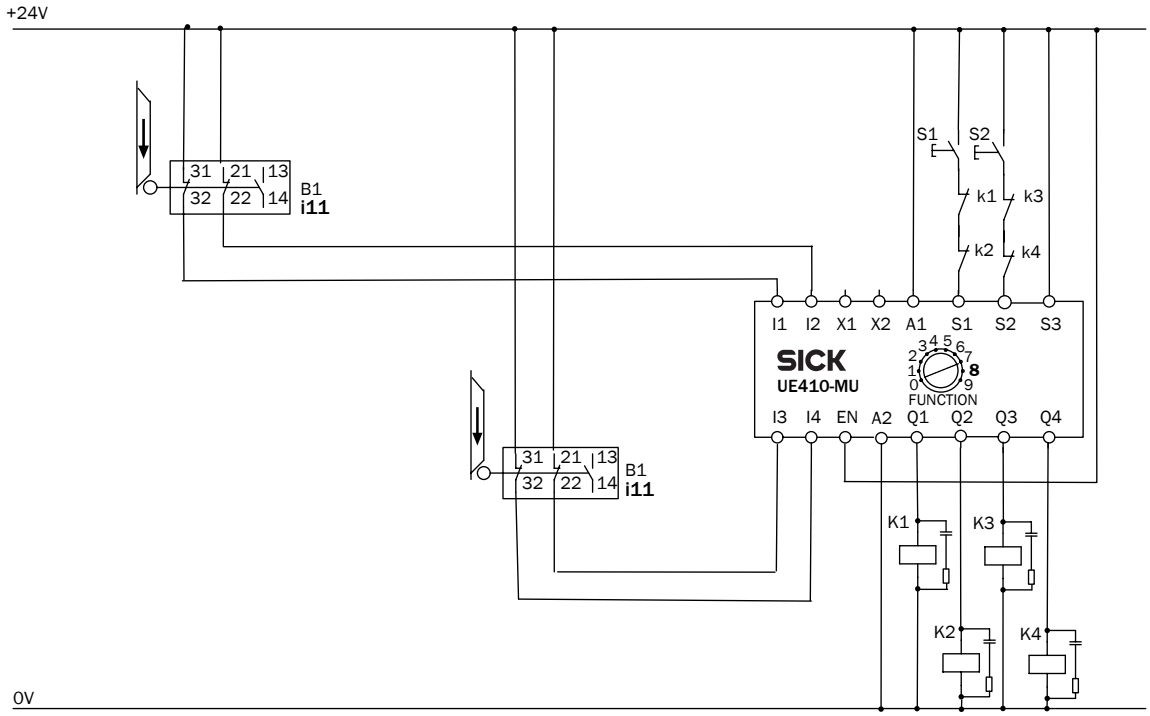

Program 7 with restart interlock and external device monitoring (EDM)





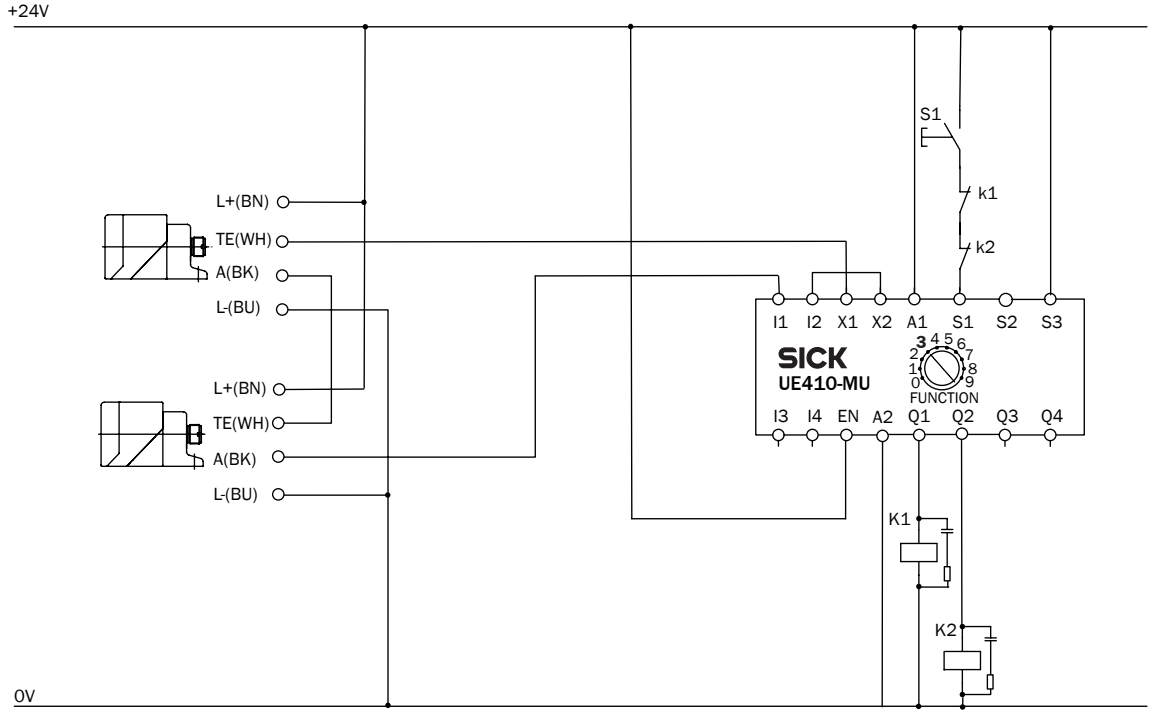
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## 2 safety switches with separate actuator i11, 2 separate hazardous areas on UE410-MU




Program 8 with restart interlock and external device monitoring (EDM)

## 2 non-contact safety switches IN4000 on UE410-MU

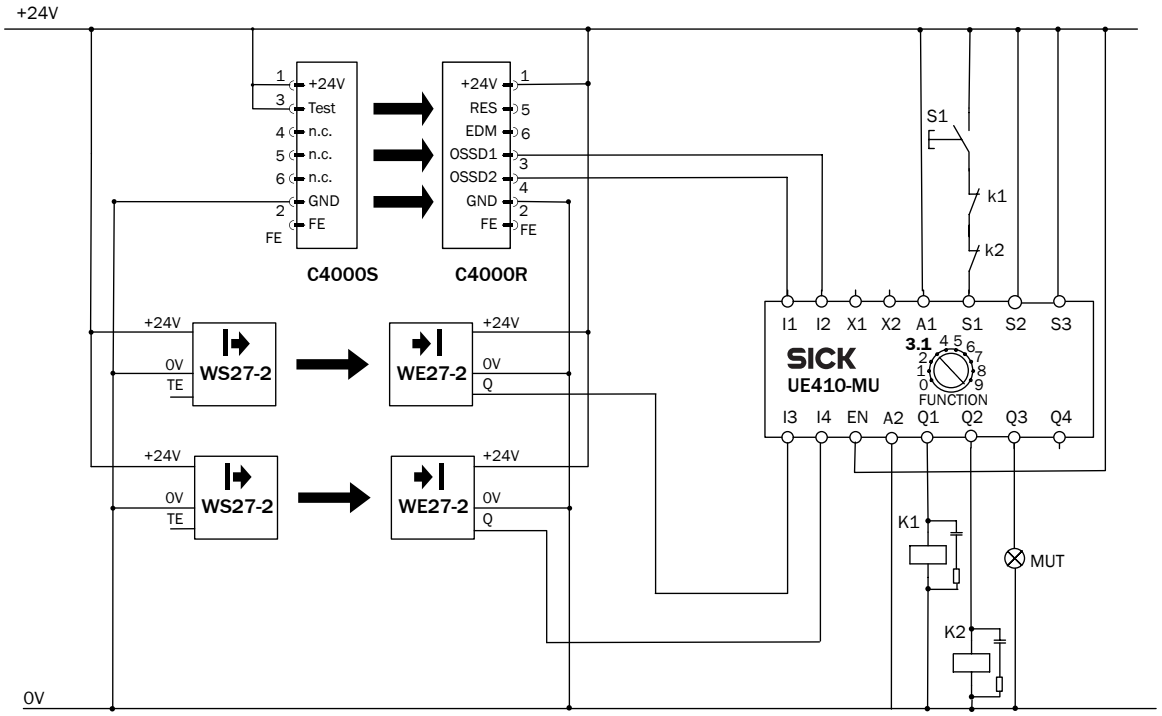



Program 3.2 with restart interlock and external device monitoring (EDM)

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## Safety light curtain C4000 with 2 muting sensors on UE410-MU




Program 3.1 with restart interlock and external device monitoring (EDM)

# Accessories

### Muting indicator lamp

| Type of muting indicator | Cable length | Description | Remark connection cable | Part number |
|---|---|---|---|---|
| LED lamp | 2 m | Incl. mounting kit | Incl. connection cable | 2019909 |
| | 10 m | | | 2019910 |
| Indicator lamp (bulb) | – | | Connecting cable not included | 2020743 |

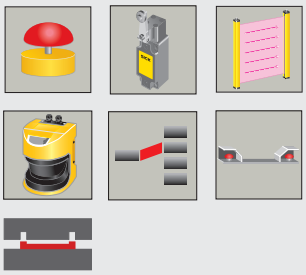
### Antimanipulation covers

| Description | Package Quantity | Part number |
|---|---|---|
| Antimanipulation covers for use with version C.x housings or later | 10 | 5319789 |

→ Configuring UE410 Flexi modules: www.ue410flexi.com

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- Online monitoring
- CDS interface
- Simple drag and drop programming
- Space saving

## Overview of technical specifications

| | |
|---|---|
| **Safety category** | Up to category 4 (EN 954-1) |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) |
| **Number of inputs** | 15 single-channel / 7 dual-channel |
| **Number of EFI interfaces** | 2 |
| **Number safety applications** | 2 |
| **Number of operating modes** | 5 |
| **Number of safety outputs** | 2 |
| **Number of application diagnostic outputs** | 4 |
| **Enclosure rating** | IP 20 |
| **Stop category to EN 60204** | 0, 1 |
| **Supply voltage** | 24 V DC |
| **Response time** | <10 ms |

## Product description

- Two independent or dependent safety applications
- Intelligent communication interface for electrosensitive protective equipment
- 2 pairs of safe semiconductor outputs (category 4) with separate EDM and reset
- 4 wear-free semiconductor outputs
- Stopping category 0 and 1
- Reduced wiring effort due to logical linking of the safety sensors (AND, OR, NAND ...)
- Secure against tampering due to different password levels

## In-system added value

- 5 operating modes
- Simple configuration via drag and drop with uniform user software CDS for SICK safety devices
- Simple replication of the application by uploading and downloading data sets
- 2 ESPE interfaces category 4 for C4000/S3000
- Function expansion for intelligent SICK sensors (simultaneous protective field monitoring S3000)

## Applications

- Safety light curtains
- Photoelectric safety switches
- Safety laser scanners
- Safety switches
- Emergency stop




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| Further information | Page |
|---|---|
| → Device overview and connections | 0-24 |
| → Dimensional drawings | 0-25 |
| → Connection diagrams | 0-25 |
| → Accessories | 0-29 |
| → Services | A-2 |



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# Ordering information

| Type | Signals related to pressing actions | Part number |
|---|---|---|
| UE440-A0410 | – | 1023859 |
| UE470-A0410 | ✔ | 1023862 |

# Detailed technical specifications

## General data

| | UE440-A0410 | UE470-A0410 |
|---|---|---|
| **Enclosure rating** | IP 20 (EN/IEC 60529) | |
| **Category** | 4 (EN 954-1) | |
| **Safety integrity level** | SIL3 (IEC 61508) | |
| **Protection class** | III (EN 50178) | |
| **Connector technology** | Screw-terminal connector | |
| **Dimensions (W x H x D)** | 65 mm x 120 mm x 100 mm | |

## Electrical data

| | UE440-A0410 | UE470-A0410 |
|---|---|---|
| **Supply voltage** | 24 V DC (19.2 V DC ... 28.8 V DC) [1] | |
| **Ripple** | ≤10 %, within the limits of $U_V$ | |
| **Power consumption** | Max. 4.5 A | |
| **Number of inputs** | 15 single-channel / 7 dual-channel | |
| **Number of EFI interfaces** | 2 | |
| **Number of operating modes** | 5 | |
| **Number of safety outputs** | 2 | |
| **Number of application diagnostic outputs** | 4 | |
| **Stop category to EN 60204** | 0, 1 | |
| **Maximum response time** | <10 ms | |
| **Input delay** | 0 ms ... 1000 ms, configurable | |
| **Discrepancy time** | 10 ms ... 30 s, configurable | |

[1] The external voltage supply must be capable of buffering brief mains failures of 20 ms as specified in EN 60204-1

## Functions

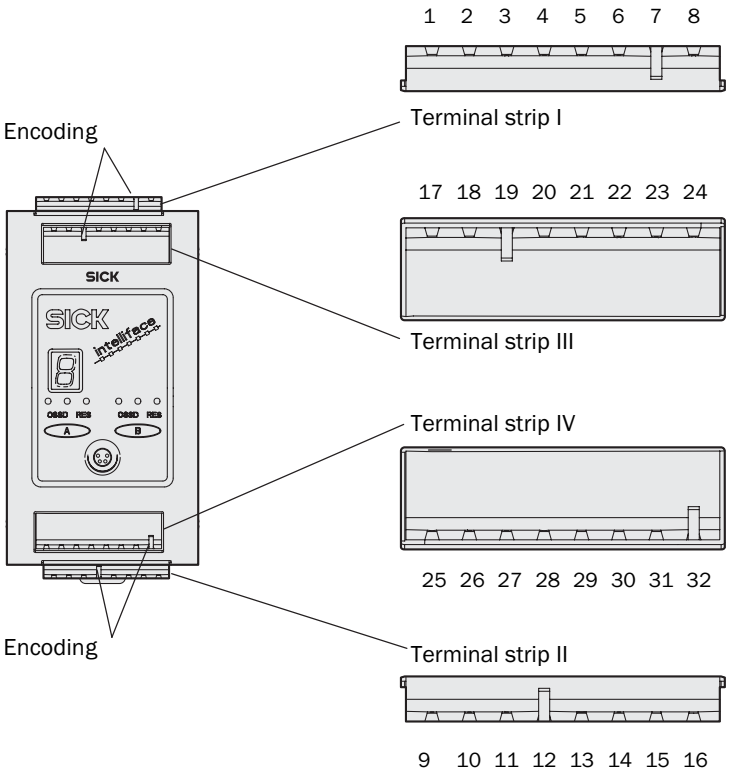
| | UE440-A0410 | UE470-A0410 |
|---|---|---|
| **Restart interlock** | ✔ | |
| **Automatic Reset** | ✔ | |
| **External device monitoring** | ✔ | |
| **Signals related to pressing actions** | | |
| **Bottom dead centre** | – | ✔ |
| **Top dead centre** | – | ✔ |
| **Stop control contact** | – | ✔ |
| **Expanded functions through the use of the safe SICK device communication EFI** | ✔ | |





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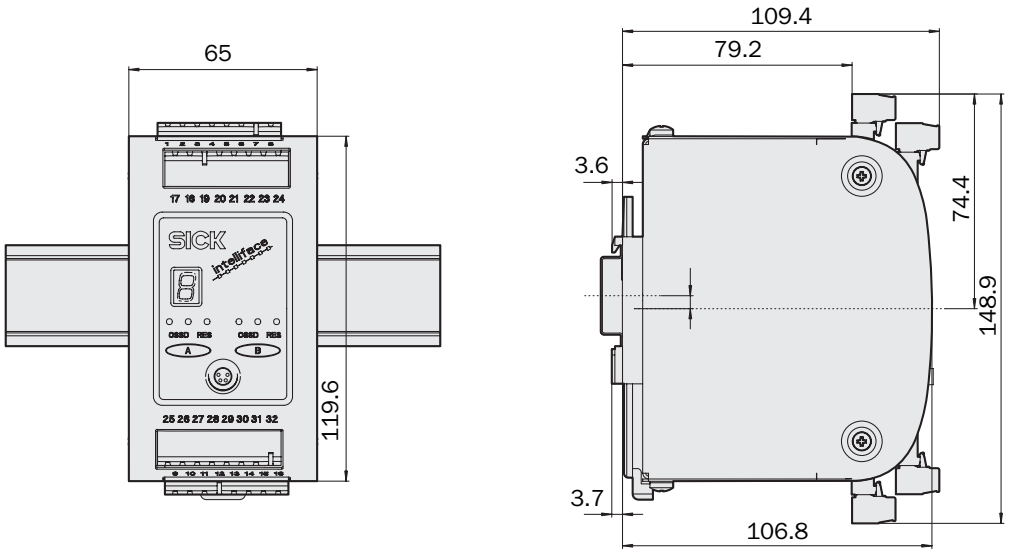
# Device overview and connections




| Terminal number(s) | Name convention | Functionality |
|---|---|---|
| **1** | 24 V DC | V DC input (voltage supply) |
| **2** | 0 V DC | V DC input (voltage supply) |
| **3** | FE | Functional earthing |
| **4-8** | I1.1 to I1.4 | Inputs |
| **14, 16, 17-20** | I2.1, I2.3, I3.0 to I3.3 | Inputs |
| **26-27** | I1.5 to I1.6 | Inputs |
| **30, 32** | I2.0, I2.2 | Inputs |
| **21, 25** | O1.0 to O1.1 | Single output (single-channel) or can be used for test signals |
| **12, 28** | O1.3, O1.2 | Single output (single-channel) |
| **13, 15, 29, 31** | O2.0, O2.2, O2.1, O2.3 | Single output (single-channel) or can be used as switching output (dual-channel switch-off of a machine or system) |
| **10-11, 22-23** | $EFI1_B$, $EFI1_A$, $EFI2_A$, $EFI2_B$ | Device communication for ESPE with EFI |
| **9** | FE | Functional earthing, for applying shielding of EFI1 (if shielding is necessary for EMC reasons) |
| **24** | FE | Functional earthing, for applying shielding of EFI2 (if shielding is necessary for EMC reasons) |


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## Dimensional drawings

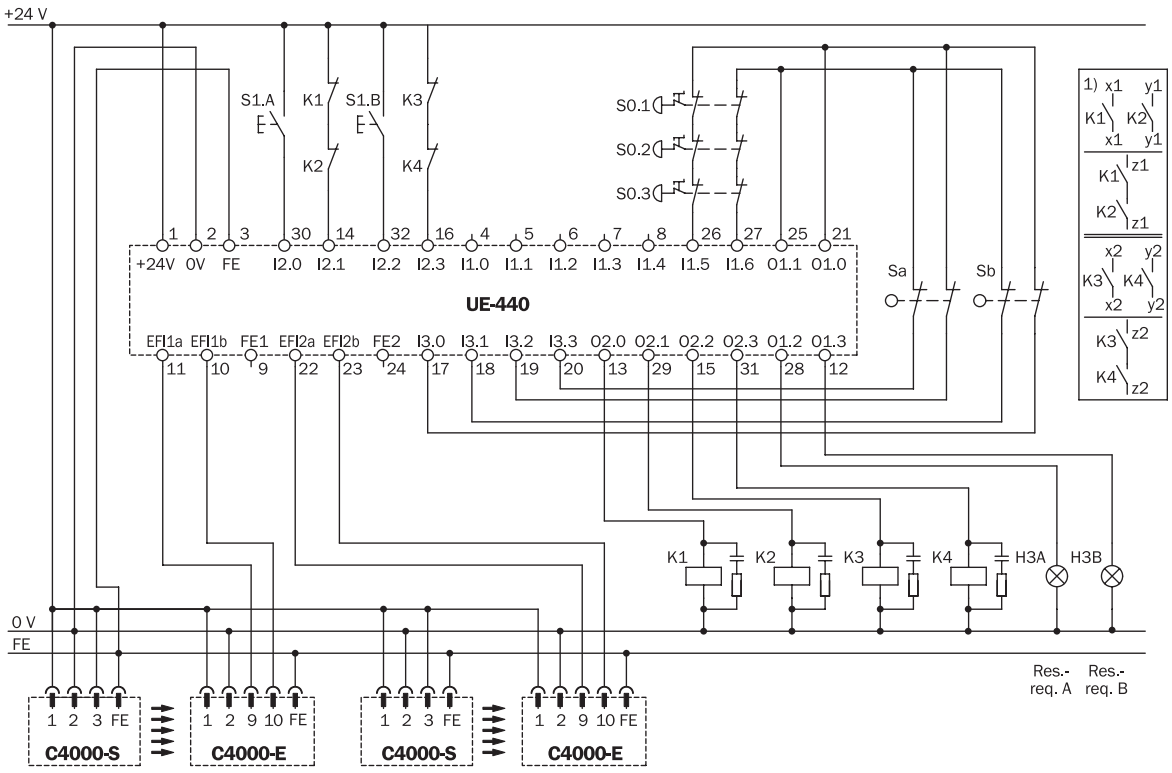



Dimensions in mm

## Connection diagrams

➜ You can find more connection diagrams at www.sickusa.com/connectiondiagramms

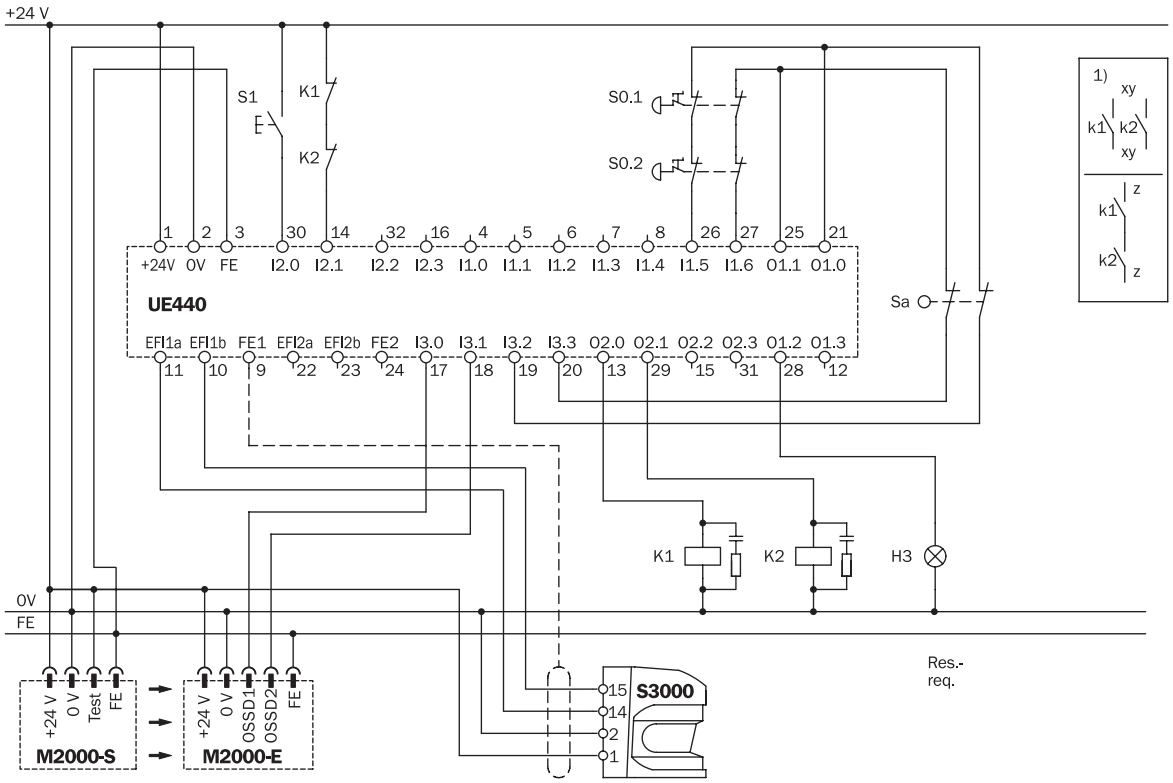
### Protection of two separate accesses with UE440 and C4000 Standard/Advanced




With restart interlock, external device monitoring (EDM), emergency stop, safety doors

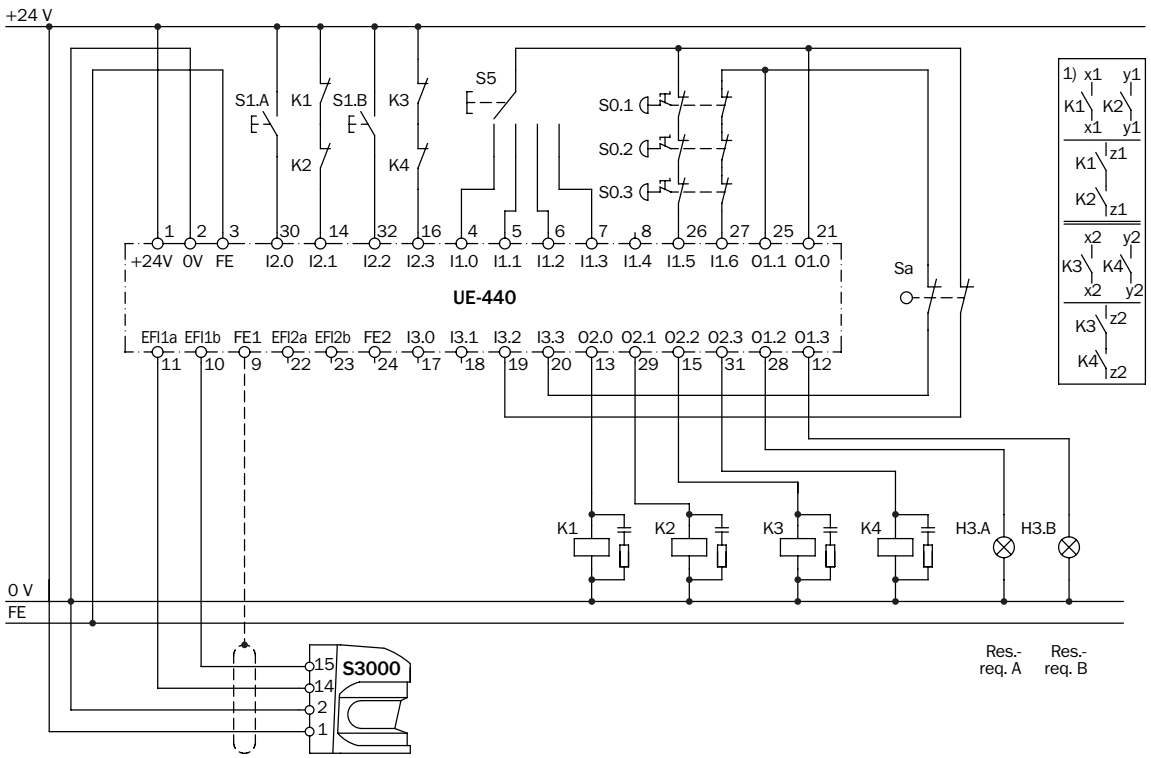

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## Access protection with UE440 and M2000, point-of-operation guarding with S3000




With restart interlock, external device monitoring (EDM), emergency stop, safety door

## Simultaneous hazardous point protection with UE440 and S3000



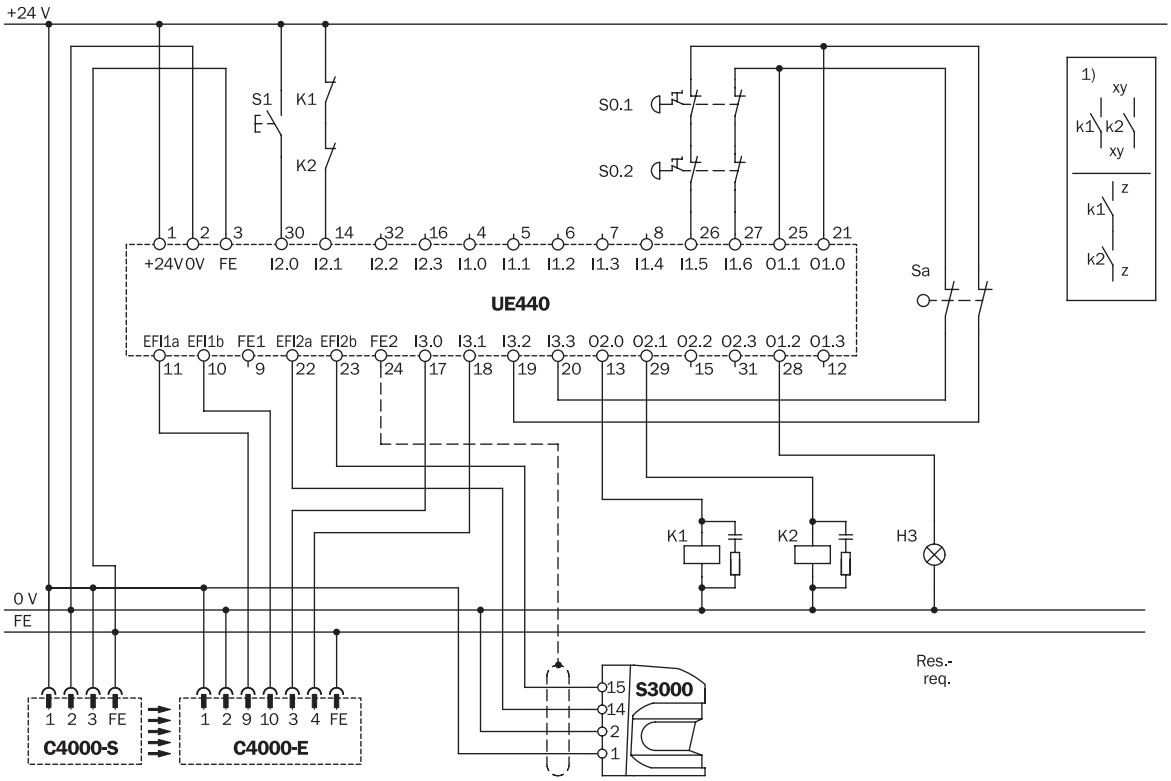

With operating mode selector switch, restart interlock, external device monitoring (EDM), emergency stop, safety doors

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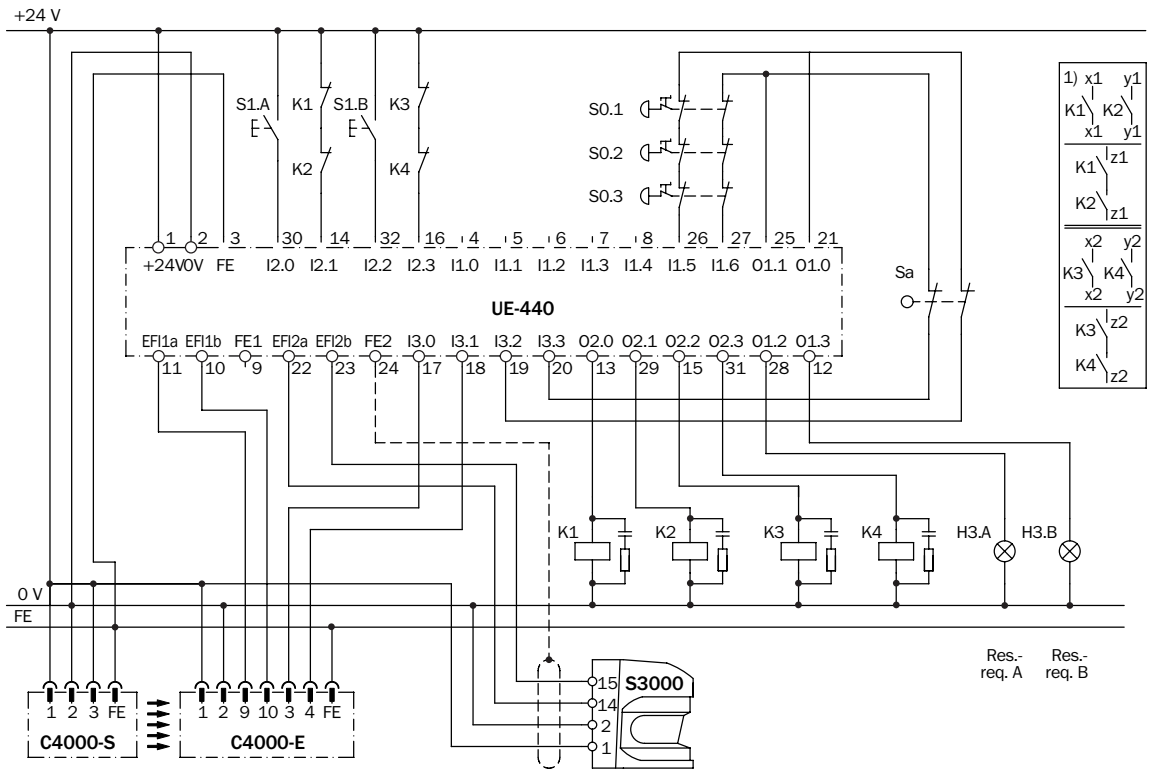
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## Hazardous point protection with UE440 and C4000, interior area protection with S3000




With restart interlock, external device monitoring (EDM), emergency stop, safety door

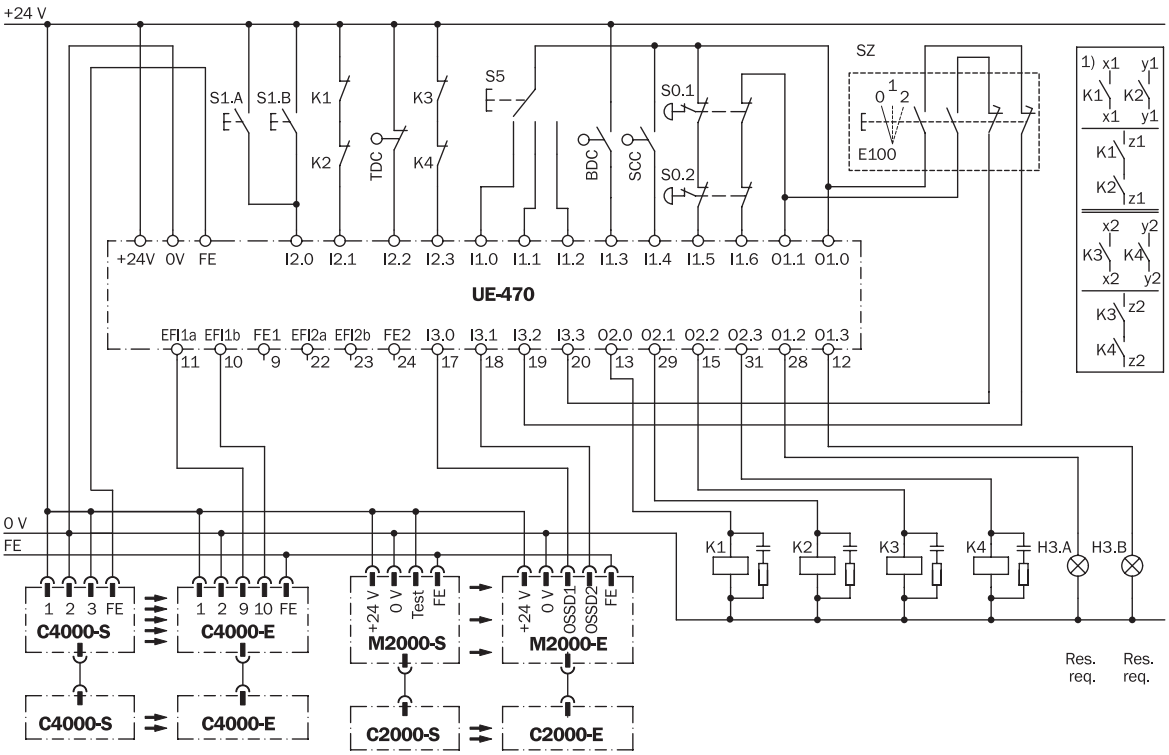
## Protection of two separate hazardous points with C4000, S3000 and UE440




With restart interlock, external device monitoring (EDM), emergency stop, safety door


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## Hazardous point protection with UE470, C4000, C2000 and M2000 on a press with PSDI mode




With operating mode selector switch, restart interlock, external device monitoring (EDM), machine cycle contacts BDC, TDC and SCC as well as emergency stop and enabling switch

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# Accessories

### Connection cable

| Type | Connector technology | Cable length | Part number |
|---|---|---|---|
| EFI connection cable | Stripped | 50 m | 6026675 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |
| Release code of CDS software | Enables configuration and online diagnostics of the UE440/470 and the connected EFI devices | 2031323 |

### Connection set

| Type | Usage | Part number |
|---|---|---|
| System plug | Four pre-encoded screw-connection terminal, strips, including blank fields in bag | 2029991 |

### Configuration connection cable

| Connector technology | Cable length | Part number |
|---|---|---|
| M8 x 4, SUB-D 9-pol | 2 m | 6021195 |
| | 8 m | 2027649 |




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- Control cabinet free manufacture
- Central diagnosis
- Less wiring expenditure
- Safety Data Link (SDL) to SICK safety components

## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | PROFIsafe |
| **Number of safety inputs** | 8 dual-channel resp. 16 single-channel |
| **Number of SDL connections** | 2 |
| **Enclosure rating** | IP 67 |
| **Safety category** | Up to category 4 (EN 954-1) |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) |

## Product description

- Easy configuration and diagnosis with the aid of Windows-based CDS software (Configuration & Diagnostic Software)
- Offline configuration of the system without FPLC is possible
- Support for PROFIsafe V1.20 10/2002
- Support for PROFIBUS-DP V1:
  - Cyclic communication with DP-Master Class 1 (central control)
  - Acyclic communication with DP-Master Class 2 (configuration and diagnosis tool)
- 2 SDL connections to connect active SICK safety components (UE4150/ UE4155)
- Configuration and diagnosis of all the components connected to the SDL connection via the configuration connection of the UE4150/UE4155
- Usage of the expanded functions of the safety components with SICK device communication (UE4155)

## Applications

- Electrosensitive protective equipments
- Emergency stop buttons
- Electromechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact





| Further information | Page |
|---|---|
| → Dimensional drawings | 0-32 |
| → Device overview and connections | 0-32 |
| → Connection diagrams | 0-34 |
| → Accessories | 0-35 |
| → Services | A-2 |




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# Ordering information

| Description | Number of SDL connections | Usage of the expanded functions on the SDL | Delivery | Type | Part number |
|---|---|---|---|---|---|
| Safety remote I/O | – | – | Including configuration & diagnostic software and operating instructions on CD-ROM | UE4120-01BC600 | 1024176 |
| | 2 | – | | UE4150-01BC700 | 1019557 |
| | | ✔ | | UE4155-01BC700 | 1024057 |

# Detailed technical specifications

| Type | UE4120-01BC600 | UE4150-01BC700 | UE4155-01BC700 |
|---|---|---|---|
| Fieldbus | PROFIsafe | | |
| Enclosure rating | IP 67 | | |
| Category | 4 (EN 954-1) | | |
| Safety integrity level | SIL3 (IEC 61508) | | |
| Supply voltage | 24 V DC (19.2 V DC ... 28.8 V DC) [1] | | |
| Power consumption | Max. 9 A | | |

[1] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1.

## Field-signal inputs

| | |
|---|---|
| Input voltage HIGH | 24 V (11 V ... 28.8 V) |
| Input delay | 0 ms ... 90 ms, configurable |

## Field-signal outputs

| | |
|---|---|
| Output voltage HIGH | $U_V$, without load, switched-on |
| Switching current | 0 mA ... 700 mA |
| Minimum current for fault monitoring | 7 mA, 20 mA, 40 mA, on field-signal connections 7 and 8 [1] |

[1] Only when the connection is configured as an output for a muting lamp.

## SDL connections

| | | |
|---|---|---|
| Input current | – | Max. 1.4 A |
| Internal resistance | – | Max. 0.3 Ohm |

## OSSD inputs

| | | |
|---|---|---|
| Input voltage HIGH | – | 24 V (13 V ... 28.8 V) |
| Test pulse width | – | Max. 700 ms |
| Test pulse rate | – | Max. 500 Hz |

## PROFIBUS connection

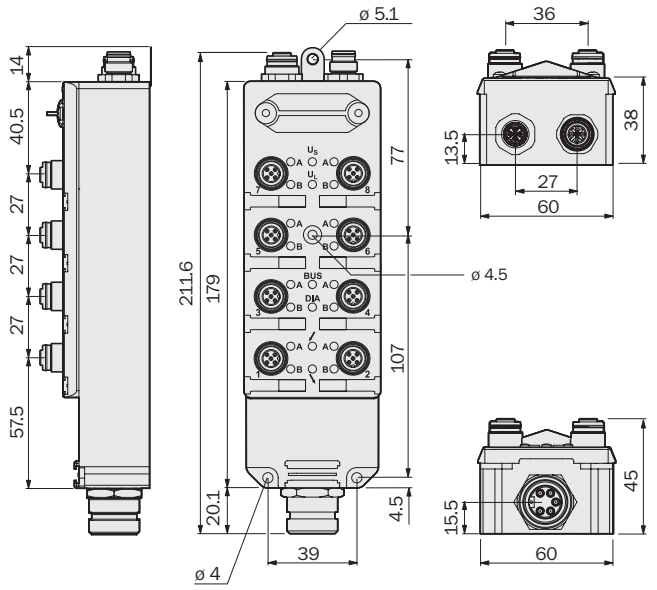
| | | |
|---|---|---|
| Baud rate | 9.6 KBit/s ... 12 MBit/s | |
| Address mode | 3 ... 125 | |
| Recovery detection | 070F hex | 071A hex |



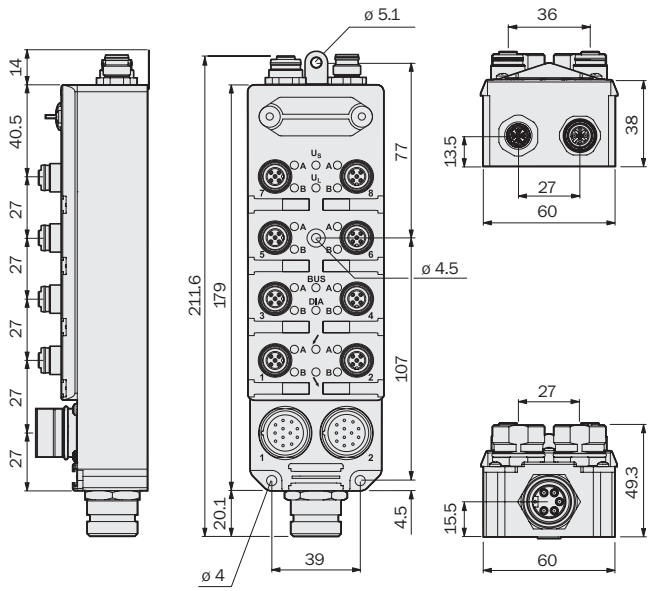

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# Dimensional drawings

**UE4120**



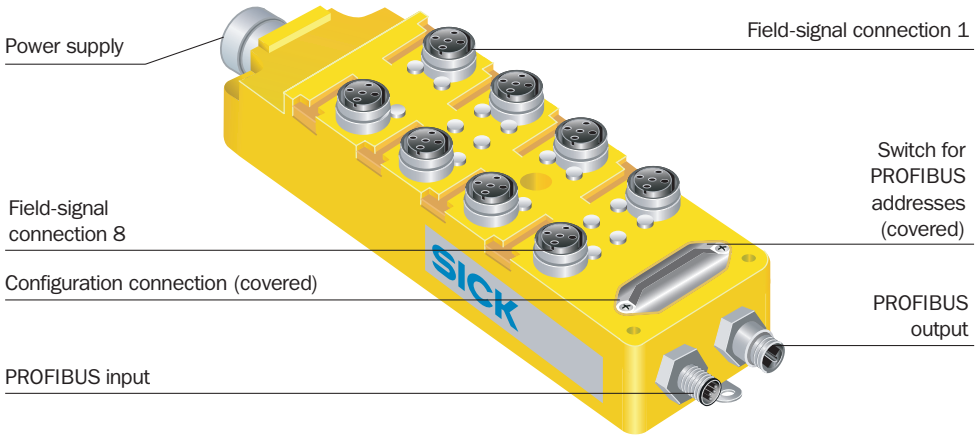

**UE4150, UE 4155**




Dimensions in mm

# Device overview and connections

## UE4120

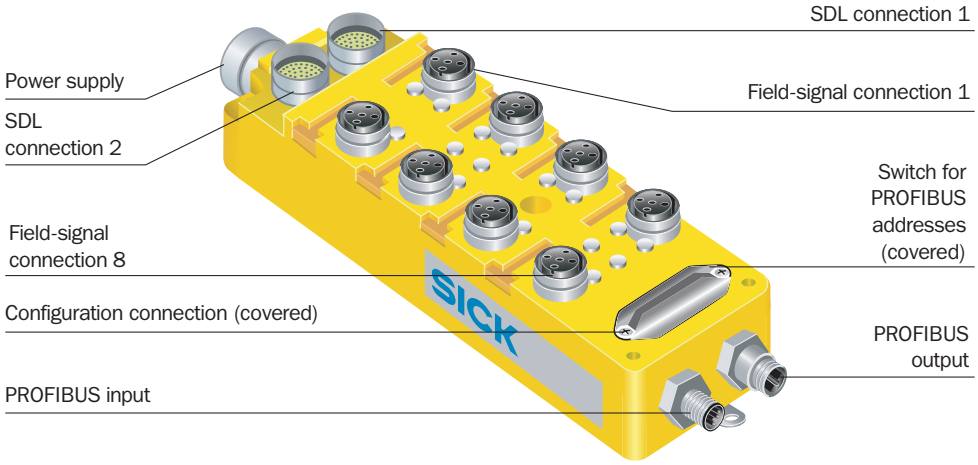



| Connection | Function |
|---|---|
| **Power supply** | Common voltage supply for UE4120 and the safety components connected to the field-signal connections |
| **Field-signal connections** | To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts<br>1 field-signal connection = 2 channels (2 safety inputs and 2 outputs)<br>Connections can be shared by a two-way splitter |
| **Configuration connection** | To directly connect a PC to the SICK CDS in order to configure the system |
| **PROFIBUS connection** | Input and output according to PROFIBUS specification |

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## UE4150, UE 4155




| Connection | Function |
|---|---|
| **Power supply** | Common supply voltage for the bus node and the safety components connected to the SDL and field-signal connections |
| **SDL connections** | To connect safety components with SICK device communication and/or OSSDs |
| **Field-signal connections** | To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts<br>1 field-signal connection = 2 channels (2 safety inputs and 2 outputs)<br>Connections can be shared by a two-way splitter |
| **Configuration connection** | To directly connect a PC to the SICK CDS in order to configure the system |
| **PROFIBUS connection** | Input and output according to PROFIBUS specification |



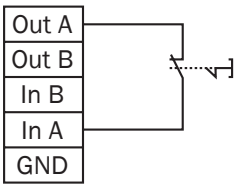


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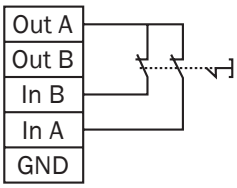
# Connection diagrams

## Emergency stop, emergency shutdown, safety door on the field-signal connection

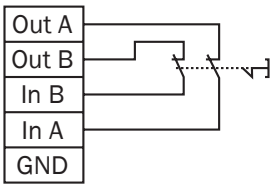
Single-channel
(up to category 2)




Dual-channel with
common testing
(up to category 3)

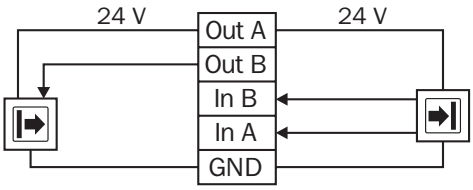



Dual-channel with
isolated testing
(up to category 4)

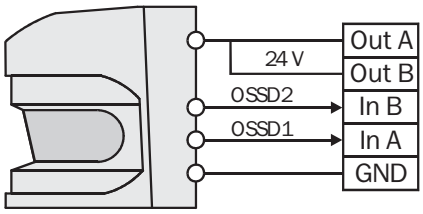



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.
The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

## Electrosensitive protective equipment (ESPE) on the field-signal connection

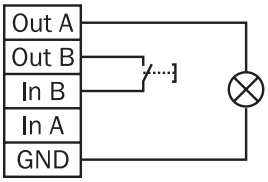



In the connection of electrosensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.
You can use output Out B to test the sender.



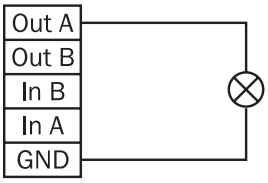

The switching outputs of the receiver are present on inputs In A and In B.

## Control switch with indicator display on the field-signal connection




The indicator display (Out A) is being controlled via an FPLC.

## Muting lamp on the field-signal connection




It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.





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# Accessories

### Field-signal connection accessories

| Type | Direction of the cable outlet on the plug | Shielded | Cable length | Part number |
|---|---|---|---|---|
| Cable, M12 x 5 male connector with flying leads | Straight | ✔ | 2 m | 6024860 |
| | | | 5 m | 6024861 |
| | | | 10 m | 6024862 |
| | | – | 2 m | 6026133 |
| | | | 5 m | 6026134 |
| | | | 10 m | 6026135 |
| Cable, M12 x 5 male connector to M26 x 11 + FE, female connector for C4000 Standard or Advanced sender unit | Straight | ✔ | 2.5 m | 2040017 |
| | | ✔ | 5 m | 2040018 |
| | | ✔ | 10 m | 2040019 |
| | | ✔ | 15 m | 2040056 |
| Cable, M12 x 5 male connector to M26 x 11 + FE, female connector for C4000 Standard or Advanced receiver unit | Straight | ✔ | 2.5 m | 2040014 |
| | | ✔ | 5 m | 2040015 |
| | | ✔ | 10 m | 2040016 |
| | | ✔ | 15 m | 2040053 |
| Field attachable connector, M12 x 5 | Straight | – | – | 6022083 |
| | | ✔ | – | 6024741 |
| | Angled | – | – | 6022082 |
| Field attachable connector M12 x 8 for C2000, C4000 Micro and Basic Plus, and M4000 Standard | Straight | ✔ | – | 6028422 |
| Two-way splitter, M12 x 5 Straight through connection | – | – | – | 6024744 |
| Two-way splitter, M12 x 5 Internal series wired connection | – | – | – | 4050723 |
| Two-way splitter for C4000 Eco Sender/Receiver to M12 x 5 | – | – | – | 6026517 |

### Protective caps for IP 67 integrity

| Description | Packing unit | Part number |
|---|---|---|
| Protective cap M12 | 10 | 5309189 |
| Protective cap | 1 | 5310774 |

### PROFIBUS connection, connectors

| Connection type | Connector technology | Direction of the cable outlet | Maximum connection cable cross-section | Coding | Shielded | Type | Part number |
|---|---|---|---|---|---|---|---|
| Socket M12 x 5 | Screwed | Straight | 0.75 mm² | B-coding | ✔ | PR-DOS-1205-G | 6021353 |
| Plug M12 x 5 | | | | | ✔ | PR-STE-1205-G | 6021354 |
| Plug M12 x 4 with terminating resistor | – | – | – | | – | PR-STE-END | 6021156 |

### Power supply, cable receptacles

| Connector technology | Direction of the cable outlet | Part number |
|---|---|---|
| Screwed | Straight | 6024745 |




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### SDL connection accessories

| Type | Connection type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|
| SDL connection cables, shielded | Interconnectron M23 x 12, male with flying leads for connection of S3000 system plug (sold seperately) | Straight | 2.5 m | 2029337 |
| | | | 5 m | 2029338 |
| | | | 10 m | 2029339 |
| | | | 15 m | 2029340 |
| | Hirschmann M26 x 11 + FE female to Interconnectron M23 x 11 + FE male cable for C4000 Standard/ C4000 Advanced | Plug straight/socket straight | 2.5 m | 2029131 |
| | | | 5 m | 2025634 |
| | | | 10 m | 2025635 |
| | | | 15 m | 2025636 |
| | Interconnetron M23 x 11 + FE female to Interconnectron M23 x 11 + FE male cable for C4000 (special variant) | Plug straight/socket straight | 0.5 m | 7029160 |
| | | | 3 m | 7029161 |
| | | | 7.5 m | 7029162 |
| | | | 15 m | 7029163 |
| | | | 20 m | 7029164 |
| Field attachable connector | SDL connection, M23 x 11 + FE | – | – | 6024742 |

### Configuration connection, configuration connection cable

| Connection type | Description | Cable length | Part number |
|---|---|---|---|
| M8 x 4, SUB-D 9-pol | For connecting the configuration connection to the PC | 2 m | 6021195 |
| | | 8 m | 2027649 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

### Designation plates

| Description | Packing unit | Part number |
|---|---|---|
| In the 9 x 20 mm frame | 40 | 5310775 |





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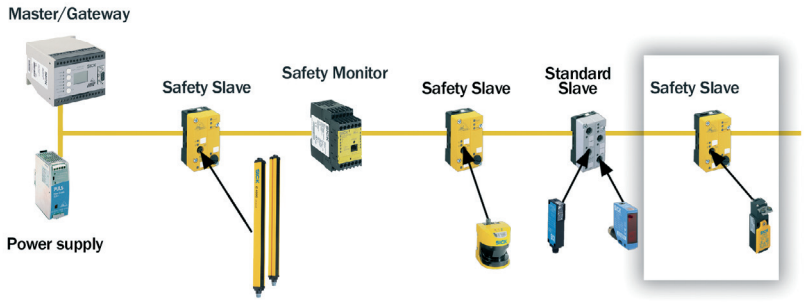
## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | AS-Interface Safety at Work |
| **Component** | Safety slave |
| **Type of output of connectable safety sensors** | Positively driven safety contacts |
| **Enclosure rating** | IP 65 |
| **Safety category** | Up to category 3 (EN 954-1) |

## Product description

- Connection for different switches fitted with volt-free (electromechanical) contacts
- AS-Interface (yellow AS-Interface cable)
- AS-Interface version 2.1

## Applications







- Safety automation without control cabinet
- Less wiring expenditure

## Ordering information

| Type | Part number |
|---|---|
| UE3212-10CA200 | 1025814 |

| Further information | Page |
|---|---|
| → Technical specifications | 0-38 |
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| → Device overview and connections | 0-38 |
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# Detailed technical specifications

| | |
|---|---|
| **Fieldbus** | AS-Interface Safety at Work |
| **Enclosure rating** | IP 65 (EN 60529) |
| **Category** | 3 (EN 954-1) |
| **Power consumption** | Max. 70 mA |
| **Response time** | 4 ms |

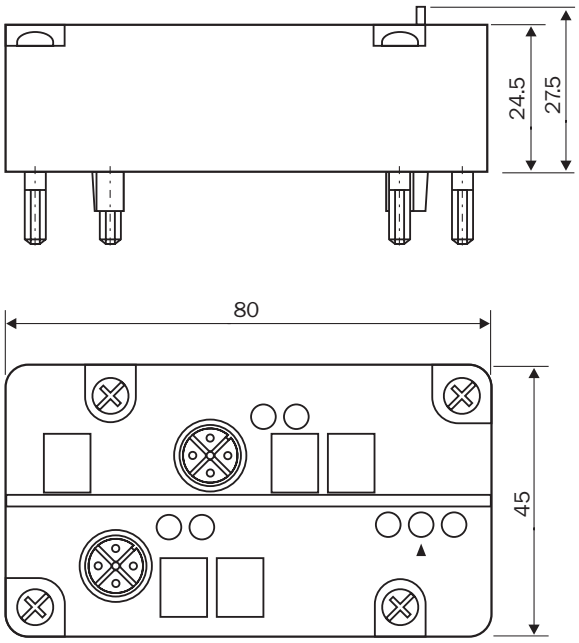
### AS-Interface Safety at Work

| | |
|---|---|
| **AS-Interface profile** | S-7.B.0. |
| **Supply voltage** | 26.5 V DC ... 31.6 V DC |
| **AS-Interface master version** | 2.1 |
| **Data bits IN input channel I1** | AS-Interface Safety at Work code sequence on D0, D1 |
| **Data bits IN input channel I2** | AS-Interface Safety at Work code sequence on D2, D3 |
| **Data bits OUT** | D0 (LED alarm) |
| **Data bits OUT not used** | D1, D2, D3 (don't care) |

### Socket I1/2

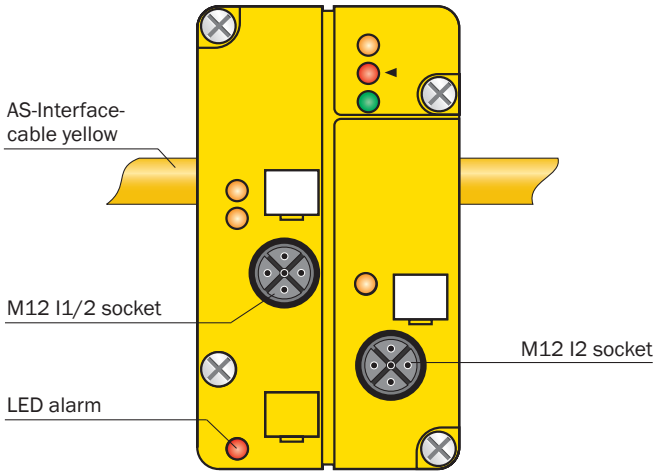
| | |
|---|---|
| **Opening time** | Min. 43 ms |
| **Cable length** | 5 m |

# Dimensional drawings




Dimensions in mm

# Device overview and connections

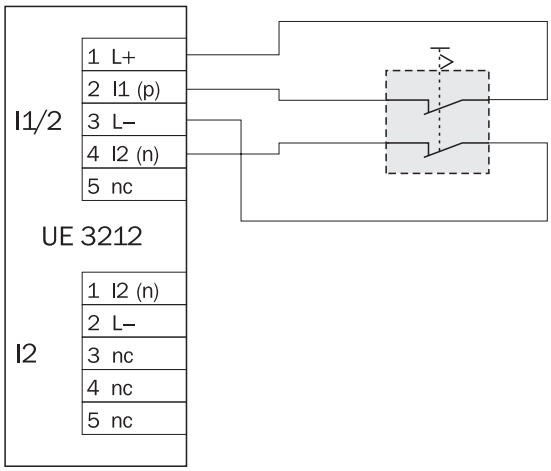



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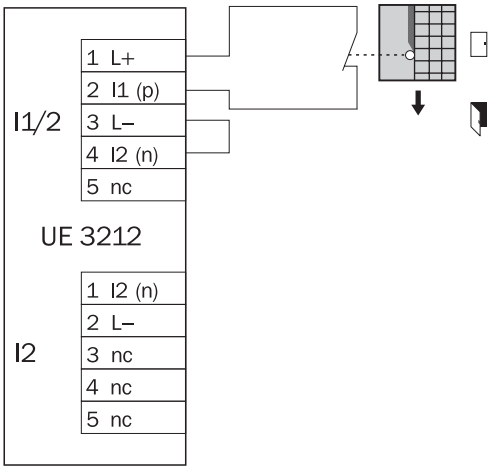
# Connection diagrams

## Connection of a dual-channel emergency stop button




Monitoring block to be selected in the safety monitor "dual-channel positively driven"

## Connection of a single-channel safety door

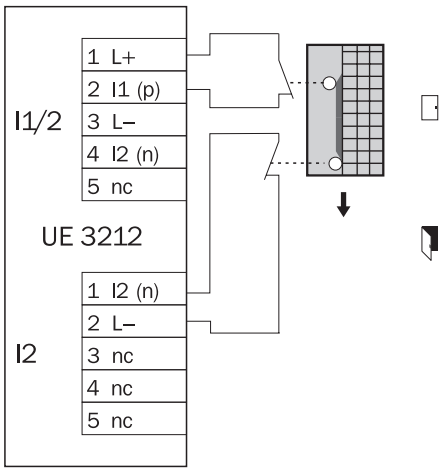



Monitoring block to be selected in the safety monitor "dual-channel independent"

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## Connection of a dual-channel safety door




Monitoring block to be selected in the safety monitor "dual-channel dependent"

# Accessories

### Connection cables

| Connection type | Direction of the cable outlet | Cable length | Part number |
|---|---|---|---|
| Plug M12 x 5 | Straight | 2 m | 6026133 |
| | | 5 m | 6026134 |

### Field attachable connectors

| Connection type | Maximum connection cable cross-section | Direction of the cable outlet | Type | Part number |
|---|---|---|---|---|
| Plug M12 x 4 | 0.75 mm² | Straight | STE-1204-G | 6009932 |
| | | Angled | STE-1204-W | 6022084 |
| Plug M12 x 5 | 0.75 mm² | Straight | STE-1205-G | 6022083 |
| | | Angled | STE-1205-W | 6022082 |

### AS-Interface accessories

| Addressing | Type | Part number |
|---|---|---|
| Without addressing socket | ASI-FK | 6022394 |
| With addressing socket | ASI-FK-A | 6022396 |





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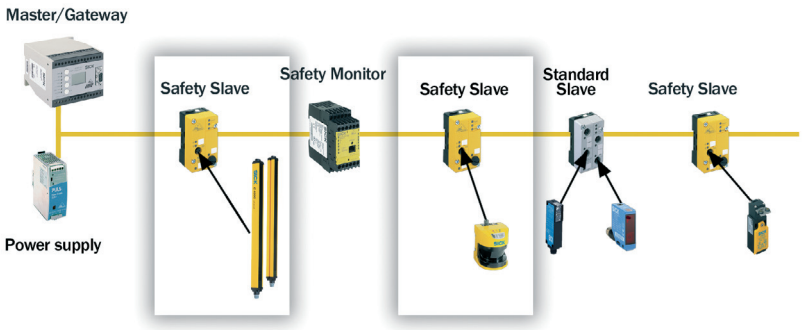
## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | AS-Interface Safety at Work |
| **Component** | Safety slave |
| **Type of output of connectable safety sensors** | OSSD |
| **Enclosure rating** | IP 67 |
| **Safety category** | Up to category 4 (EN 954-1) |

## Product description

- Connection for electrosensitive protective equipment (ESPE) with self-monitoring semiconductor outputs (OSSDs)
- Connection for the sender unit and the receiver unit of an ESPE system
- AS-Interface (yellow AS-Interface cable)
- External power supply for ESPE over 24 V ribbon cable (black AS-Interface cable)
- AS-Interface version 2.1

## Applications




## Ordering information

| Type | Part number |
|---|---|
| UE4215-14CA200 | 1025687 |




- Control cabinet free manufacture
- Less wiring expenditure

| Further information | Page |
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# Detailed technical specifications

| | |
|---|---|
| **Fieldbus** | AS-Interface Safety at Work |
| **Enclosure rating** | IP 67 (EN 60529) |
| **Category** | 4 (EN 954-1) |
| **Power consumption** | Max. 60 mA |
| **Response time** | 22 ms |

### AS-Interface Safety at Work

| | |
|---|---|
| **AS-Interface profile** | S-0.B.E |
| **Supply voltage** | 26.5 V DC ... 31.6 V DC |
| **AS-Interface master version** | 2.1 |
| **Data bits IN input channel I1** | AS-Interface Safety at Work code sequence on D0, D1 |
| **Data bits IN input channel I2** | AS-Interface Safety at Work code sequence on D2, D3 |
| **Data bits OUT** | Not used |

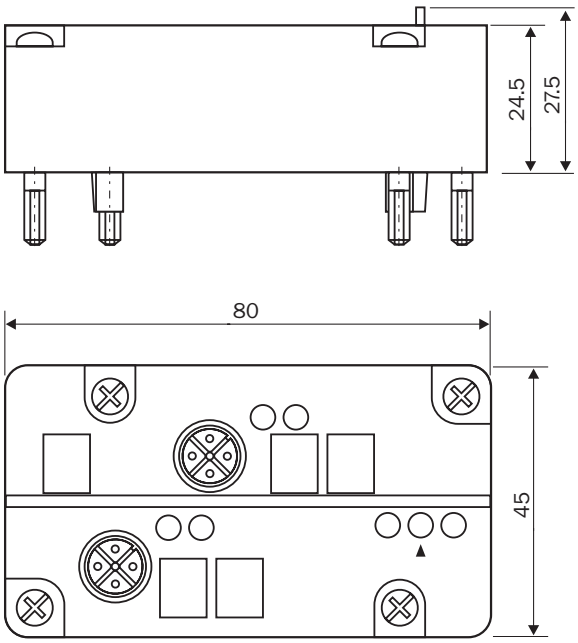
### Socket I1/2

| | |
|---|---|
| **Output current Pin 1 (AUX L+)** | Max. 1.4 A |
| **OSSD inputs** | |
| **Input voltage HIGH** | 24 V (13.5 V ... 28.8 V) |
| **Test pulse rate** | 0 Hz ... 25 Hz |
| **Test pulse width** | 0 µS ... 550 µS |
| **Opening time** | Min. 51 ms |
| **Cable capacitance** | Max. 100 pF |

### AUX PWR

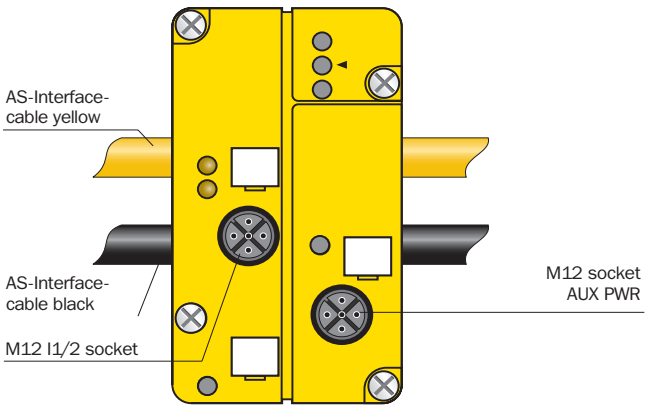
| | |
|---|---|
| **Supply voltage** | 24 V (16.8 V ... 28.8 V) |
| **ESPE sender total output current (AUX L+)** | Max. 1.4 A |

# Dimensional drawings




Dimensions in mm

# Device overview and connections

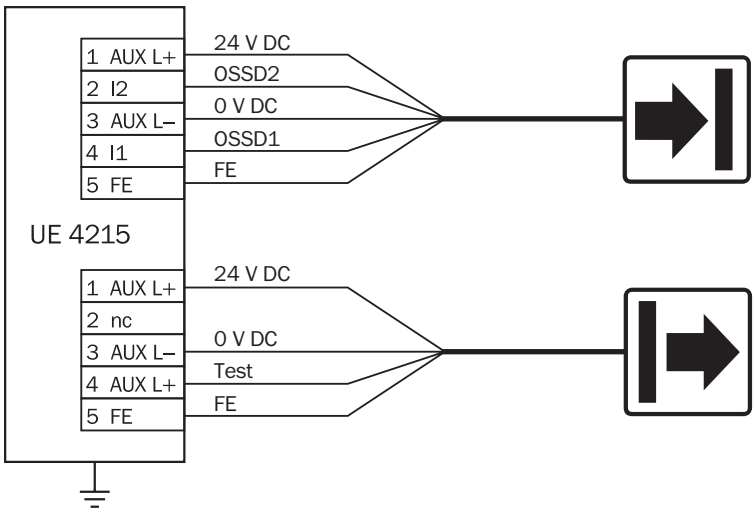




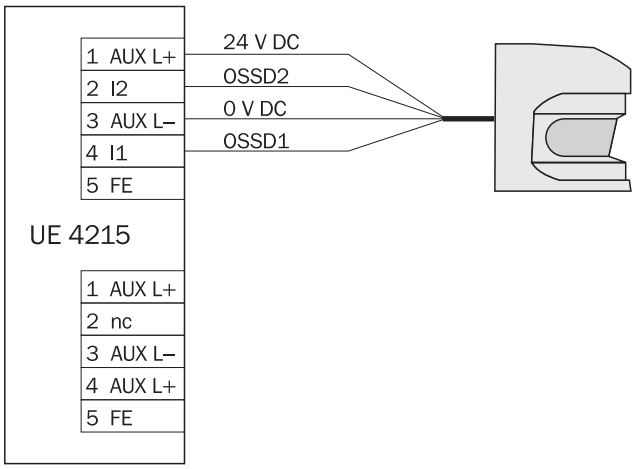
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# Connection diagrams

## Connection of safety light curtains with self-monitored semiconductor outputs (OSSDs)




## Connection of a safety laser scanner








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# Accessories

### Connection cables

| Connection type | Direction of the cable outlet | Description | Cable length | Part number |
|---|---|---|---|---|
| Plug M12 x 5 | Straight | – | 2 m | 6026133 |
| | | | 5 m | 6026134 |
| | | | 10 m | 6026135 |
| Plug M12 x 5, Hirschmann cable socket M26 x 11 + FE | Plug straight/socket straight | Connecting cable for safety light curtain (e.g. C4000) or multiple light beam safety device (e.g. M4000) | 2 m | 2030357 |
| | | | 5 m | 2030365 |
| | | | 10 m | 2030366 |
| M12 x 7 + FE | Straight | Connecting cable with cable socket for safety light curtain (e.g. C2000) or multiple light beam safety device (e.g. M2000) | 2.5 m | 6020537 |
| | | | 5 m | 6020354 |
| | | | 7.5 m | 6020353 |
| | | | 10 m | 6020352 |

### Field attachable connectors

| Connection type | Maximum connection cable cross-section | Direction of the cable outlet | Type | Part number |
|---|---|---|---|---|
| Plug M12 x 5 | 0.75 mm² | Straight | STE-1205-G | 6022083 |
| | | Angled | STE-1205-W | 6022082 |

### AS-Interface module lower parts

| Addressing | Type | Part number |
|---|---|---|
| Without addressing socket | ASI-FKE | 6022395 |
| With addressing socket | ASI-FKE-A | 6022397 |
| With addressing socket and earthing | ASI-FKE-A-E | 6025058 |

### Sliding nuts/sliding blocks

| Type | Description | Part number |
|---|---|---|
| Claw sliding nut | For direct earthing of MSL, C2000, M2000, C4000 required when using the AS-Interface module lower parts FKE or FKE-A | 4031411 |





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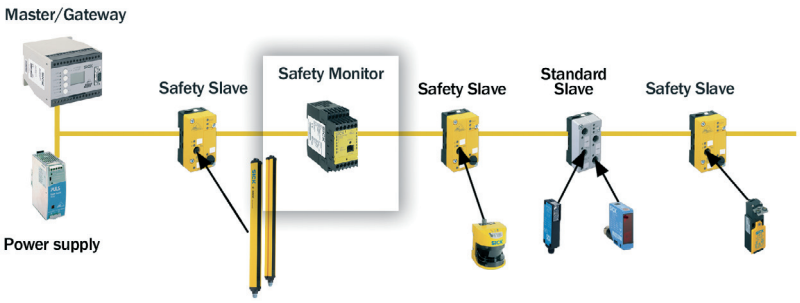
## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | AS-Interface Safety at Work |
| **Component** | Safety monitor |
| **Enclosure rating** | IP 20 |
| **Safety category** | Up to category 4 (EN 954-1) |

## Product description

- Evaluation of the safety-relevant signals in the AS-Interface network
- It is possible to use several safety monitors in an AS-Interface network
- UE4231 and UE4232 devices support up to 32 monitored devices including emergency stops, safety gates and safety light curtains (ESPE). Input signals may be specified as dual channel dependent, dual channel independent or dual channel forced.
- Enhanced functions used in complex applications are available with the UE4233 and UE4234 devices. These enhanced functions include: support for up to 48 monitored devices, additional OR functionality, AND functionality, ON-Delay and OFF-Delay timers, Flip-Flop as well as a pulse trigger on rising edge of an input signal. Further, input signals may be specified as dual channel dependent, dual channel independent, dual channel forced, dual channel dependent debounced or dual channel conditionally dependent.

## Applications




## Ordering information

| Application (graphic) | Type | Part number |
|---|---|---|
| Solution for simple safety applications | UE4231-22CE010 | 1025815 |
| | UE4232-22CE020 | 1025816 |
| Solution for complex safety applications | UE4233-22CE010 | 6032490 |
| | UE4234-22CE020 | 6032491 |



- 2 dual-channel enable path for safety-related shutdown
- Parameterisable functions by software
- Instruction set for the solution of complex safety applications
- Connection of up to 31 dual-channel safety sensors via AS-Interface
- Several safety monitors on one AS-Interface system are possible
- Diagnostics can be performed using the AS-Interface and configuration software


| Further information | Page |
|---|---|
| → Technical specifications | 0-46 |
| → Dimensional drawings | 0-46 |
| → Internal circuitry | 0-47 |
| → Accessories | 0-48 |
| → Services | A-2 |




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# Detailed technical specifications

| Type | UE4231-22CE010 | UE4232-22CE020 | UE4233-22CE010 | UE4234-22CE020 |
|---|---|---|---|---|
| Fieldbus | AS-Interface Safety at Work | | | |
| Application (graphic) | Solution for simple safety applications | | Solution for complex safety applications | |
| Enclosure rating | IP 20 (EN 60529) | | | |
| Category | 4 (EN 954-1) | | | |
| Safety integrity level | SIL3 (IEC 61508) | | | |
| Supply voltage | 24 V DC (20.4 V DC ... 27.6 V DC) | | | |
| Power consumption | Max. 150 mA | Max. 200 mA | Max. 150 mA | Max. 200 mA |
| Response time | 40 ms | | | |

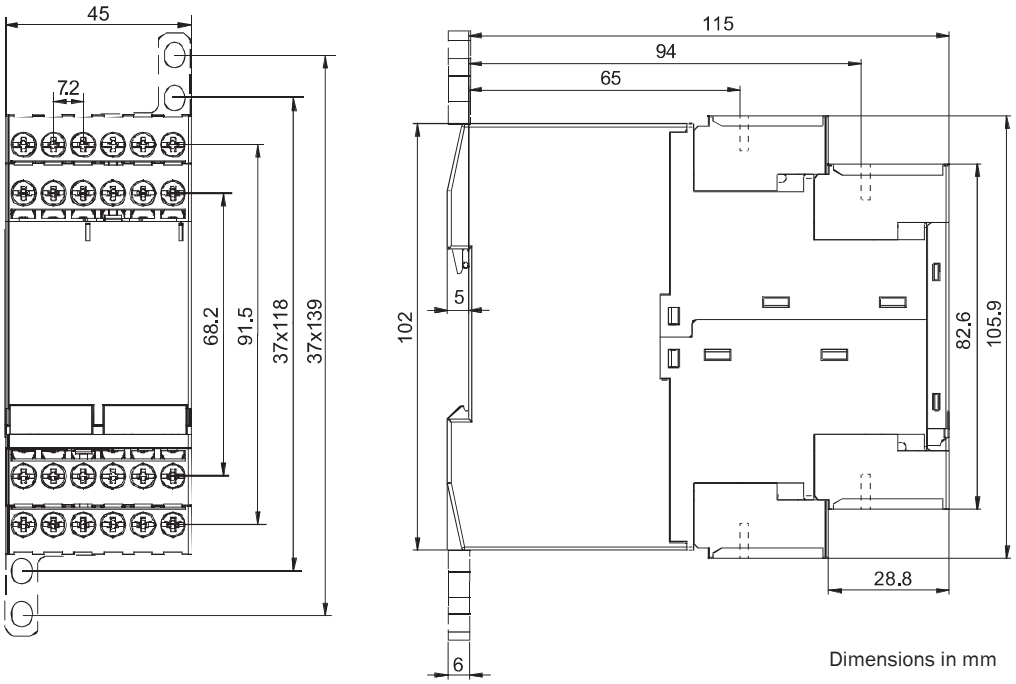
### AS-Interface Safety at Work

| | |
|---|---|
| AS-Interface profile | Monitor 7.F |
| Supply voltage | 18.5 V ... 31.6 V |
| Power consumption | Max. 45 mA |

### Safety outputs

| Type of output | 1 dual-channel | 2 dual-channel | 1 dual-channel | 2 dual-channel |
|---|---|---|---|---|
| Usage category | AC-15/DC-13 | | | |
| Rated operating current (voltage) | 3 A (230 V AC), 1 A (24 V DC) | | | |
| Total current | 6 A | 8 A | 6 A | 8 A |
| Thermal continuous current per output circuit | 3 A | | | |

# Dimensional drawings



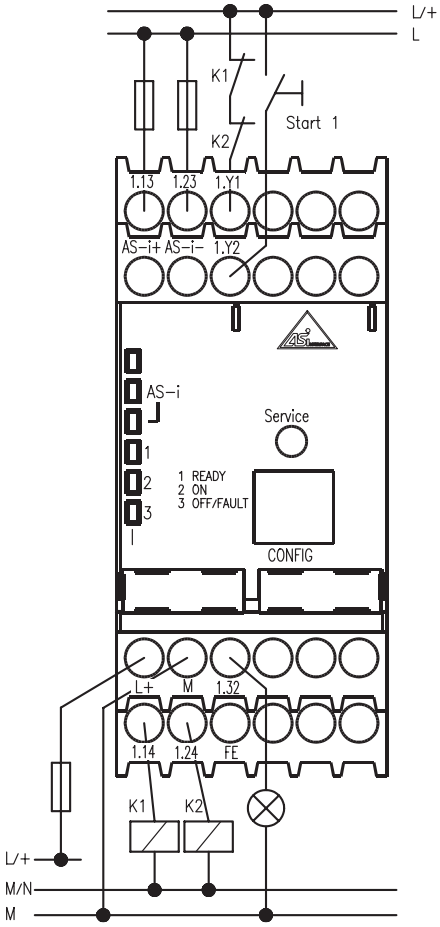

Dimensions in mm

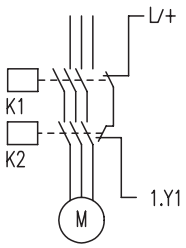


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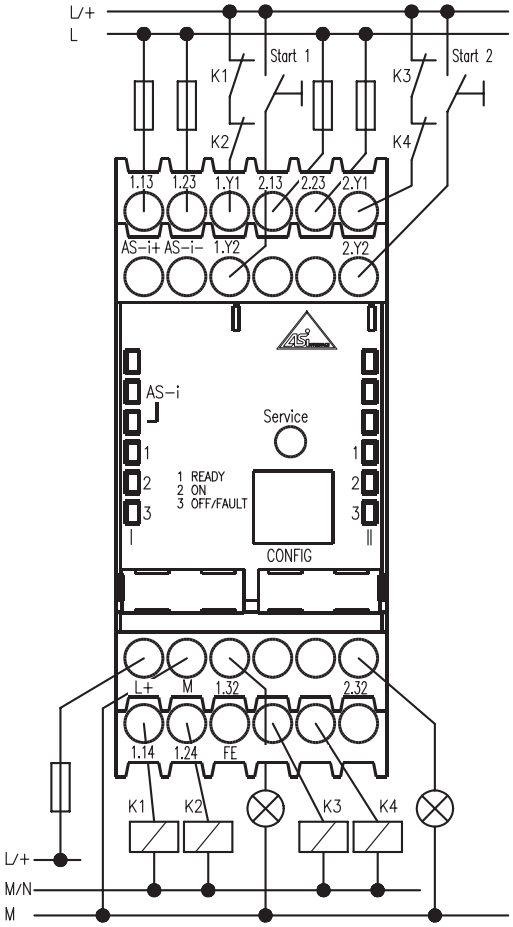
# Internal circuitry

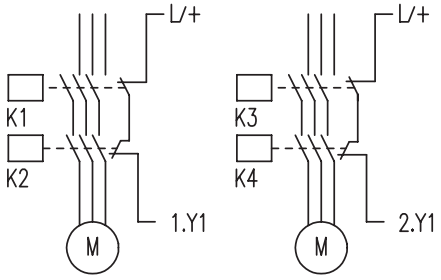
**UE4231, UE4233**




**UE4232, UE4234**




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# Accessories

### Configuration connection cables

| Connection type | Cable length | Type | Part number |
|---|---|---|---|
| RJ45/RJ45 crossover | 0.08 m | Monitor interface cable | 6028938 |
| RJ45/SUB-D 9-pol | 2 m | Monitor configuration cable | 6028937 |

### Configuration software

| Type | Part number |
|---|---|
| ASIMON configuration software | 2030532 |

### AS-i cable

| Category | Description | Type | Part number |
|---|---|---|---|
| AS-I cable yellow | Connection cable for AS-interface and AS-interface Safety at Work, yellow jacket. Used for AS-interface communication | AS-i cable, yellow | 6022462 |
| AS-I cable black | Connection cable for AS-interface and AS-interface Safety at Work, black jacket. Used for external 24 V DC power | AS-i cable, black | 6022463 |

### AS-i power supply

| Description | Type | Part number |
|---|---|---|
| AS-i power supply, 115/230 V AC input voltage, output 29.5 - 31.6 V D C, 2.8A | HN.SLA3.100 | 6022381 |
| AS-i power supply, 115/230 V AC input voltage, output 29.5 - 31.6 V D C, 8A | HN.SLA8.100 | 6022382 |

### AS-i standard components

| Category | Description | Type | Part number |
|---|---|---|---|
| AS-i master | AS-i master, RS232C IP20 | ASI-M11320 | 6022373 |
| | AS-i profibus gateway IP20 | ASI-M31320 | 6022376 |
| | AS-i profibus gateway, graphical display, IP20 | ASI-M31321 | 6027500 |
| | AS-i profibus gateway, double master, IP20 | ASI-M32320 | 6022377 |
| | AS-i profibus gateway, double master, graphical display, IP20 | ASI-M32321 | 6027501 |
| | AS-i devicenet gateway, graphical display, IP20 | ASI-M51321 | 6022379 |
| | AS-i PCI, double master, IP20 | ASI-M22310 | 6022380 |
| AS-i classic slave | AS-i classic slave, 4 Inputs | ASI-S12233 | 6022390 |
| | AS-i classic slave, 2 inputs and 2 outputs | ASI-S21334 | 6022391 |
| | AS-i classic slave, 4 inputs and 4 outputs | ASI-S24233 | 6022392 |
| | AS-i classic slave, pushbutton station with LED indicators | ASI-S23130 | 6022393 |
| AS-i compact slave | AS-i compact slave, 4 inputs | ASI-S12343 | 6022387 |
| | AS-i compact slave, 2 inputs and 2 outputs | ASI-S21243 | 6022388 |
| | AS-i compact slave, 4 inputs and 4 outputs | ASI-S24243 | 6022389 |
| AS-i smartline slave | AS-i smartline slave, 4 inputs | ASI-S12320 | 6022383 |
| | AS-i smartline slave, 4 inputs and 4 outputs | ASI-S24220 | 6022384 |





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## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | DeviceNet™, DeviceNet Safety™ |
| **Number of safety inputs (depending on type)** | 6 dual-channel resp. 12 single-channel / 4 dual-channel resp. 8 single-channel / 2 dual-channel resp. 4 single-channel |
| **Number of safety capable outputs (depending on type)** | 4 dual-channel resp. 8 single-channel / 2 dual-channel resp. 4 single-channel |
| **Safety category** | Up to category 4 (EN 954-1) |
| **Safety integrity level** | SIL3 (IEC 61508) |

## Product description

SICK's UE4421 IP 20 remote I/O bus modules integrate safety sensors and actuators using DeviceNet Safety™. UE4421 series IP 20 remote I/O bus modules are configured using an EDS file via the DeviceNet Safety™ network.

Versions include semiconductor safety inputs only, a combination of semiconductor safety inputs and safety outputs and semiconductor inputs with relay-based safety outputs.

## Applications

- Electrosensitive protective equipments
- Emergency stop buttons
- Electromechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact






- Solving applications up to SIL3 (IEC 61508)
- Easy upgrade of sensors and actuators on DeviceNet Safety™
- Multiple safety sensors and actuators are supported
- Decentralised evaluation of safety sensors and actuators
- Easy installation using pluggable terminal strip
- IP 20 enclosure rating for DIN rail, panel mounting
- Uses only one safety fieldbus address for up to 16 sensors and actuators

| Further information | Page |
|---|---|
| → Ordering information | 0-50 |
| → Technical specifications | 0-50 |
| → Dimensional drawings | 0-52 |
| → Internal circuitry | 0-53 |
| → Accessories | 0-56 |
| → Services | A-2 |

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# Ordering information

| Functionality | Number of safety inputs | Number of safety capable outputs | Number of test/signal outputs (with current monitoring) | Type | Part number |
|---|---|---|---|---|---|
| Remote input device | 6 dual-channel resp. 12 single-channel | – | 4 (1) | UE4421-22EE900 | 1028309 |
| Remote I/O device | 2 dual-channel resp. 4 single-channel | 2 dual-channel resp. 4 single-channel Relay type | 4 (1) | UE4421-22EE330 | 1028310 |
| | 4 dual-channel resp. 8 single-channel | 4 dual-channel resp. 8 single-channel | 4 (1) | UE4421-22EE490 | 1028311 |

# Detailed technical specifications

## General system data

| | UE4421-22EE900 | UE4421-22EE330 | UE4421-22EE490 |
|---|---|---|---|
| **Fieldbus** | DeviceNet Safety | | |
| **Safety category** | Up to category 4 (EN 954-1) | | |
| **Safety integrity level** | SIL3 (IEC 61508) | | |
| **Supply voltage** | 20.4 V DC ... 26.4 V DC | | |
| **Connection type supply voltage** | Spring terminal plug | | |
| **Ambient operating temperature from ... to** | –10 °C ... +55 °C | | |
| **Enclosure rating** | IP 20 | | |
| **Protection Class according to IEC 61140:1997** | III | I | III |
| **Vibration resistance according to IEC 60068-2-6** | 0.35 mm, 10 Hz ... 57 Hz, 50 m/sec², 57 Hz ... 150 Hz | | |
| **Shock resistance** | 150 m/sec², 11 ms (IEC 60068-2-27) | 100 m/sec², 11 ms (IEC 60068-2-27) | 150 m/sec², 11 ms (IEC 60068-2-27) |
| **Mounting** | 35 mm mounting rail (DIN 46277) | | |
| **Weight** | 420 g | 460 g | 420 g |

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## Field-signal connections

| | UE4421-22EE900 | UE4421-22EE330 | UE4421-22EE490 |
|---|---|---|---|
| **Connection type** | Spring terminal plug | | |
| **Number of safety inputs** | 6 dual-channel resp.<br>12 single-channel | 2 dual-channel resp.<br>4 single-channel | 4 dual-channel resp.<br>8 single-channel |
| **Type of output on the field-signal input** | PNP or contact | PNP or contact | PNP or contact |
| **Input voltage HIGH** | 11 V DC ... 26.4 V DC | 11 V DC ... 26.4 V DC | 11 V DC ... 26.4 V DC |
| **Input voltage LOW** | 0 V DC ... 5 V DC | 0 V DC ... 5 V DC | 0 V DC ... 5 V DC |
| **Input current HIGH** | 6 mA | 6 mA | 6 mA |
| **Input delay** | 0 ms ... 126 ms, configurable | 0 ms ... 126 ms, configurable | 0 ms ... 126 ms, configurable |
| **Safety outputs** | | | |
| **Number of safety capable outputs** | – | 2 dual-channel resp.<br>4 single-channel | 4 dual-channel resp.<br>8 single-channel |
| **Type of output** | – | Relay type | Current sourcing (PNP) |
| **Maximum response time** | 15 ms | 15 ms | 15 ms |
| **Switching current** | – | 2 A | 500 mA |
| **Leakage current** | – | – | 0.1 mA |
| **Mechanical life (relay contacts)** | – | $5 \times 10^6$ switching cycles | – |
| **Electrical life (relay contacts)** | – | $1 \times 10^5$ switching cycles | – |
| **Test/signal outputs** | | | |
| **Number of test/signal outputs (with current monitoring)** | 4 (1) | | |
| **Output current per channel** | 700 mA | | |
| **Leakage current** | Max. 0.1 mA | | |

## DeviceNet Safety network connections

| | |
|---|---|
| **Number of safety target connections** | Max. 4 |
| **Expected packet interval (EPI) setting** | 6 ms ... 1 ms |
| **Single cast I/O support** | 5 Bytes/5 Bytes |
| **Multi cast I/O support** | 5 Bytes/5 Bytes |

## DeviceNet network connections

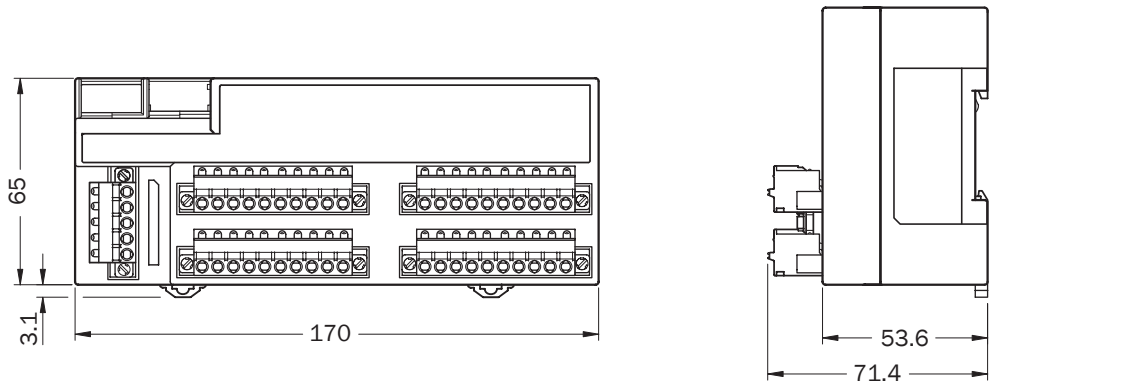
| | |
|---|---|
| **Poll connection maximum I/O transmission rate** | 5 Bytes/5 Bytes |
| **Number of standard slave connections** | Max. 2 |
| **Number of UCMM server** | Max. 2 |
| **Connection type** | Spring terminal block |
| **DeviceNet communication rate** | 125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection |
| **DeviceNet communication rate setting method** | Automatic (Autobaud Only) |
| **DeviceNet addressing** | Via safety network configuration tool (e.g. SICK DeviceNet Safety Configurator) or rotary switches |



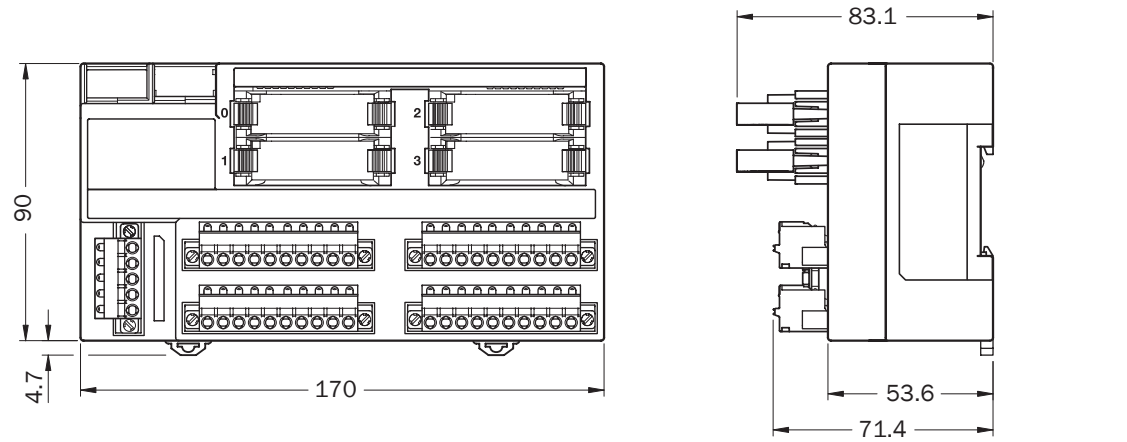

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# Dimensional drawings

**UE4421-22EE900, UE4421-22EE490**




**UE4421-22EE330**



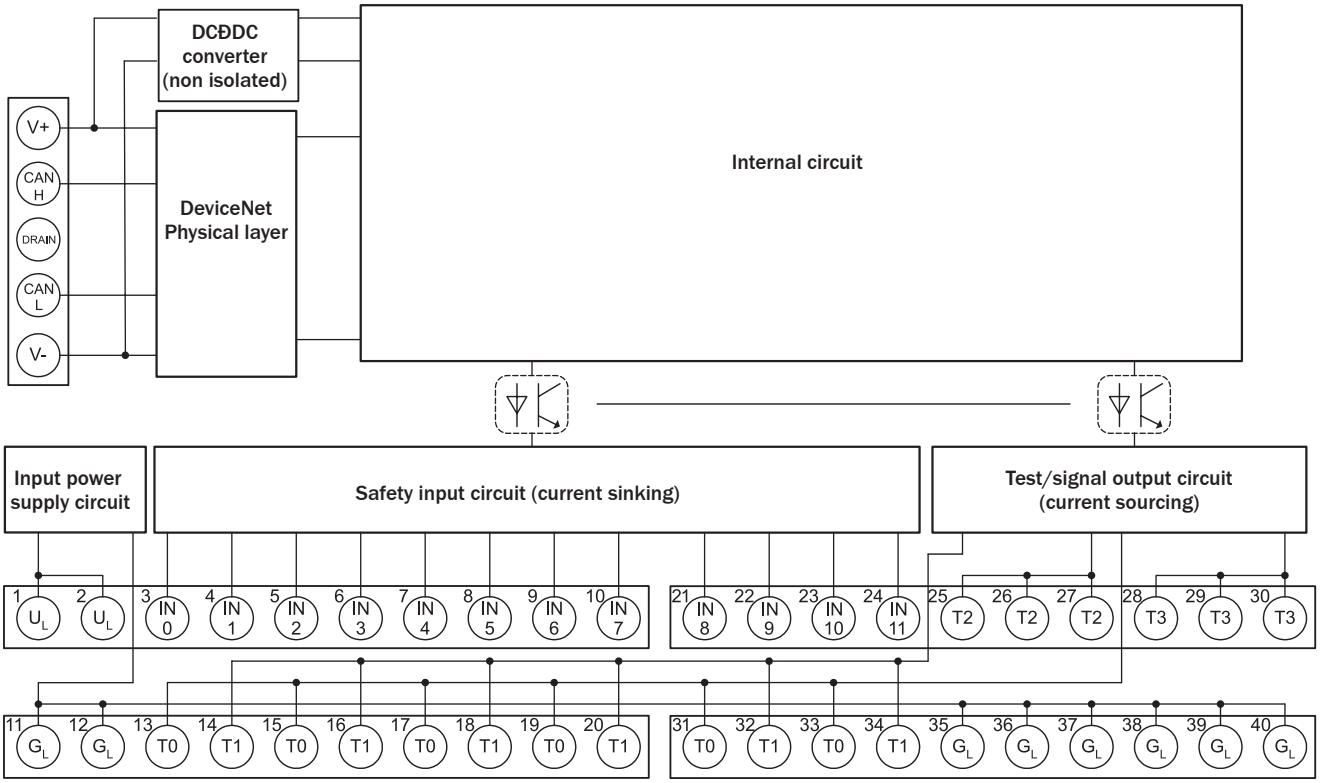

Dimensions in mm

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# Internal circuitry

**UE4421-22EE900**



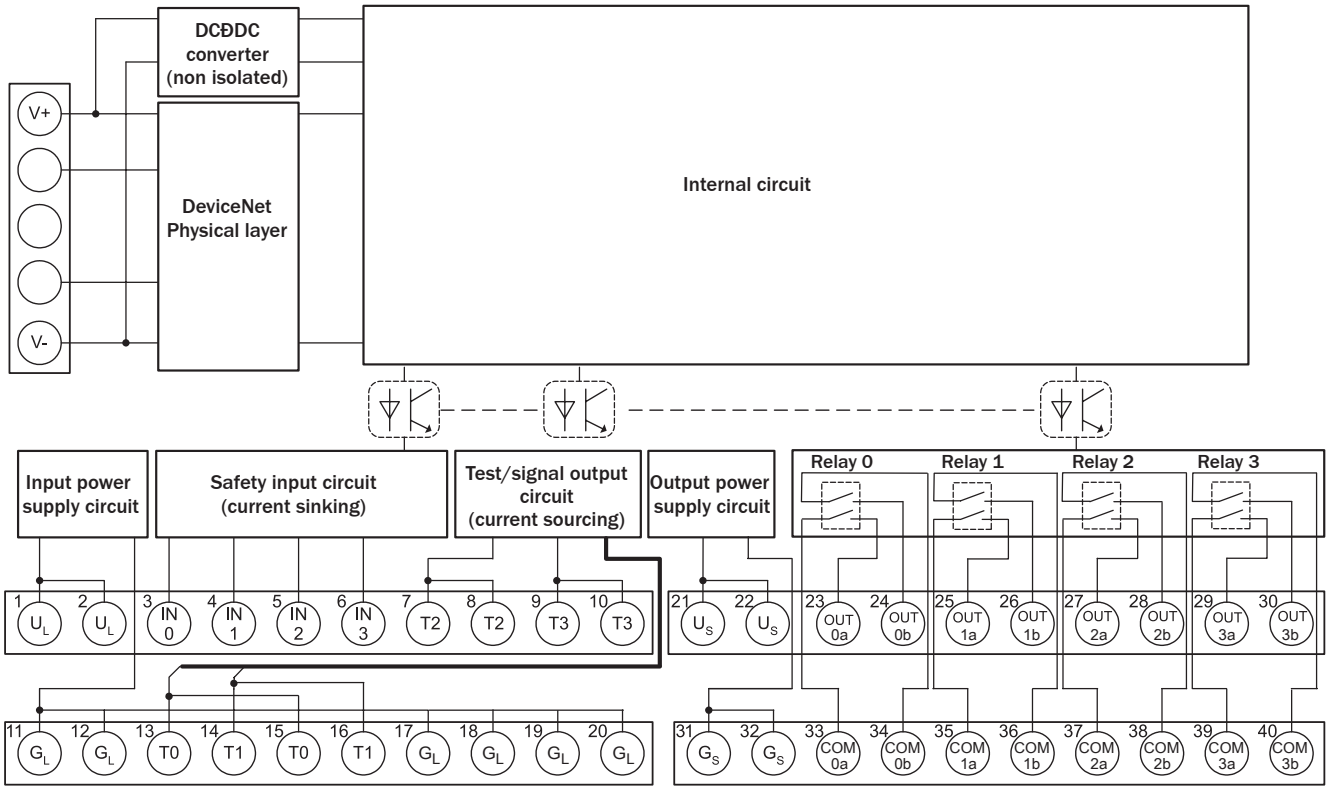

| Terminal number(s) | Naming convention | Functionality |
|---|---|---|
| **1, 2** | $U_L$ | Power terminals for safety capable input devices and test/signal outputs.<br>The terminals must be wired to 24 V DC |
| **11, 12, 35 - 40** | $G_L$ | Power terminals for safety capable inputs and test/signal outputs.<br>The terminals must be wired to common (0 V DC).<br>All $G_L$ terminals are internally connected |
| **3 - 10, 21 - 24** | IN0 to IN11 | Terminals for safety capable intput devices |
| **13 - 20, 25 - 30, 31 - 34** | T0 to T3 | Terminals for test/signal outputs |





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**UE4421-22EE330**

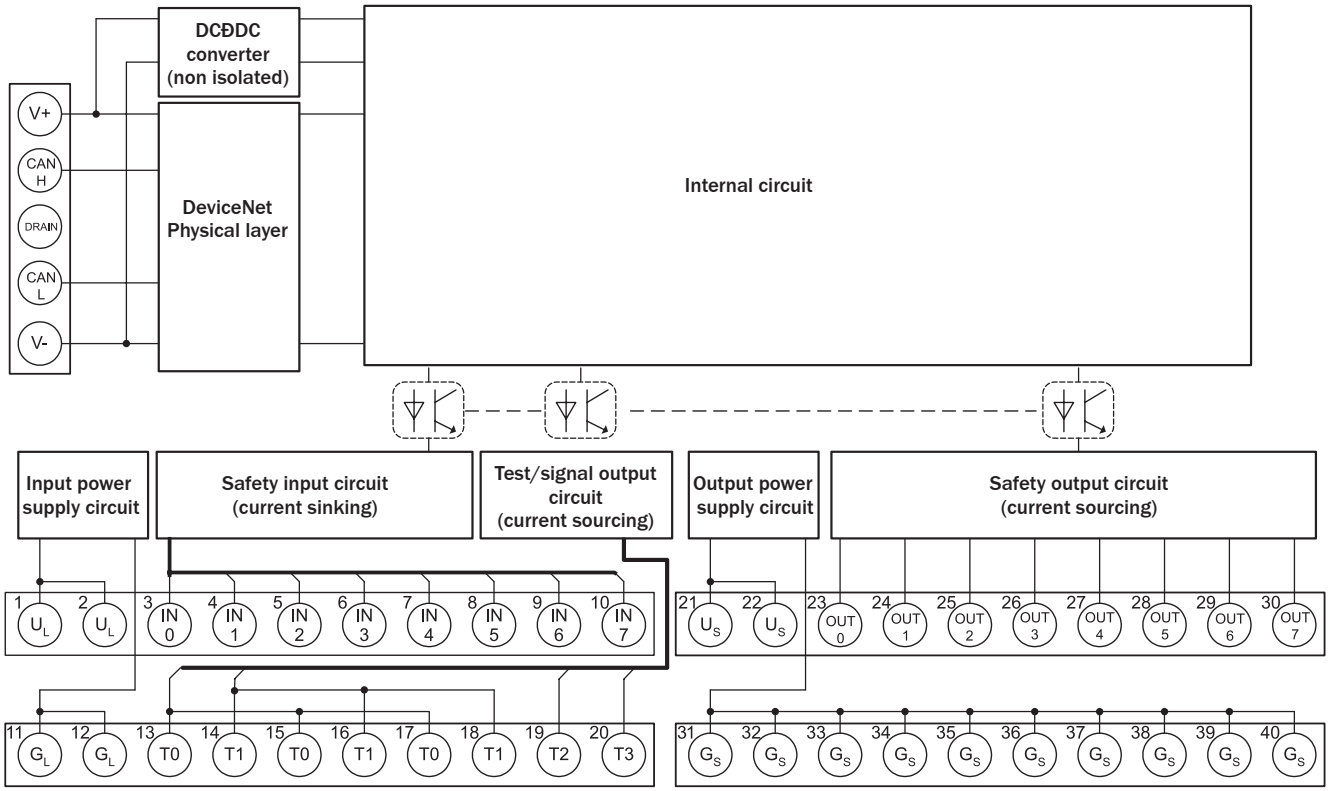



| Terminal number(s) | Naming convention | Functionality |
|---|---|---|
| **1, 2** | $U_L$ | Power terminals for input devices<br>The terminals must be wired to 24 V DC |
| **11, 12, 17 - 20** | $G_L$ | Power terminals for safety capable inputs and test/signal outputs<br>These terminals should be connected to 0 V DC common for $U_L$<br>All $G_L$ terminals are internally connected |
| **3 - 6** | IN0 to IN7 | Terminals for safety capable input devices |
| **7 - 10, 13 - 16** | T0 to T3 | Terminals for test/signal |
| **21, 22** | $U_S$ | Power terminals for output devices<br>The terminals must be wired to 24 V DC |
| **31, 32** | $G_S$ | Power terminals for output devices<br>These terminals must be wired to 0 V DC common<br>All $G_S$ terminals are internally connected |
| **23 - 30** | OUT 0a/0b to OUT 3a/3b | Terminals for safety capable output devices<br>OUT xa/xb are the same output |
| **33 - 40** | COM 0a/0b to COM 3a/3b | Terminals for safety capable output devices<br>COM xa/xb are the same output |

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**UE4421-22EE490**




| Terminal number(s) | Naming convention | Functionality |
|---|---|---|
| **1, 2** | $U_L$ | Power terminals for safety capable input devices and test/signal outputs<br>The terminals must be wired to 24 V DC |
| **11, 12** | $G_L$ | Power terminals for safety capable inputs and test/signal outputs<br>The terminals must be wired to common (0 V DC)<br>All $G_L$ terminals are internally connected. |
| **3 - 10** | IN0 to IN7 | Terminals for safety capable input devices |
| **13 - 20** | T0 to T3 | Terminals for test/signal |
| **21, 22** | $U_S$ | Power terminals for output devices<br>The terminals must be wired to 24 V DC |
| **31 - 40** | $G_S$ | Power terminals for safety capable outputs<br>These terminals should be connected to 0 V DC common for $U_S$<br>All $G_S$ terminals are internally connected |
| **23 - 30** | OUT0 to OUT7 | Terminals for safety capable output devices |




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# Accessories

### Auxiliary power supply accessories

| Type | Connection type | Cable type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|---|
| Connection cables | Mini receptacle 7/8" x 4, female | Flying leads | Straight | 0.3 m | 6030805 |
| | Mini receptacle 7/8" x 4, male | Flying leads | Straight | 0.3 m | 6030806 |
| | Bulk auxiliary power cable | By the meter | – | – | 6030757 |
| | Power cable, Mini 7/8" x 4, female with flying leads | – | – | 2 m | 6030753 |
| | | | | 5 m | 6030754 |
| | | | | 10 m | 6030755 |
| Field attachable connectors | Mini connector 7/8" x 4, female | – | Straight | – | 6030803 |
| | Mini connector 7/8" x 4, male | – | Straight | – | 6030804 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS plug-in for DeviceNet Safety SNCT | Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2 032 920) | 2027422 |
| SICK DeviceNet Safety Configurator | Safety Network Configuration Tool (SNCT). Enables the configuration and diagnosis of the DeviceNet and DeviceNet Safety network. Includes SICK plug-in configuration software and .EDS files for SICK DeviceNet Safety UE442X, UE445X and UE447X components. | 2032920 |
| SICK EasySCT | Safety Configuration Tool for SICK UE442X, UE445X and UE447X products. Provides configuration for these products as well as integration of these products on a DeviceNet Safety fieldbus network. For configuration of other SICK devices or third-party devices, use SICK DeviceNet Safety Configurator. | Contact factory |

### Field attachable connectors, termination resistors and T-connectors for DeviceNet and DeviceNet Safety

| Type | Connection type | Direction of the cable outlet on the plug | Part number |
|---|---|---|---|
| Panel Mounted Receptacles | Mini connector 7/8" x 5, female | Straight | 6030807 |
| | Mini connector 7/8" x 5, male | Straight | 6030808 |
| DeviceNet terminators | Mini connector 7/8" x 5 male | Straight | 6028995 |
| | Mini connector 7/8" x 5 female | Straight | 6028329 |
| T-connectors | DeviceNet T-connector Mini/Mini/Mini 7/8" x 5 | – | 6030752 |
| | DeviceNet T-connector Mini 7/8" x 5/M12 x 5/Mini 7/8" x 5 | – | 6028330 |
| Field attachable connectors | Mini connector 7/8" x 5, female | Straight | 6028331 |
| | Mini connector 7/8" x 5, male | Straight | 6028332 |
| | M12 x 5 connector, female | Straight | 6030801 |
| | | Angled | 6030799 |
| | M12 x 5 connector, male | Straight | 6030802 |
| | | Angled | 6030800 |

### Power supply units (SELV, PELV, Class 2)

| Input voltage | Input frequency | Output voltage | Maximum output current | Part number |
|---|---|---|---|---|
| 100 V AC...240 V AC | 43 Hz...63 Hz | 24 V DC | 2.1 A | 7028789 |
| 100...120 V AC/220...240 V AC | 47 Hz...63 Hz | 24 V DC | 3.9 A | 7028790 |





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### Connection cables for DeviceNet and DeviceNet Safety

| Type | Cable diameter | Connection type | Cable type | Cable length | Cable material | Part number |
|---|---|---|---|---|---|---|
| DeviceNet thick cable | 12.2 mm | Mini connector 7/8" x 5 male and female | Double-ended | 2 m | PVC | 6030749 |
| | | | | 5 m | PVC | 6030750 |
| | | | | 10 m | PVC | 6030751 |
| DeviceNet thin cable | 6.9 mm | Mini connector 7/8" x 5 male and female | Double-ended | 1 m | PVC | 6030743 |
| | | | | 2 m | PVC | 6030744 |
| | | | | 3 m | PVC | 6030745 |
| | | | | 4 m | PVC | 6030746 |
| | | | | 5 m | PVC | 6030747 |
| | | | | 6 m | PVC | 6030748 |
| | | M12 x 5 connector, male and female | Double-ended | 1 m | PVC | 6030915 |
| | | | | 2 m | PVC | 6030916 |
| | | | | 3 m | PVC | 6030917 |
| | | | | 4 m | PVC | 6030737 |
| | | | | 5 m | PVC | 6030918 |
| | | | | 6 m | PVC | 6030919 |
| | | M12 x 5 cable, male with flying leads | Single-ended | 1 m | PVC | 6030738 |
| | | | | 2 m | PVC | 6030920 |
| | | | | 3 m | PVC | 6030739 |
| | | | | 4 m | PVC | 6030740 |
| | | | | 5 m | PVC | 6030741 |
| | | | | 6 m | PVC | 6030742 |
| DeviceNet thick cable | 12.2 mm | Bulk cable | By the meter | – | PVC | 6030756 |
| DeviceNet thin cable | 6.9 mm | Bulk cable | By the meter | – | PVC | 6030921 |

### Terminal connector, DeviceNet connection

| Type | Connection type | Direction of the cable outlet on the plug | Delivery | Part number |
|---|---|---|---|---|
| Terminal connector | Terminal plug with M12 x 5 plug connector | Straight | – | 6030818 |
| | Spring terminal plug, 5-pole | Single entry | With screw flange | 6030817 |
| | | Double entry | With screw flange | 6030816 |
| DeviceNet color code stickers | – | – | For 5-pole terminal blocks | 5315184 |

### Replacement parts

| Type | Description | Part number |
|---|---|---|
| Spring terminal block kit for UE4421 | Replacement terminals for UE4421 devices. Includes four 10-pole terminals, black, spring-clamp style and terminal block keys. | 6030814 |
| Screw terminal block kit for UE4421 | Replacement terminals for UE4421 devices. Includes four 10-pole terminals, black, screw-type and terminal block keys. | 6030813 |
| Replacement relay | Replacement relay for UE4421-22EE330 | 6030821 |





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DeviceNet Safety™

DeviceNet™



- Solving applications up to SIL3 (IEC 61508)
- Easy upgrade of sensors and actuators on DeviceNet Safety
- Multiple safety sensors and actuators are supported
- Decentralised evaluation of safety sensors and actuators
- Easy installation utilising standardized connectors
- Rugged IP 67 enclosure for field mounting
- Only one safety fieldbus address for up to 14 sensors and actuators


| Further information | Page |
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| → Dimensional drawings | 0-60 |
| → Device overview and connections | 0-61 |
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| → Accessories | 0-63 |
| → Services | A-2 |


## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | DeviceNet Safety |
| **Number of safety inputs** | 6 dual-channel resp. 12 single-channel |
| **Number of SDL connections** | Up to 2 |
| **Number of safety capable outputs** | 2 dual-channel, bipolar type |
| **Safety category** | Up to category 4 (EN 954-1) |
| **Safety integrity level** | Up to SIL3 (IEC 61508) |

## Product description

SICK's UE4400 series IP 67 remote I/O bus modules integrate safety sensors and actuators into a flexible control system using DeviceNet Safety™.
Units are designed with 6 dual-channel safety inputs and 2 dual-channel bipolar safety outputs.
UE4400 IP 67 remote I/O bus modules allow users to implement safety applications up to category 4 (EN 954-1) and SIL3 (IEC 61508).
Individual test outputs provide easy management of safety input signals.
Connection to both DeviceNet Safety™ and standard DeviceNet allows users to bring diagnostic information seamlessly to an operator interface.
Configuration can be done locally via RS-232 interface or remotely through the network.
SICK safety sensors such as C4000 safety light curtains and S3000 safety laser scanners can be intelligently integrated into the DeviceNet Safety fieldbus network using SICK Safety Data Link (SDL) technology on the UE4450/UE4455 product types.

## Applications

- Electrosensitive protective equipments
- Emergency stop buttons
- Electromechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact




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7024240

# Ordering information

| Functionality | Number of safety inputs | Number of safety capable outputs | Usage of the expanded functions on the SDL | Number of test/ signal outputs (with current monitoring) | Type | Part number |
|---|---|---|---|---|---|---|
| Remote I/O device | 6 dual-channel resp. 12 single-channel | 2 dual-channel, bipolar type | – | 12 (1) | UE4420-03DC9F0 | 1028302 |
| | | | | | UE4450-03DC9F0 | 1028305 |
| | | | ✔ | 12 (1) | UE4455-03DC9F0 | 1028306 |

# Detailed technical specifications

## General system data

| | UE4420-03DC9F0 | UE4450-03DC9F0 | UE4455-03DC9F0 |
|---|---|---|---|
| **Fieldbus** | DeviceNet Safety | | |
| **Safety category** | Up to category 4 accord. EN 954-1 | | |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) | | |
| **Supply voltage** | 19.2 V DC ... 28.8 V DC | | |
| **Connection type supply voltage** | Mini 7/8" × 4 | | |
| **Ambient operating temperature from ... to** | –10 °C ... +55 °C | | |
| **Enclosure rating** | IP 67 | | |
| **Protection class** | III (IEC 61131-2) | | |
| **Vibration resistance according to IEC 60068-2-6** | 0.35 mm, 10 Hz ... 57 Hz, 50 m/sec², 57 Hz ... 150 Hz | | |
| **Shock resistance** | 150 g, 11 ms (IEC 60068-2-27) | | |
| **Mounting** | Location in the vincinity of the equipment | | |
| **Weight** | 522 g | 582 g | |

## Field-signal connections

| | |
|---|---|
| **Connection type** | 5-pole M12 connector |
| **Number of safety inputs** | 6 dual-channel resp. 12 single-channel |
| **Type of output on the field-signal input** | PNP or contact |
| **Input voltage HIGH** | 11 V DC ... 30 V DC |
| **Input voltage LOW** | –30 V DC ... 5 V DC |
| **Input current HIGH** | 5 mA |
| **Input delay** | 0 ms ... 635 ms, configurable |
| **Number of SDL connections** | – / 2 |
| **Safety outputs** | |
| **Number of safety capable outputs** | 2 dual-channel |
| **Type of output** | Bipolar type |
| **Maximum response time** | 15 ms |
| **Switching current** | 2 A |
| **Leakage current** | 0.5 mA |
| **Test/signal outputs** | |
| **Number of test/signal outputs (with current monitoring)** | 12 |
| **Output current per channel** | 700 mA |
| **Leakage current** | Max. 0.5 mA |

0


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### DeviceNet Safety connections

| | UE4420-03DC9F0 | UE4450-03DC9F0 | UE4455-03DC9F0 |
|---|---|---|---|
| Number of safety target connections | Max. 6 | | |
| Expected packet interval (EPI) setting | 10 ms ... 5 ms | | |
| Single cast I/O support | 16 Bytes/16 Bytes | | |
| Multi cast I/O support | 16 Bytes/16 Bytes | | |

### DeviceNet connections

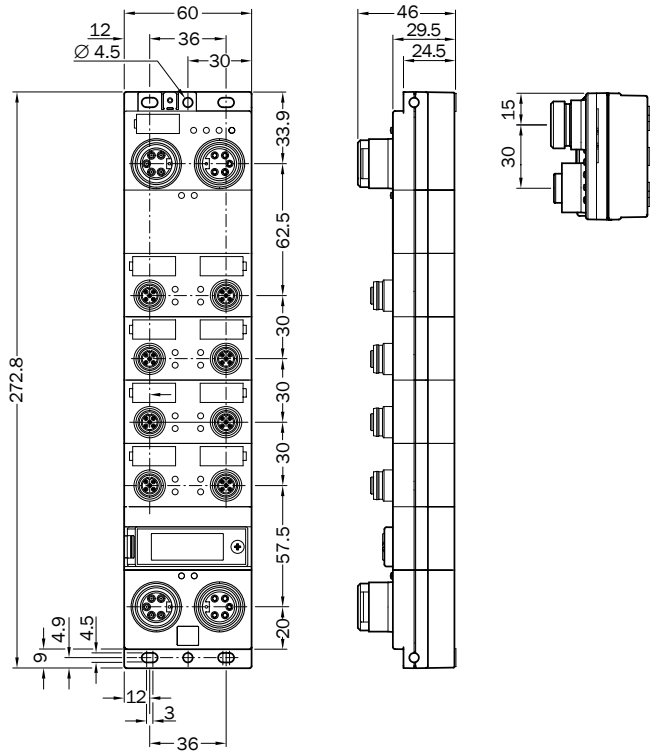
| | | |
|---|---|---|
| Poll connection maximum I/O transmission rate | 16 Bytes/16 Bytes | |
| Number of standard slave connections | Max. 3 | |
| Number of UCMM server | Max. 4 | |
| Connection type | Mini 7/8" × 5 | |
| DeviceNet communication rate | 125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection | |
| DeviceNet communication rate setting method | Software | |
| DeviceNet addressing | Via safety network configuration tool (e.g. SICK DeviceNet Safety Configurator) or rotary switches | |

### Functions

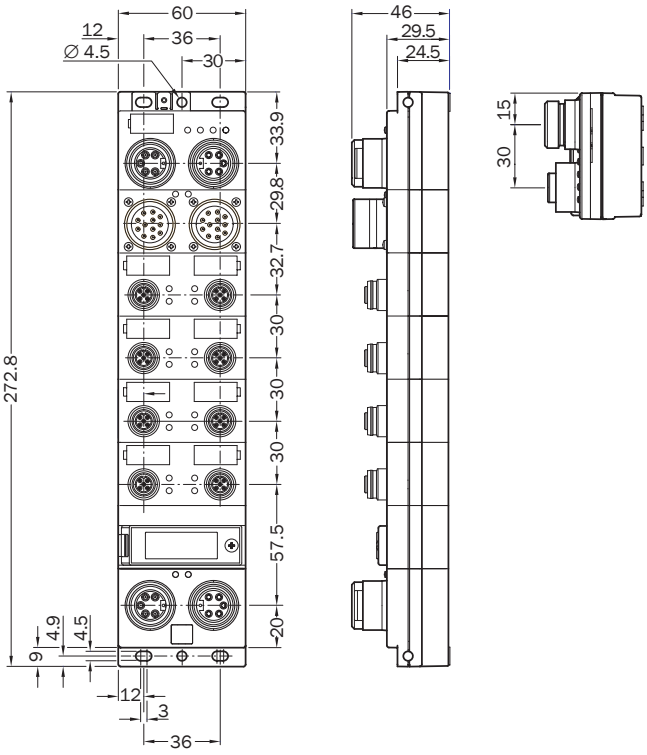
| | | |
|---|---|---|
| Functionality | Remote I/O device | |
| Signal routing | – | ✔ |
| Bidirectional communication | – | ✔ |

## Dimensional drawings

**UE4420**




**UE4450, UE4455**



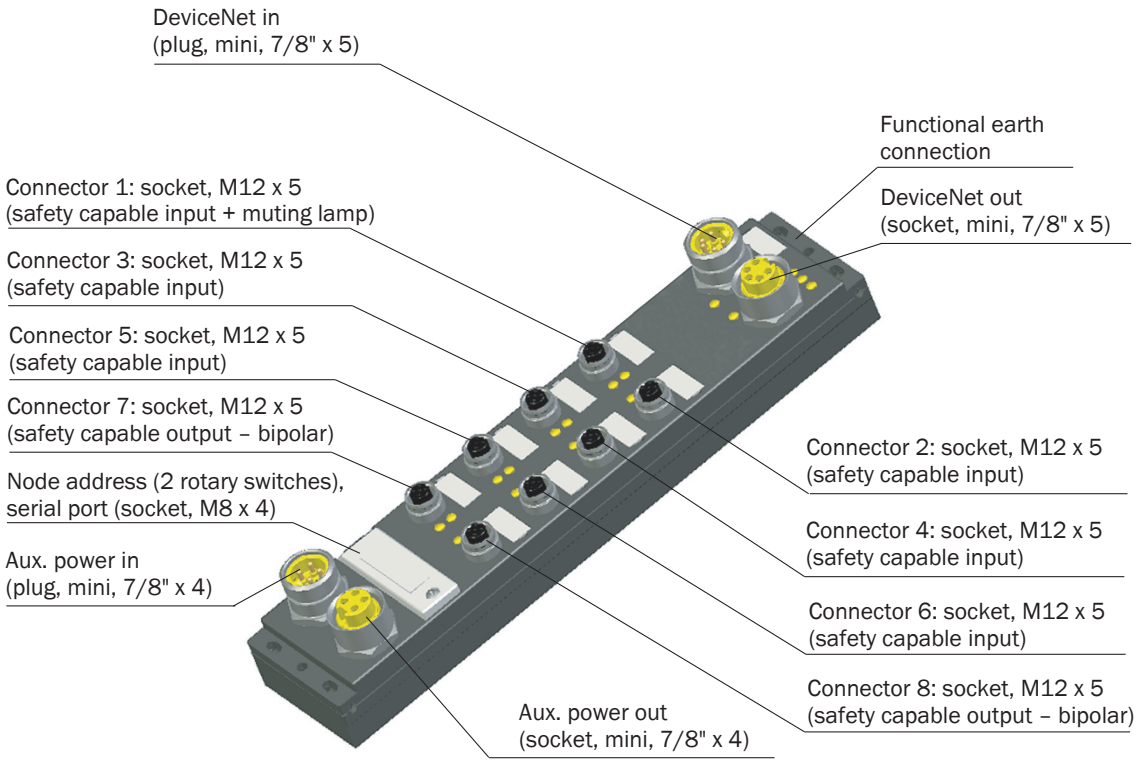

Dimensions in mm



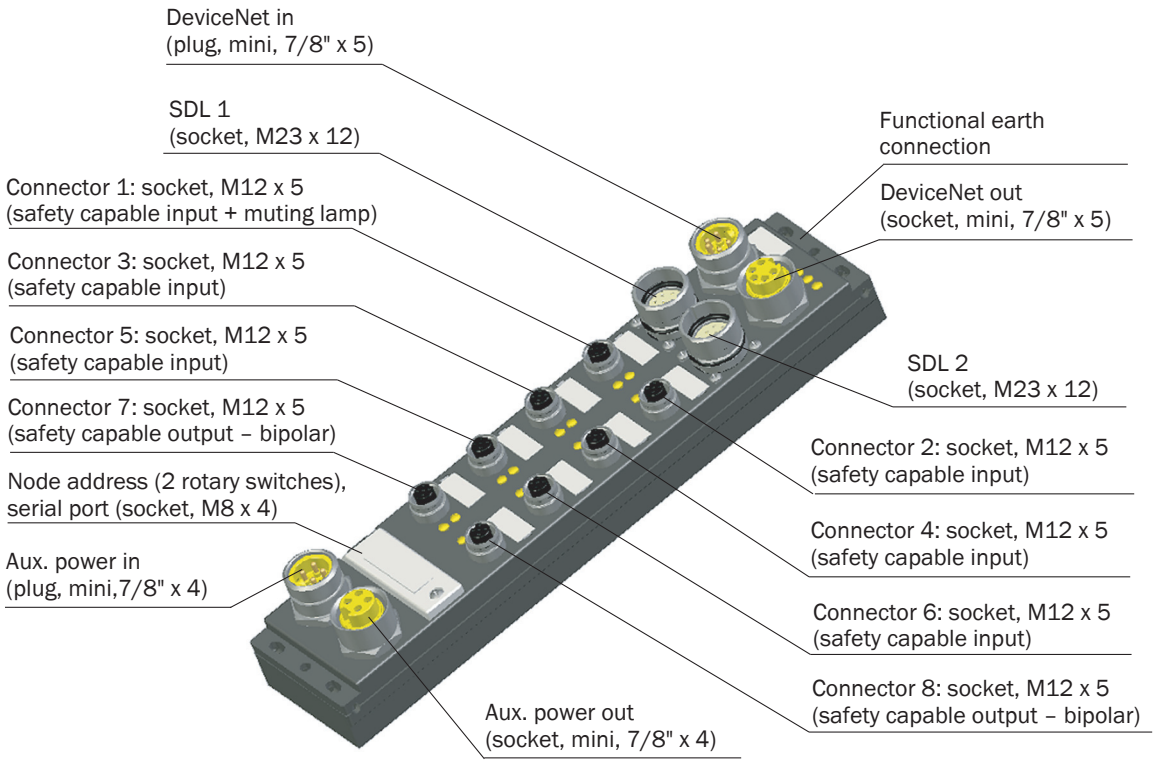
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# Device overview and connections

## UE4420




## UE4450, UE4455







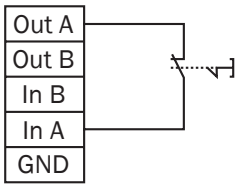
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# Connection diagrams

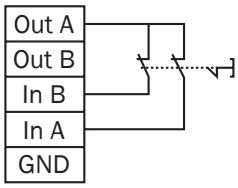
→ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Emergency stop, emergency shutdown, safety door on the field-signal connection

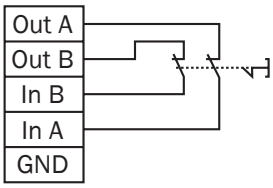
Single-channel
(up to category 2)




Dual-channel with
common testing
(up to category 3)

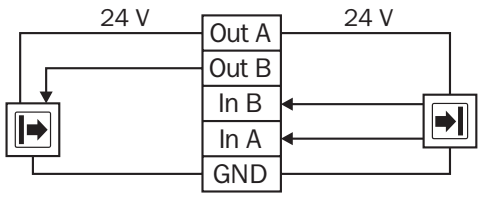



Dual-channel with
isolated testing
(up to category 4)

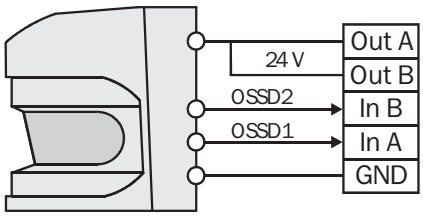



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.
The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

## Electrosensitive protective equipment (ESPE) on the field-signal connection

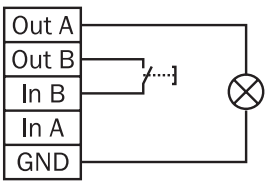



In the connection of electrosensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.
You can use output Out B to test the sender.



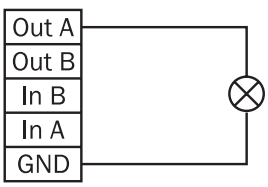

The switching outputs of the receiver are present on inputs In A and In B.

## Control switch with indicator display on the field-signal connection




The indicator display (Out A) is being controlled via an FPLC.

## Muting lamp on the field-signal connection




It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.





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# Accessories

### Field-signal connection accessories

| Type | Direction of the cable outlet on the plug | Shielded | Cable length | Part number |
|---|---|---|---|---|
| Cable, M12 x 5 male connector with flying leads | Straight | ✔ | 2 m | 6024860 |
| | | | 5 m | 6024861 |
| | | | 10 m | 6024862 |
| | | – | 2 m | 6026133 |
| | | | 5 m | 6026134 |
| | | | 10 m | 6026135 |
| Cable, M12 x 5 male connector to M26 x 11 + FE, female connector for C4000 Standard or Advanced sender unit | Straight | ✔ | 2.5 m | 2040017 |
| | | ✔ | 5 m | 2040018 |
| | | ✔ | 10 m | 2040019 |
| | | ✔ | 15 m | 2040056 |
| Cable, M12 x 5 male connector to M26 x 11 + FE, female connector for C4000 Standard or Advanced receiver unit | Straight | ✔ | 2.5 m | 2040014 |
| | | ✔ | 5 m | 2040015 |
| | | ✔ | 10 m | 2040016 |
| | | ✔ | 15 m | 2040053 |
| Field attachable connector, M12 x 5 | Straight | – | – | 6022083 |
| | | ✔ | – | 6024741 |
| | Angled | – | – | 6022082 |
| Field attachable connector M12 x 8 for C2000, C4000 Micro and Basic Plus, and M4000 Standard | Straight | ✔ | – | 6028422 |
| Two-way splitter, M12 x 5 Straight through connection | – | – | – | 6024744 |
| Two-way splitter, M12 x 5 Internal series wired connection | – | – | – | 4050723 |
| Two-way splitter for C4000 Eco Sender/Receiver to M12 x 5 | – | – | – | 6026517 |

### Auxiliary power supply accessories

| Type | Connection type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|
| Connection cables | Power cable, Mini 7/8" x 4, female with flying leads | Straight | 2 m | 6030753 |
| | | | 5 m | 6030754 |
| | | | 10 m | 6030755 |
| | Bulk cable - auxillary power | – | By the meter | 6030757 |
| Panel mount receptacles | Mini 7/8" x 4, female with flying leads | Straight | 0.3 m | 6030805 |
| | Mini 7/8" x 4, male with flying leads | Straight | 0.3 m | 6030806 |
| Field attachable connectors | Mini connector 7/8" x 4, female | Straight | – | 6030803 |
| | Mini connector 7/8" x 4, male | Straight | – | 6030804 |




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### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages. For local device configuration | 2032314 |
| CDS plug-in for DeviceNet Safety SNCT | Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2 032 920). | 2027422 |
| SICK DeviceNet Safety Configurator | Safety Network Configuration Tool (SNCT). Enables the configuration and diagnosis of the DeviceNet and DeviceNet Safety network. Includes SICK plug-in configuration software and .EDS files for SICK DeviceNet Safety UE442X, UE445X and UE447X components. | 2032920 |
| SICK EasySCT | Safety Configuration Tool for SICK UE442X, UE445X and UE447X products. Provides configuration for these products as well as integration of these products on a DeviceNet Safety fieldbus network. For configuration of other SICK devices or third-party devices, use SICK DeviceNet Safety Configurator. | Contact factory |

### Field attachable connectors, termination resistors and T-connectors for DeviceNet Safety

| Type | Connection type | Direction of the cable outlet on the plug | Part number |
|---|---|---|---|
| Field attachable connectors | Mini receptacle 7/8" x 5, female | Straight | 6030807 |
| | Mini receptacle 7/8" x 5, male | Straight | 6030808 |
| | Mini connector 7/8" x 5, female | Straight | 6028331 |
| | Mini connector 7/8" x 5, male | Straight | 6028332 |
| T-connector | DeviceNet T-connector, Mini/Mini/Mini 7/8" x 5 | – | 6030752 |
| Termination resistors | Mini 7/8" x 5, female | Straight | 6028329 |
| | Mini 7/8" x 5, male | Straight | 6028995 |

### Connection cables for DeviceNet and DeviceNet Safety

| Type | Cable diameter | Connection type | Cable type | Cable length | Cable material | Part number |
|---|---|---|---|---|---|---|
| DeviceNet thick cable | f12.2 mm | Mini connector 7/8" x 5 male and female | Double ended | 2 m | PVC | 6030749 |
| | | | | 5 m | PVC | 6030750 |
| | | | | 10 m | PVC | 6030751 |
| DeviceNet thin cable | 6.9 mm | Mini connector 7/8" male and female | Double ended | 1 m | PVC | 6030743 |
| | | | | 2 m | PVC | 6030744 |
| | | | | 3 m | PVC | 6030745 |
| | | | | 4 m | PVC | 6030746 |
| | | | | 5 m | PVC | 6030747 |
| | | | | 6 m | PVC | 6030748 |
| DeviceNet thick cable | 12.2 mm | Bulk cable | By the meter | – | PVC | 6030756 |
| DeviceNet thin cable | 6.9 | Bulk cable | By the meter | – | PVC | 6030921 |

### Tamper evident sheath

| Connection type | Type | Part number |
|---|---|---|
| M12 | Cable sheath/cover; Package of 10 pcs. | 5315186 |


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### Power supply units (PELV, SELV, Class 2)

| Input voltage | Input frequency | Output voltage | Maximum output current | Part number |
|---|---|---|---|---|
| 100...240 V AC | 43 Hz...63 Hz | 24 V DC | 2.1 A | 7028789 |
| 100...120 V AC/220...240 V AC | 47 Hz...63 Hz | 24 V DC | 3.9 A | 7028790 |

### Protective caps for IP 67 Integrity and Device Labels

| Connection type | Quantity per package | Part number |
|---|---|---|
| M12 x 5 field signal connections | 10 | 2019706 |
| Mini connector 7/8" x 5, male<br>Mini connector 7/8" x 4, male | 1 | 5315188 |
| Mini connector 7/8" x 5, female<br>Mini connector 7/8" x 4, female | 1 | 5315187 |
| SDL / M23 x 12 connection | 1 | 5310774 |
| UE4400 IP 67 accessory pack | Includes 10 labels and four M12 protective caps | 5315185 |

### Configuration connection cable, configuration connection

| Type | Connection type | Cable length | Part number |
|---|---|---|---|
| Connection cable | M8 x 4, RJ45/SUB-D 9-pin | 2 m | 6021195 |
| | | 8 m | 2027649 |

### SDL connection accessories

| Type | Connection type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|
| SDL connection cables, shielded | Interconnectron M23 x 12, male with flying leads for connection of S3000 system plug (sold seperately) | Straight | 2.5 m | 2029337 |
| | | | 5 m | 2029338 |
| | | | 10 m | 2029339 |
| | | | 15 m | 2029340 |
| | Hirschmann M26 x 11 + FE female to Interconnectron M23 x 11 + FE male cable for C4000 Standard/ C4000 Advanced | Plug straight/socket straight | 2.5 m | 2029131 |
| | | | 5 m | 2025634 |
| | | | 10 m | 2025635 |
| | | | 15 m | 2025636 |
| | Interconnetron M23 x 11 + FE female to Interconnectron M23 x 11 + FE male cable for C4000 (special variant) | Plug straight/socket straight | 0.5 m | 7029160 |
| | | | 3 m | 7029161 |
| | | | 7.5 m | 7029162 |
| | | | 15 m | 7029163 |
| | | | 20 m | 7029164 |
| Field attachable connector | SDL connection, M23 x 11 + FE | – | – | 6024742 |




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- Stand-alone or network-based safety controller
- Solving applications up to SIL3 (IEC 61508)
- Decentralized evaluation of safety sensors and actuators
- Easy installation utilizing standardized connectors
- Rugged IP 67 enclosure for field mounting

| Further information | Page |
|---|---|
| → Dimensional drawings | 0-69 |
| → Device overview and connections | 0-70 |
| → Connection diagrams | 0-71 |
| → Accessories | 0-72 |
| → Services | A-2 |

## Overview of technical specifications

| | |
|---|---|
| **Field bus** | Stand-alone operation, DeviceNet™ and/or DeviceNet Safety™ |
| **Number of safety inputs** | 6 dual-channel resp. 12 single-channel |
| **Number of safety capable outputs** | 2 dual-channel, bipolar type |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) |
| **Safety category** | Up to category 4 (EN 954-1) |

## Product description

UE44X7 IP 67 remote I/O bus modules provide for direct implementation of function block logic into the bus module and hardware interrupt-style fast shutoff functionality. Several benefits may be realized:

- The UE44X7 reduces the response time required to control local safety capable outputs based on local safety input values.
- The UE44X7 can be used in stand-alone mode for applications where the implementation of the safety function can be attained using the local safety capable inputs and safety capable outputs.

When the safety-relevant logic can be implemented in the UE44X7, a separate safety-rated controller is not needed.

SICK's UE44X7 Remote I/O controllers also integrate safety sensors and actuators into a flexible control system and supports both DeviceNet™ and DeviceNet Safety™.
Units are designed with 6 dual-channel safety inputs and 2 dual-channel bipolar safety outputs.
SICK machine protecting devices such as C4000 safety light curtains and S3000 safety laser scanners can be intelligently integrated into the DeviceNet™ and DeviceNet Safety™ fieldbus network using SICK Safety Data Link (SDL) technology on the UE4457 product types.
This provides customers with advanced diagnostic capability and reduces the number of node addresses required.
Configuration can be done locally or remotely through DeviceNet™ or DeviceNet Safety™.

- Fewer bus addresses required
  - UE4457 supports I/O and AOPD(DR)s on SICK SDL connectors
- More efficient response time
  - Fewer addresses = less polling required = faster response times
- Control functionality
  - Integrated control functionality included in remote I/O device
- Better utilization of hardware
- Commonality of parts
  - Networked and stand-alone sensors are the same
  - No special variants required
- Both safety-rated devices and standard devices can be connected

## Applications

→ You can find more applications by using the application finder at www.sickusa.com/applications

- Electrosensitive protective equipments
- Emergency stop buttons
- Electromechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switches



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# Ordering information

| Functionality | Number of safety inputs | Number of safety capable outputs | Number of SDL connections | Type | Part number |
|---|---|---|---|---|---|
| Safety remote I/O and safety controller | 6 dual-channel resp. 12 single-channel | 2 dual-channel, bipolar type | – | UE4427-03DC9F0 | 1028304 |
| | | | 2 | UE4457-03DC9F0 | 1028307 |

# Detailed technical specifications

## General system data

| | UE4427-03DC9F0 | UE4457-03DC9F0 |
|---|---|---|
| **Fieldbus** | Stand-alone operation, DeviceNet™ and/or DeviceNet Safety™ | |
| **Safety category** | Up to category 4 (EN 954-1) | |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) | |
| **Supply voltage** | 19.2 V DC ... 28.8 V DC | |
| **Connection type supply voltage** | Mini 7/8" × 4 | |
| **Ambient operating temperature from ... to** | –10 °C ... +55 °C | |
| **Enclosure rating** | IP 67 | |
| **Protection class** | III (IEC 61131-2) | |
| **Vibration resistance according to IEC 60068-2-6** | 0.35 mm, 10 Hz ... 57 Hz, 50 m/sec², 57 Hz ... 150 Hz | |
| **Shock resistance** | 150 g, 11 ms (IEC 60068-2-27) | |
| **Mounting** | Location in the vincinity of the equipment | |
| **Weight** | 570 g | 650 g |

## Field signal connections

| | | |
|---|---|---|
| **Connection type** | 5-pole M12 connector | |
| **Number of safety inputs**<br>**Type of output on the field-signal input**<br>**Input voltage HIGH**<br>**Input voltage LOW**<br>**Input current HIGH**<br>**Input delay** | 6 dual-channel resp. 12 single-channel<br>PNP or contact<br>11 V DC ... 30 V DC<br>–30 V DC ... 5 V DC<br>5 mA<br>0 ms ... 635 ms, configurable | |
| **Number of SDL connections** | – | 2 |
| **Safety outputs**<br>**Number of safety capable outputs**<br>**Type of output**<br>**Maximum response time**<br>**Switching current**<br>**Leakage current** | 2 dual-channel<br>Bipolar type<br>15 ms<br>2 A<br>0.5 mA | |
| **Test/signal outputs**<br>**Output current per channel**<br>**Leakage current** | 700 mA<br>Max. 0.5 mA | |

## DeviceNet Safety connections

| | |
|---|---|
| **Number of safety target connections** | Max. 6 |
| **Expected packet interval (EPI) setting** | 10 ms minimum, 5 ms increments |
| **Single cast I/O support** | 16 Bytes/16 Bytes |
| **Multi cast I/O support** | 16 Bytes/16 Bytes |




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## DeviceNet connections

| | UE4427-03DC9F0 | UE4457-03DC9F0 |
|---|---|---|
| Poll connection maximum I/O transmission rate | 16 Bytes/16 Bytes | |
| Number of standard slave connections | Max. 3 | |
| Number of UCMM server connections | Max. 4 | |
| Connection type | Mini 7/8" × 5 | |
| DeviceNet communication rate | 125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection | |
| DeviceNet communication rate setting method | Software | |
| DeviceNet addressing | Via safety network configuration tool (e.g. SICK DeviceNet Safety Configurator) or rotary switches | |

## Functions

| | | |
|---|---|---|
| Type of switching amplifier | Safety remote I/O and safety controller | |
| Emergency stop switch | ✔ | |
| Safety switches | ✔ | |
| Optoelectronic protective devices | ✔ | |
| Two-hand control systems | ✔ | |
| External device monitoring | ✔ | |
| Restart interlock | ✔ | |
| Automatic Reset | ✔ | |
| Logical functions | AND, OR, XOR, XNOR, NOT | |
| On-delay | ✔ | |
| Off-delay | ✔ | |
| Door monitoring | ✔ | |
| Muting with sequential sensor orientation | ✔ (available summer 2007) | |
| Muting with parallel sensor orientation | ✔ (available summer 2007) | |
| Muting with crossed sensor orientation | ✔ (available summer 2007) | |
| Valve monitoring | ✔ (available summer 2007) | |
| Clock generator | ✔ (available summer 2007) | |
| Multi-operator | ✔ (available summer 2007) | |
| RS Flip-Flop element | ✔ (available summer 2007) | |
| UP, DOWN, UP/DOWN event counters | ✔ (available summer 2007) | |
| Edge detection | ✔ (available summer 2007) | |
| Usage of the expanded functions on the SDL | – | ✔ |
| Signal routing of SDL relevant signals | – | ✔ |

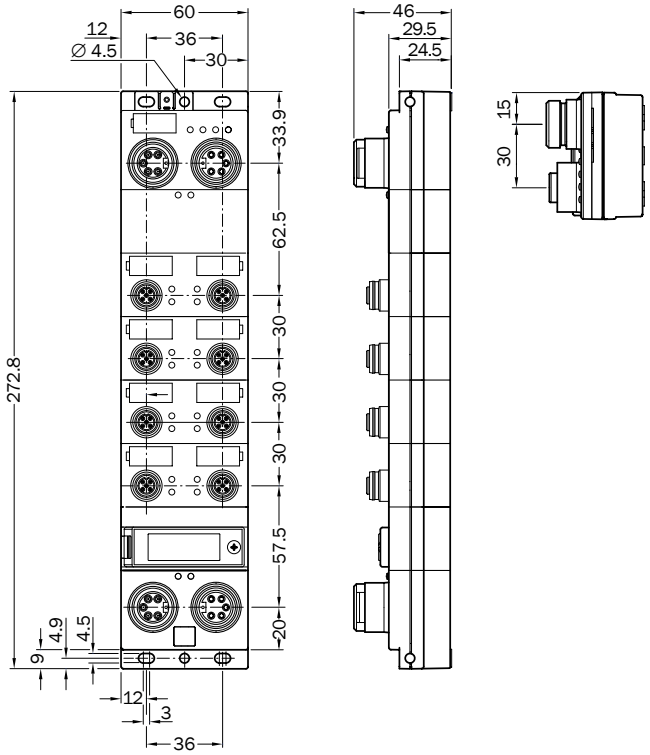




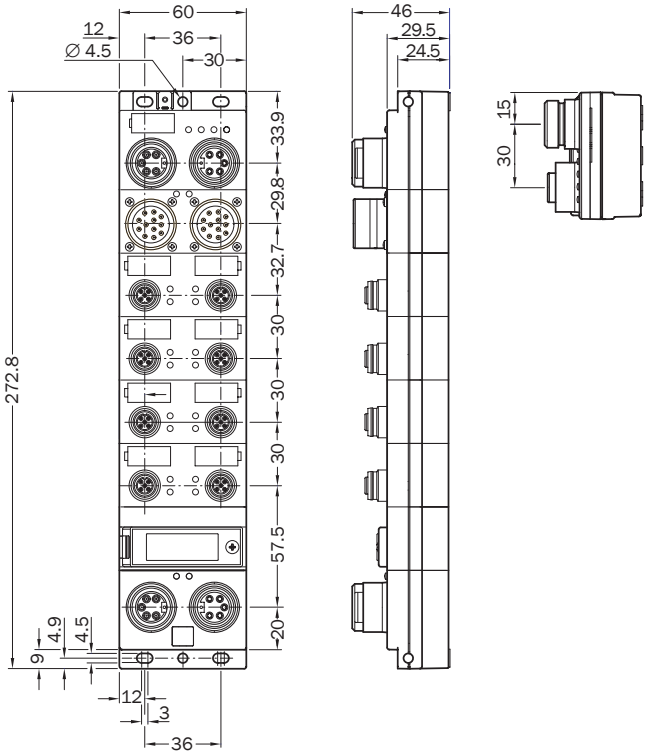
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# Dimensional drawings

**UE4427**




**UE4457**



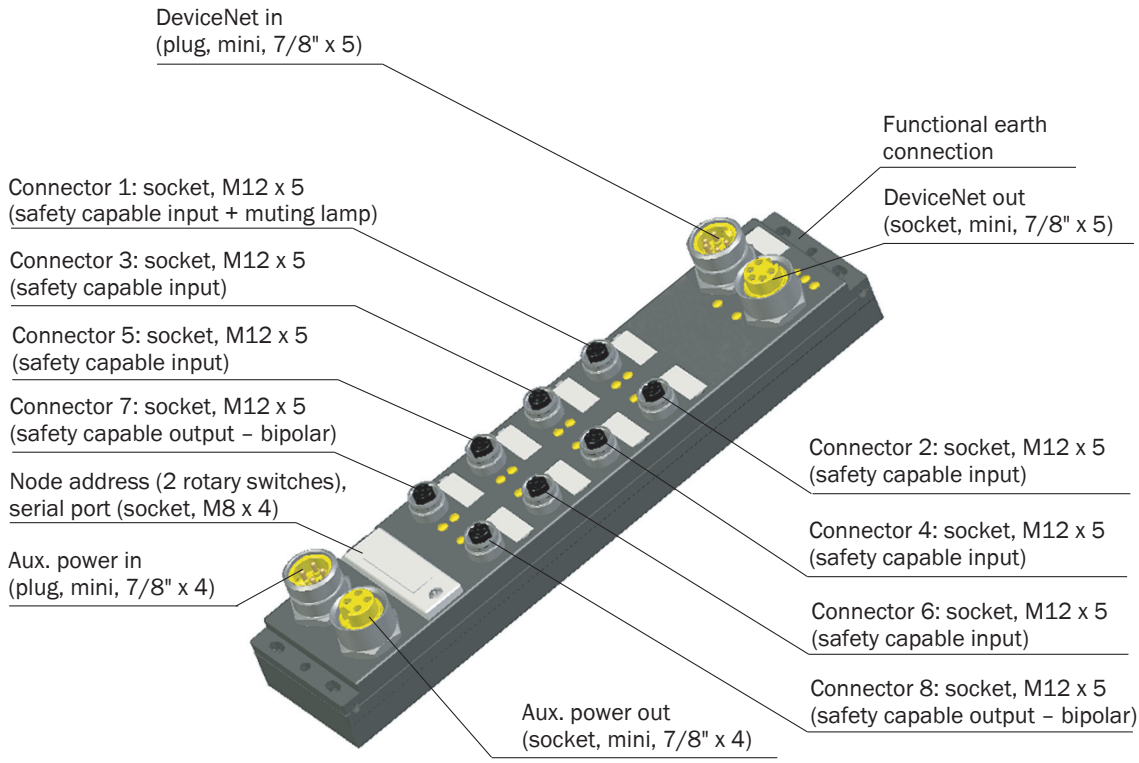

Dimensions in mm

0

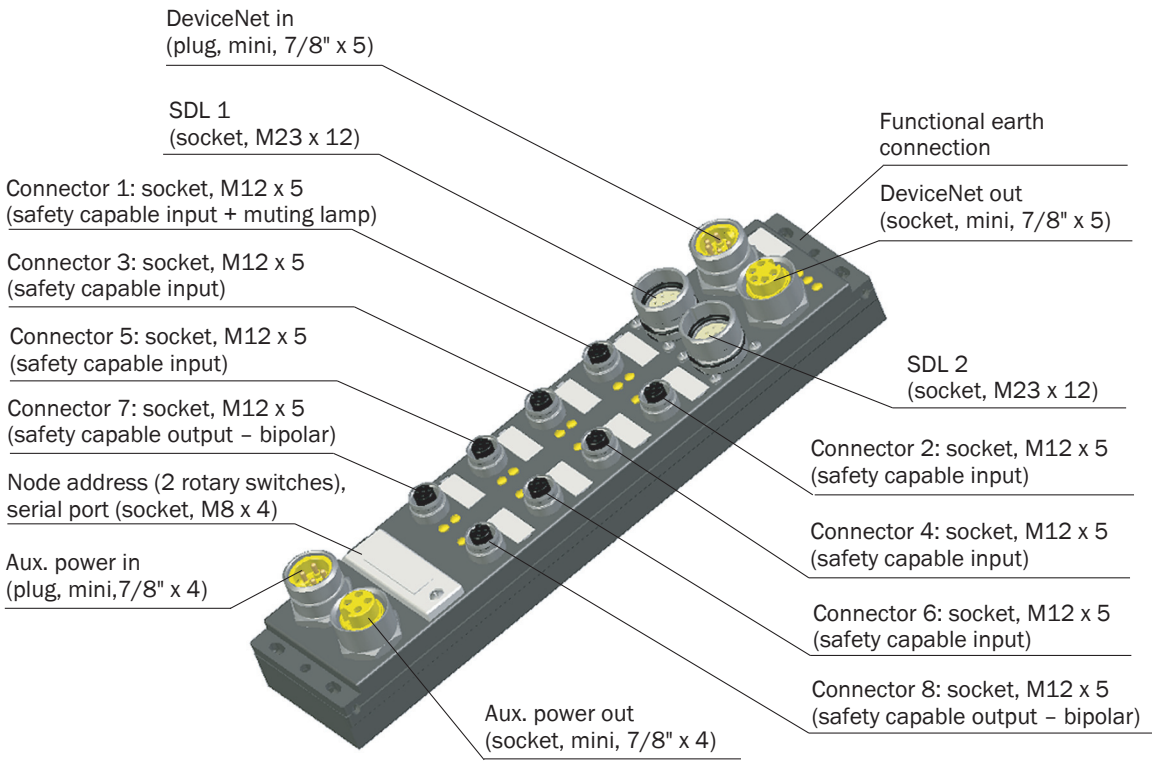

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# Device overview and connections

## UE4427




## UE4457







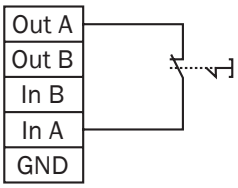

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# Connection diagrams

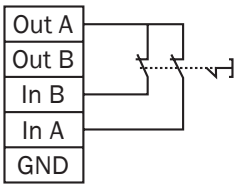
➜ You can find connection diagrams at www.sickusa.com/connectiondiagrams

## Emergency stop, emergency shutdown, safety door on the field-signal connection

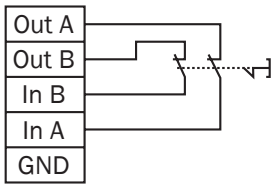
Single-channel
(up to category 2)




Dual-channel with
common testing
(up to category 3)

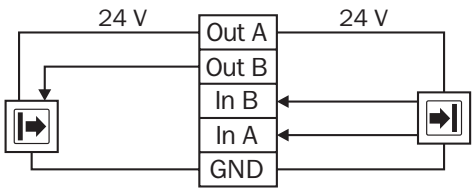



Dual-channel with
isolated testing
(up to category 4)

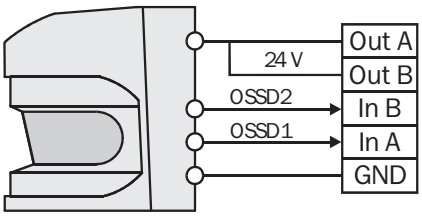



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.
The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

## Electrosensitive protective equipment (ESPE) on the field-signal connection

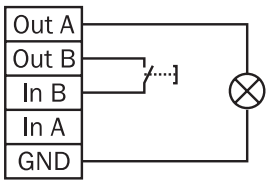



In the connection of electrosensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.



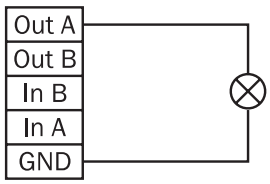

You can use output Out B to test the sender in a safety light curtain.
The safety outputs (output signal switching devices [OSSDs]) are connected to inputs In A and In B.

## Control switch with indicator display on the field-signal connection




The indicator display (Out A) is being controlled via the internal logic of the UE44X7 or via an external safety rated programmable logic controller.

## Muting lamp on the field-signal connection




It is only permitted to connect a muting lamp to test output 1A, as only this output has current monitoring capability.



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# Accessories

### Field-signal connection accessories

| Type | Direction of the cable outlet on the plug | Shielded | Cable length | Part number |
|---|---|---|---|---|
| Cable, M12 x 5 male connector with flying leads | Straight | ✔ | 2 m | 6024860 |
| | | | 5 m | 6024861 |
| | | | 10 m | 6024862 |
| | | – | 2 m | 6026133 |
| | | | 5 m | 6026134 |
| | | | 10 m | 6026135 |
| Cable, M12 x 5 male connector to M26 x 11 + FE, female connector for C4000 Standard or Advanced sender unit | Straight | ✔ | 2.5 m | 2040017 |
| | | ✔ | 5 m | 2040018 |
| | | ✔ | 10 m | 2040019 |
| | | ✔ | 15 m | 2040056 |
| Cable, M12 x 5 male connector to M26 x 11 + FE, female connector for C4000 Standard or Advanced receiver unit | Straight | ✔ | 2.5 m | 2040014 |
| | | ✔ | 5 m | 2040015 |
| | | ✔ | 10 m | 2040016 |
| | | ✔ | 15 m | 2040053 |
| Field attachable connector, M12 x 5 | Straight | – | – | 6022083 |
| | | ✔ | – | 6024741 |
| | Angled | – | – | 6022082 |
| Field attachable connector M12 x 8 for C2000, C4000 Micro and Basic Plus, and M4000 Standard | Straight | ✔ | – | 6028422 |
| Two-way splitter, M12 x 5 Straight through connection | – | – | – | 6024744 |
| Two-way splitter, M12 x 5 Internal series wired connection | – | – | – | 4050723 |
| Two-way splitter for C4000 Eco Sender/Receiver to M12 x 5 | – | – | – | 6026517 |

### Auxiliary power supply accessories

| Type | Connection type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|
| Connection cables | Power cable, Mini 7/8" x 4, female with flying leads | Straight | 2 m | 6030753 |
| | | | 5 m | 6030754 |
| | | | 10 m | 6030755 |
| | Bulk cable - auxillary power | – | By the meter | 6030757 |
| Panel mount receptacles | Mini 7/8" x 4, female with flying leads | Straight | 0.3 m | 6030805 |
| | Mini 7/8" x 4, male with flying leads | Straight | 0.3 m | 6030806 |
| Field attachable connectors | Mini connector 7/8" x 4, female | Straight | – | 6030803 |
| | Mini connector 7/8" x 4, male | Straight | – | 6030804 |





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### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages. For local device configuration | 2032314 |
| CDS plug-in for DeviceNet Safety SNCT | Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2 032 920). | 2027422 |
| SICK DeviceNet Safety Configurator | Safety Network Configuration Tool (SNCT). Enables the configuration and diagnosis of the DeviceNet and DeviceNet Safety network. Includes SICK plug-in configuration software and .EDS files for SICK DeviceNet Safety UE442X, UE445X and UE447X components. | 2032920 |
| SICK EasySCT | Safety Configuration Tool for SICK UE442X, UE445X and UE447X products. Provides configuration for these products as well as integration of these products on a DeviceNet Safety fieldbus network. For configuration of other SICK devices or third-party devices, use SICK DeviceNet Safety Configurator. | Contact factory |

### Field attachable connectors, termination resistors and T-connectors for DeviceNet Safety

| Type | Connection type | Direction of the cable outlet on the plug | Part number |
|---|---|---|---|
| Field attachable connectors | Mini receptacle 7/8" x 5, female | Straight | 6030807 |
| | Mini receptacle 7/8" x 5, male | Straight | 6030808 |
| | Mini connector 7/8" x 5, female | Straight | 6028331 |
| | Mini connector 7/8" x 5, male | Straight | 6028332 |
| T-connector | DeviceNet T-connector, Mini/Mini/Mini 7/8" x 5 | – | 6030752 |
| Termination resistors | Mini 7/8" x 5, female | Straight | 6028329 |
| | Mini 7/8" x 5, male | Straight | 6028995 |

### Connection cables for DeviceNet and DeviceNet Safety

| Type | Cable diameter | Connection type | Cable type | Cable length | Cable material | Part number |
|---|---|---|---|---|---|---|
| DeviceNet thick cable | f12.2 mm | Mini connector 7/8" x 5 male and female | Double ended | 2 m | PVC | 6030749 |
| | | | | 5 m | PVC | 6030750 |
| | | | | 10 m | PVC | 6030751 |
| DeviceNet thin cable | 6.9 mm | Mini connector 7/8" male and female | Double ended | 1 m | PVC | 6030743 |
| | | | | 2 m | PVC | 6030744 |
| | | | | 3 m | PVC | 6030745 |
| | | | | 4 m | PVC | 6030746 |
| | | | | 5 m | PVC | 6030747 |
| | | | | 6 m | PVC | 6030748 |
| DeviceNet thick cable | 12.2 mm | Bulk cable | By the meter | – | PVC | 6030756 |
| DeviceNet thin cable | 6.9 | Bulk cable | By the meter | – | PVC | 6030921 |

### Tamper evident sheath

| Connection type | Type | Part number |
|---|---|---|
| M12 | Cable sheath/cover; Package of 10 pcs. | 5315186 |




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### Power supply units (PELV, SELV, Class 2)

| Input voltage | Input frequency | Output voltage | Maximum output current | Part number |
|---|---|---|---|---|
| 100...240 V AC | 43 Hz...63 Hz | 24 V DC | 2.1 A | 7028789 |
| 100...120 V AC/220...240 V AC | 47 Hz...63 Hz | 24 V DC | 3.9 A | 7028790 |

### Protective caps for IP 67 Integrity and Device Labels

| Connection type | Quantity per package | Part number |
|---|---|---|
| M12 x 5 field signal connections | 10 | 2019706 |
| Mini connector 7/8" x 5, male<br>Mini connector 7/8" x 4, male | 1 | 5315188 |
| Mini connector 7/8" x 5, female<br>Mini connector 7/8" x 4, female | 1 | 5315187 |
| SDL / M23 x 12 connection | 1 | 5310774 |
| UE4400 IP 67 accessory pack | Includes 10 labels and four M12 protective caps | 5315185 |

### Configuration connection cable, configuration connection

| Type | Connection type | Cable length | Part number |
|---|---|---|---|
| Connection cable | M8 x 4, RJ45/SUB-D 9-pin | 2 m | 6021195 |
| | | 8 m | 2027649 |

### SDL connection accessories

| Type | Connection type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|
| SDL connection cables, shielded | Interconnectron M23 x 12, male with flying leads for connection of S3000 system plug (sold seperately) | Straight | 2.5 m | 2029337 |
| | | | 5 m | 2029338 |
| | | | 10 m | 2029339 |
| | | | 15 m | 2029340 |
| | Hirschmann M26 x 11 + FE female to Interconnectron M23 x 11 + FE male cable for C4000 Standard/ C4000 Advanced | Plug straight/socket straight | 2.5 m | 2029131 |
| | | | 5 m | 2025634 |
| | | | 10 m | 2025635 |
| | | | 15 m | 2025636 |
| | Interconnetron M23 x 11 + FE female to Interconnectron M23 x 11 + FE male cable for C4000 (special variant) | Plug straight/socket straight | 0.5 m | 7029160 |
| | | | 3 m | 7029161 |
| | | | 7.5 m | 7029162 |
| | | | 15 m | 7029163 |
| | | | 20 m | 7029164 |
| Field attachable connector | SDL connection, M23 x 11 + FE | – | – | 6024742 |



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## Overview of technical specifications

| | |
|---|---|
| **Fieldbus** | Stand-alone operation, DeviceNet™ and/or DeviceNet Safety™ |
| **Number of safety inputs** | 8 dual-channel resp. 16 single-channel |
| **Number of safety capable outputs** | 4 dual-channel resp. 8 single-channel |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) |
| **Safety category** | Up to category 4 (EN 954-1) |

## Product description

SICK's UE4400 safety network controllers integrate and evaluate any combination of safety input and actuator devices in stand-alone, DeviceNet™ and DeviceNet Safety™ networks, using local or remote safety inputs and outputs. Safety devices can now be logically combined for optimised machine safety control strategies. Applications include packaging machinery, robot cells, machine tools and transfer lines. Status, diagnostic and error information can be easily accessed locally or through the network. Integrated basic and application-specific function blocks are provided for simple and complex control capability. Logical operations include: AND, OR, Exclusive OR, Exclusive NOR, NOT, ON-delay timer, OFF-delay timer, restart interlock, external device monitoring (EDM), emergency stop, safety gate monitoring, ESPE/AOPD (e.g. safety light curtain), enabling switch, two-hand control, automatic reset, and operating mode selector switch. Additional functions are planned for summer 2007. These include: RS-Flip Flop, edge trigger detection, press elements, muting elements, counters (up, down, up/down), valve monitoring, RE300 sensor and clock generator. Contact your local SICK representative for additional information regarding these functions and availability.

## Applications

- Electrosensitive protective equipments
- Emergency stop buttons
- Electromechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact




DeviceNet Safety™

DeviceNet™




- Solving applications up to SIL3 (IEC 61508)
- Local/remote connection of safety sensors and actuators
- Decentralised evaluation of safety sensors and actuators
- Easy upgrade of installed base of sensors and actuators
- Logical combinations between sensors and actuators
- Large library of approved safety function blocks
- Remote configuration of other DeviceNet Safety™ devices via network

| Further information | Page |
|---|---|
| → Ordering information | 0-76 |
| → Technical specifications | 0-76 |
| → Dimensional drawings | 0-78 |
| → Device overview and connections | 0-78 |
| → Internal circuitry | 0-79 |
| → Accessories | 0-80 |
| → Services | A-2 |

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# Ordering information

| Functionality | Number of safety inputs | Number of test/signal outputs (with current monitoring) | Type | Part number |
|---|---|---|---|---|
| Flexible safety controller | 8 dual-channel resp. 16 single-channel | 4 (0) | UE4470-22EE690 | 1028312 |

# Detailed technical specifications

## General system data

| | |
|---|---|
| **Fieldbus** | Stand-alone operation, DeviceNet™ and/or DeviceNet Safety™ |
| **Category** | Up to category 4 (EN 954-1) |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) |
| **Supply voltage** | 20.4 V DC ... 26.4 V DC |
| **Connection type supply voltage** | Spring terminal plug |
| **Ambient operating temperature from ... to** | –10 °C ... +55 °C |
| **Enclosure rating** | IP 20 |
| **Protection class** | III (IEC 61131-2) |
| **Vibration resistance according to IEC 60068-2-6** | 0.35 mm, 10 Hz ... 57 Hz, 50 m/sec², 57 Hz ... 150 Hz |
| **Shock resistance** | 150 m/sec², 11 ms (IEC 60068-2-27) |
| **Mounting** | 35 mm mounting rail (DIN 46277) |
| **Weight** | 460 g |

## Field-signal connections

| | |
|---|---|
| **Connection type** | Spring terminal plug |
| **Number of safety inputs** | 8 dual-channel resp. 16 single-channel |
| **Type of output on the field-signal input** | PNP or contact |
| **Input voltage HIGH** | 11 V DC ... 30 V DC |
| **Input voltage LOW** | 0 V DC ... 5 V DC |
| **Input current HIGH** | 5 mA |
| **Input delay** | 0 ms ... 126 ms, configurable |
| **Safety outputs** | |
| **Number of safety capable outputs** | 4 dual-channel resp. 8 single-channel |
| **Type of output** | Source output (PNP) |
| **Maximum response time** | 15 ms |
| **Switching current** | 500 mA |
| **Leakage current** | 0.1 mA |
| **Test/signal outputs** | |
| **Number of test/signal outputs (with current monitoring)** | 4 (0) |
| **Output current per channel** | 700 mA |
| **Leakage current** | Max. 0.1 mA |

## DeviceNet Safety connections

| | |
|---|---|
| **Number of originator connections** | Max. 16 |
| **Number of safety target connections** | Max. 4 |
| **Expected packet interval (EPI) setting** | Minimum device cycle time |
| **Single cast I/O support** | 16 Bytes/16 Bytes |
| **Multi cast I/O support** | 16 Bytes/16 Bytes |





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## DeviceNet connections

| | |
|---|---|
| **Poll connection maximum I/O transmission rate** | 16 Bytes/16 Bytes |
| **Number of standard slave connections** | Max. 2 |
| **Number of UCMM clients** | 8, open connections |
| **Number of UCMM server** | Max. 5 |
| **Connection type** | Spring terminal block |
| **DeviceNet communication rate** | 125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection |
| **DeviceNet communication rate setting method** | DIP switch |
| **DeviceNet addressing** | Via safety network configuration tool (e.g. SICK DeviceNet Safety Configurator) or rotary switches |

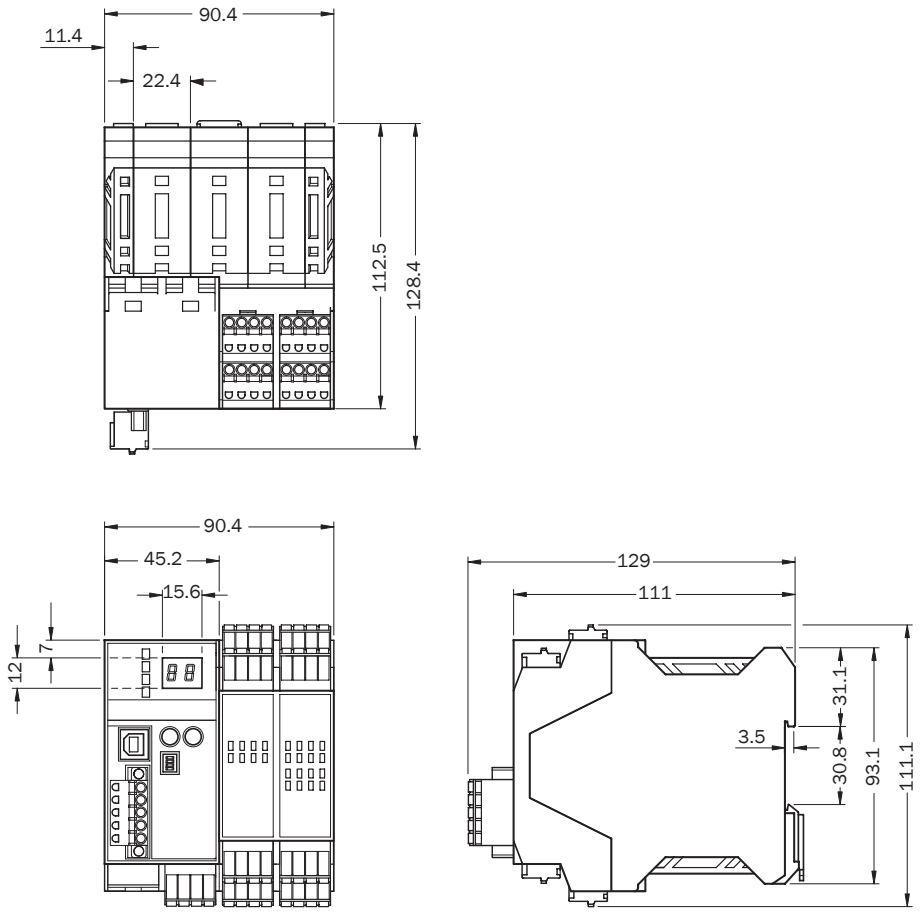
## Functions

| | |
|---|---|
| **Functionality** | Flexible safety controller |
| **External device monitoring** | ✔ |
| **Restart interlock** | ✔ |
| **Automatic Reset** | ✔ |
| **Logical functions** | AND, OR, XOR, XNOR, NOT |
| **On-delay** | ✔ |
| **Off-delay** | ✔ |
| **Door monitoring** | ✔ |
| **Signal routing** | ✔ |
| **Emergency stop switch** | ✔ |
| **Safety switches** | ✔ |
| **Optoelectronic protective devices** | ✔ |
| **Two-hand control systems** | ✔ |
| **Muting with sequential sensor orientation** | ✔ |
| **Muting with parallel sensor orientation** | ✔ |
| **Muting with crossed sensor orientation** | ✔ |
| **Press automatic, single stroke and setup** | ✔ |
| **Press N-Break (PSDI)** | ✔ |
| **Universal press element** | ✔ |
| **Eccentric (mechanical) press element** | ✔ |
| **Valve monitoring** | ✔ |
| **Clock generator** | ✔ |
| **Multi-operator** | ✔ |
| **RE300 sensor element** | ✔ |
| **RS Flip-Flop element** | ✔ |



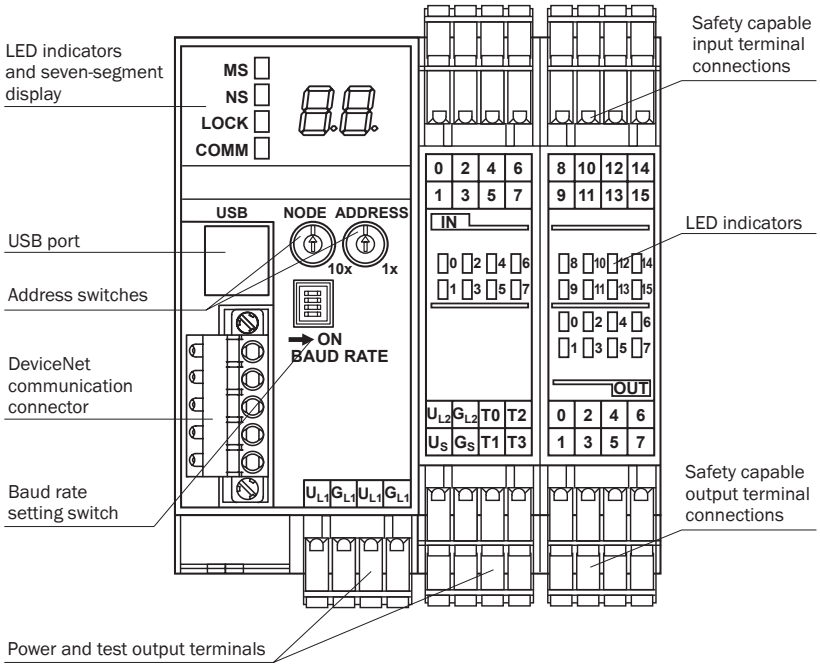

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## Dimensional drawings




Dimensions in mm

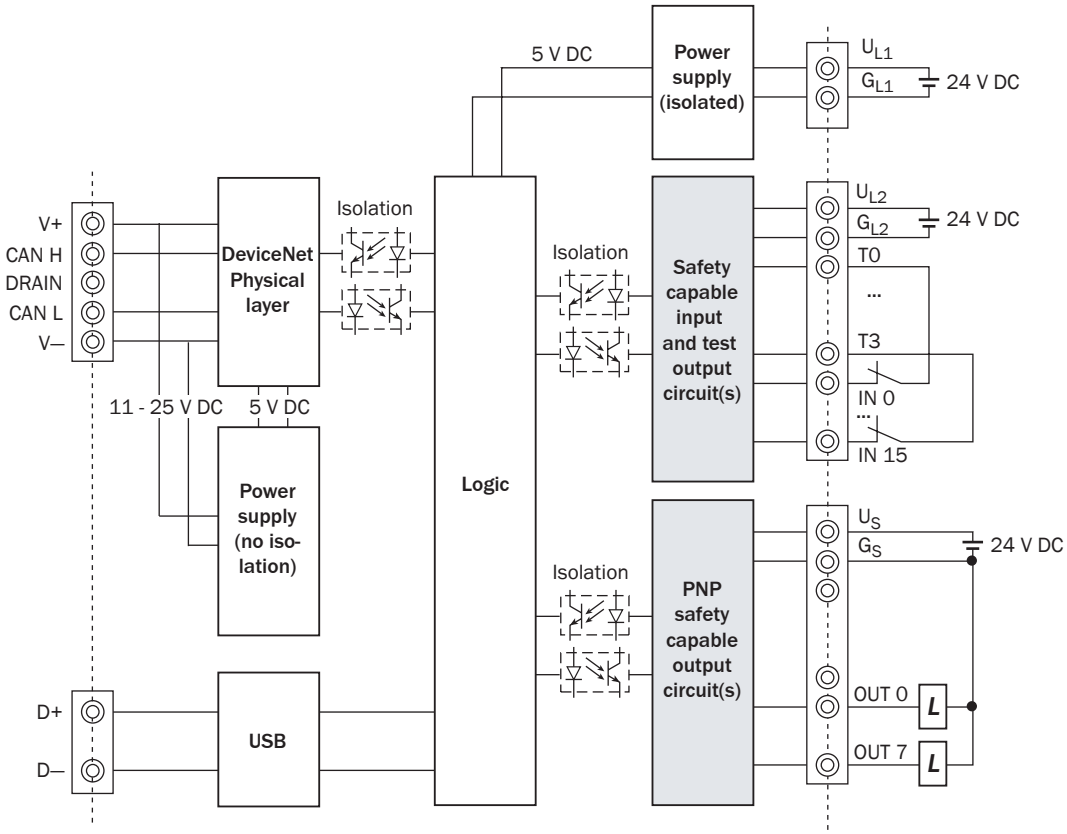
## Device overview and connections





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# Internal circuitry




| Terminal name | Description |
|---|---|
| $U_{L1}$ | 24 V DC power supply terminal for internal device power (e.g. internal logic). Both $U_{L1}$ terminals are internally connected |
| $G_{L1}$ | 0 V DC power supply terminal for internal device power (e.g. internal logic). Both $G_{L1}$ terminals are internally connected |
| $U_{L2}$ | 24 V DC power supply terminal for external input device and test output |
| $G_{L2}$ | 0 V DC power supply terminal for external input device and test output |
| $U_S$ | 24 V DC power supply terminal for external output device |
| $G_S$ | 0 V DC power supply terminal for external output device |
| IN0 to IN15 | Safety capable input terminals |
| T0 to T3 | Test/signal output terminals |
| OUT0 to OUT7 | Safety capable output terminals |





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# Accessories

### Auxiliary power supply accessories

| Type | Connection type | Cable type | Direction of the cable outlet on the plug | Cable length | Part number |
|---|---|---|---|---|---|
| Connection cables | Mini receptacle 7/8" x 4, female | Flying leads | Straight | 0.3 m | 6030805 |
| | Mini receptacle 7/8" x 4, male | Flying leads | Straight | 0.3 m | 6030806 |
| | Bulk auxiliary power cable | By the meter | – | – | 6030757 |
| | Power cable, Mini 7/8" x 4, female with flying leads | – | – | 2 m | 6030753 |
| | | | | 5 m | 6030754 |
| | | | | 10 m | 6030755 |
| Field attachable connectors | Mini connector 7/8" x 4, female | – | Straight | – | 6030803 |
| | Mini connector 7/8" x 4, male | – | Straight | – | 6030804 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS plug-in for DeviceNet Safety SNCT | Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2 032 920) | 2027422 |
| SICK DeviceNet Safety Configurator | Safety Network Configuration Tool (SNCT). Enables the configuration and diagnosis of the DeviceNet and DeviceNet Safety network. Includes SICK plug-in configuration software and .EDS files for SICK DeviceNet Safety UE442X, UE445X and UE447X components. | 2032920 |
| SICK EasySCT | Safety Configuration Tool for SICK UE442X, UE445X and UE447X products. Provides configuration for these products as well as integration of these products on a DeviceNet Safety fieldbus network. For configuration of other SICK devices or third-party devices, use SICK DeviceNet Safety Configurator. | Contact factory |

### Field attachable connectors, termination resistors and T-connectors for DeviceNet and DeviceNet Safety

| Type | Connection type | Direction of the cable outlet on the plug | Part number |
|---|---|---|---|
| Panel Mounted Receptacles | Mini connector 7/8" x 5, female | Straight | 6030807 |
| | Mini connector 7/8" x 5, male | Straight | 6030808 |
| DeviceNet terminators | Mini connector 7/8" x 5 male | Straight | 6028995 |
| | Mini connector 7/8" x 5 female | Straight | 6028329 |
| T-connectors | DeviceNet T-connector Mini/Mini/Mini 7/8" x 5 | – | 6030752 |
| | DeviceNet T-connector Mini 7/8" x 5/M12 x 5/Mini 7/8" x 5 | – | 6028330 |
| Field attachable connectors | Mini connector 7/8" x 5, female | Straight | 6028331 |
| | Mini connector 7/8" x 5, male | Straight | 6028332 |
| | M12 x 5 connector, female | Straight | 6030801 |
| | | Angled | 6030799 |
| | M12 x 5 connector, male | Straight | 6030802 |
| | | Angled | 6030800 |

### Power supply units (SELV, PELV, Class 2)

| Input voltage | Input frequency | Output voltage | Maximum output current | Part number |
|---|---|---|---|---|
| 100 V AC...240 V AC | 43 Hz...63 Hz | 24 V DC | 2.1 A | 7028789 |
| 100...120 V AC/220...240 V AC | 47 Hz...63 Hz | 24 V DC | 3.9 A | 7028790 |


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### Connection cables for DeviceNet and DeviceNet Safety

| Type | Cable diameter | Connection type | Cable type | Cable length | Cable material | Part number |
|---|---|---|---|---|---|---|
| DeviceNet thick cable | 12.2 mm | Mini connector 7/8" x 5 male and female | Double-ended | 2 m | PVC | 6030749 |
| | | | | 5 m | PVC | 6030750 |
| | | | | 10 m | PVC | 6030751 |
| DeviceNet thin cable | 6.9 mm | Mini connector 7/8" x 5 male and female | Double-ended | 1 m | PVC | 6030743 |
| | | | | 2 m | PVC | 6030744 |
| | | | | 3 m | PVC | 6030745 |
| | | | | 4 m | PVC | 6030746 |
| | | | | 5 m | PVC | 6030747 |
| | | | | 6 m | PVC | 6030748 |
| | | M12 x 5 connector, male and female | Double-ended | 1 m | PVC | 6030915 |
| | | | | 2 m | PVC | 6030916 |
| | | | | 3 m | PVC | 6030917 |
| | | | | 4 m | PVC | 6030737 |
| | | | | 5 m | PVC | 6030918 |
| | | | | 6 m | PVC | 6030919 |
| | | M12 x 5 cable, male with flying leads | Single-ended | 1 m | PVC | 6030738 |
| | | | | 2 m | PVC | 6030920 |
| | | | | 3 m | PVC | 6030739 |
| | | | | 4 m | PVC | 6030740 |
| | | | | 5 m | PVC | 6030741 |
| | | | | 6 m | PVC | 6030742 |
| DeviceNet thick cable | 12.2 mm | Bulk cable | By the meter | – | PVC | 6030756 |
| DeviceNet thin cable | 6.9 mm | Bulk cable | By the meter | – | PVC | 6030921 |

### Terminal connector, DeviceNet connection

| Type | Connection type | Direction of the cable outlet on the plug | Delivery | Part number |
|---|---|---|---|---|
| Terminal connector | Terminal plug with M12 x 5 plug connector | Straight | – | 6030818 |
| | Spring terminal plug, 5-pole | Single entry | With screw flange | 6030817 |
| | | Double entry | With screw flange | 6030816 |
| DeviceNet color code stickers | – | – | For 5-pole terminal blocks | 5315184 |

### Configuration connection cable, DeviceNet Safety connection

| Type | Connection type | Cable length | Part number |
|---|---|---|---|
| USB connection cable | USB A to USB B | 1.8 m (6 ft) | 6030820 |
| | | 4.6 m (15 ft) | 6030819 |

### Replacement parts

| Type | Description | Part number |
|---|---|---|
| Spring terminal block kit for UE4470 | Replacement terminals for UE4470 devices. Includes nine 4-pole terminals, black, spring -clamp style and terminal block keys. | 6030815 |





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Ethernet



- 2 inputs (EFI interface) for the connection of intelligent SICK safety solutions
- Easy configuration and diagnosis with the aid of CDS (Configuration & Diagnostic Software)

## Overview of technical specifications

| | |
|---|---|
| **Fieldbus/communication interface (depending on type)** | PROFIBUS / Ethernet (TCP/IP) / CANopen / PROFIsafe |
| **Number of EFI interfaces** | 2 |
| **Enclosure rating** | IP 20 |
| **Safety category** | Up to category 4 (EN 954-1) |
| **Safety integrity level** | Up to SIL 3 (IEC 61508) |

## Product description

The family of EFI gateways is used for connecting intelligent SICK safety devices to fieldbus and Ethernet interfaces.

Properties of EFI gateways:

- All SICK components connected to the EFI gateway can be easily configured and with diagnostics easily performed via CDS.

Properties of UE1840:

- Activation of an e-mail function by linking the information on EFI devices connected (e.g. contamination on the S3000).

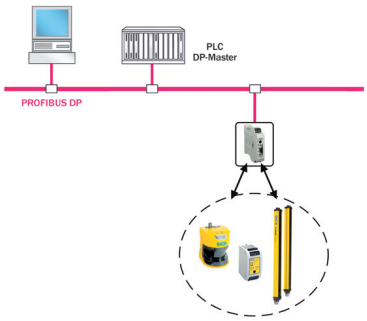
Properties of UE1140, UE1940 and UE4140:

- Configurable process image with information from the EFI sensors connected to the PLC and from the PLC to the sensors (input and output).
- Support of PROFIBUS-DP V1 (UE1140, UE4140)
- Support of PROFIsafe V2.00 (UE4140)
- Support of CANopen (UE1940)

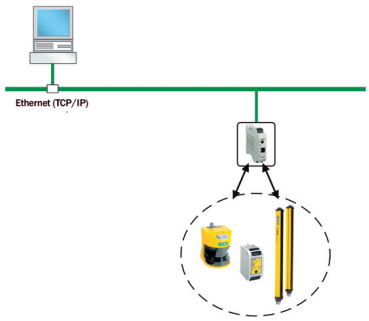
## Applications

- S3000/S300 safety laser scanners
- M4000 multiple light beam safety devices
- C4000 safety light curtains
- UE440/UE470 safety controllers

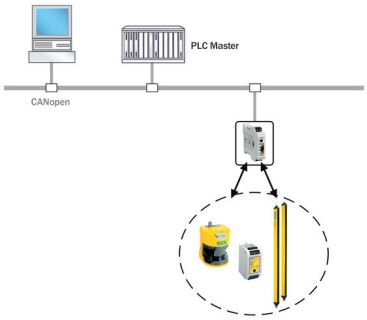
### PROFIBUS Gateway UE1140



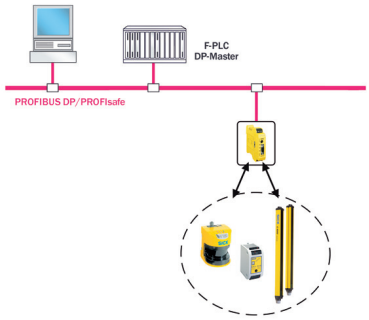

### Ethernet Gateway UE1840




### CANopen Gateway UE1940




### PROFIsafe Gateway UE4140




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| Further information | Page |
|---|---|
| → Dimensional drawings | 0-83 |
| → Device overview and connections | 0-84 |
| → Accessories | 0-85 |
| → Services | A-2 |

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## Ordering information

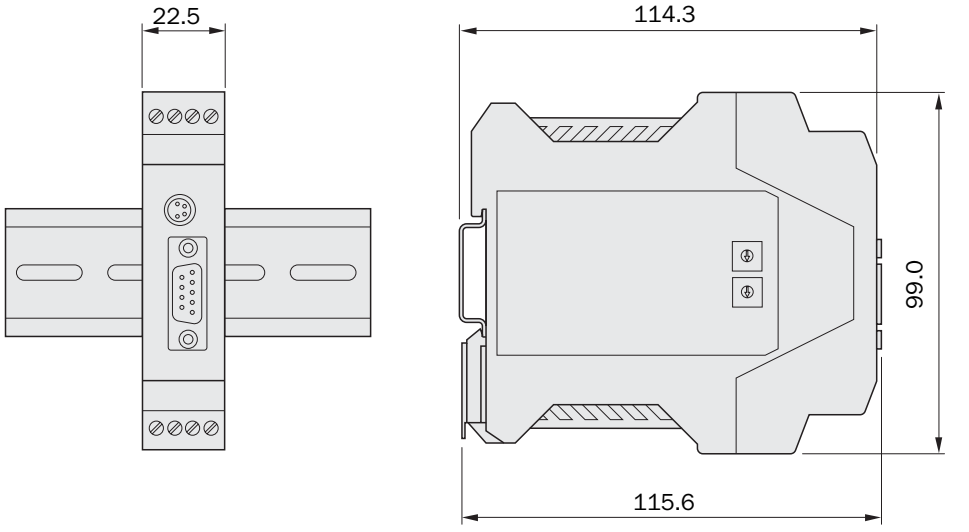
| Fieldbus/communication interface | Number of EFI interfaces | Use of expanded functions through EFI | Type | Part number |
|---|---|---|---|---|
| PROFIBUS | 2 | ✔ | UE1140-22I0000 | 1029099 |
| Ethernet (TCP/IP) | 2 | ✔ | UE1840-22H0000 | 1029100 |
| CANopen | 2 | ✔ | UE1940-I220000 | 1040397 |
| PROFIsafe | 2 | ✔ | UE4140-22I0000 | 1029098 |

## Detailed technical specifications

| Type | UE1140-22I0000 | UE1840-22H0000 | UE1940-I220000 | UE4140-22I0000 |
|---|---|---|---|---|
| Fieldbus/communication interface | PROFIBUS | Ethernet (TCP/IP) | CANopen | PROFIsafe |
| Enclosure rating | IP 20 (IEC 60529) | | | |
| Category<br>UE1140, UE1840, UE1940<br>UE4140 | Up to category 4 (EN 954-1) for internal signal routing<br>Up to category 4 (EN 954-1) | | | |
| Safety integrity level | SIL3 (IEC 61508) | | | |
| Supply voltage | 24 V DC (19.2 V DC ... 28.8 V DC) | | | |
| Maximum power consumption | 4 W | | | |
| Connection type | Plug-in terminals, screwed | | | |
| Baud rate | 0.0096 MBit/s ... 12 MBit/s | 10 MBit/s ... 100 MBit/s | 0.01 MBit/s ... 1 MBit/s | 0.0096 MBit/s ... 12 MBit/s |
| Address range | 3 ... 126 | – | 0 ... 99 | 3 ... 126 |
| Recovery detection | 0995 hex | – | | 0994 hex |
| CANopen profile | – | | 401 | – |

## Dimensional drawings

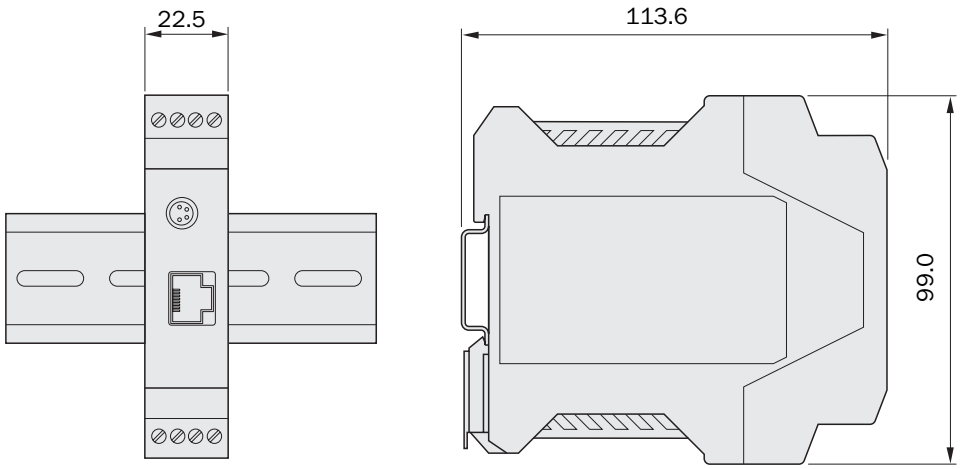
**PROFIBUS Gateway UE1140, CANopen Gateway UE1940,**
**PROFIsafe Gateway UE4140**




Dimensions in mm


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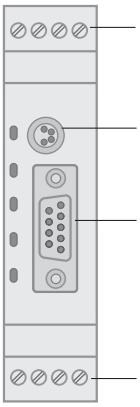
**Ethernet Gateway UE1840**




Dimensions in mm

# Device overview and connections

## PROFIBUS Gateway UE1140



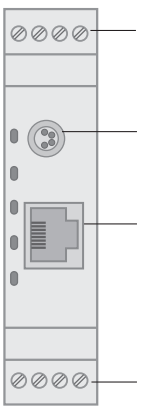

- Supply and EFI connections
  - Terminal 1 + 8: Voltage supply EFI gateway
  - Terminal 2 + 7: Functional earth for screened EFI cable
  - Terminal 3 + 4: Connection 2 for intelligent SICK EFI safety devices
  - Terminal 5 + 6: Connection 1 for intelligent SICK EFI safety devices
- Configuration connection:

To directly connect a PC and configure the system using the SICK CDS

- PROFIBUS connection (9-pin D-SUB):

For connection to PROFIBUS master or other PROFIBUS slaves

## Ethernet Gateway UE1840




- Supply and EFI connections
  - Terminal 1 + 8: Voltage supply EFI gateway
  - Terminal 2 + 7: Functional earth for screened EFI cable
  - Terminal 3 + 4: Connection 2 for intelligent SICK EFI safety devices
  - Terminal 5 + 6: Connection 1 for intelligent SICK EFI safety devices
- Configuration connection:

To directly connect a PC and configure the system using the SICK CDS

- Ethernet connection (RJ-45):

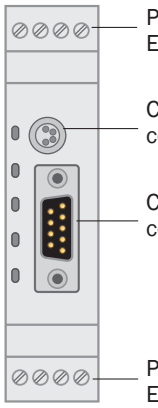
For connection to Ethernet network for configuration and diagnostics





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## CANopen Gateway UE1940



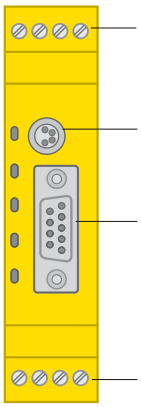

- Supply and EFI connections
  - Terminal 1 + 8: Voltage supply EFI gateway
  - Terminal 2 + 7: Functional earth for screened EFI cable
  - Terminal 3 + 4: Connection 2 for intelligent SICK EFI safety devices
  - Terminal 5 + 6: Connection 1 for intelligent SICK EFI safety devices
- Configuration connection:

To directly connect a PC and configure the system using the SICK CDS

- CANopen connection (9-pin D-SUB):

For connection to CANopen networks

## PROFIsafe Gateway UE4140




- Supply and EFI connections
  - Terminal 1 + 8: Voltage supply EFI gateway
  - Terminal 2 + 7: Functional earth for screened EFI cable
  - Terminal 3 + 4: Connection 2 for intelligent SICK EFI safety devices
  - Terminal 5 + 6: Connection 1 for intelligent SICK EFI safety devices
- Configuration connection:

To directly connect a PC and configure the system using the SICK CDS

- PROFIsafe connection (9-pin D-SUB):

For connection to PROFIsafe master or other PROFIsafe slaves

# Accessories

### Connection cables

| Cable type (acc. to standard) | Cable type | Type | Part number |
|---|---|---|---|
| 1 x 2 x 0.22 mm$^2$ | By the meter | EFI connection cable | 6029448 |

### Configuration connection cables

| Connection type | Description | Cable length | Part number |
|---|---|---|---|
| M8 x 4, SUB-D 9-pol | For connecting the configuration connection to the PC | 2 m | 6021195 |
| | | 8 m | 2027649 |

### Configuration software

| Type | Description | Part number |
|---|---|---|
| CDS | CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages | 2032314 |

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- Simplified documentation including operating instructions
- Structure for implementing the directives and standards
- Hazard analysis and risk assessment
- Full text of directives and standards
- Network enabled

# Product description

Safexpert is a software package for safety engineering. This package guides you, step by step, towards CE certification, provides support during risk analysis and simplifies the documentation process.
Safexpert assists in achieving high levels of safety.

**Add-on modules:**
- Operating instructions assistant
- Check and Acceptance assistant
- Packages of full-text standards

# Benefit

**Simplified documentation**
- CE labelling and documentation in a single step
- Parallel preparation of the operating instructions
- Simplified adaptation of the documentation and the hazard analysis on changes or modifications to the machine

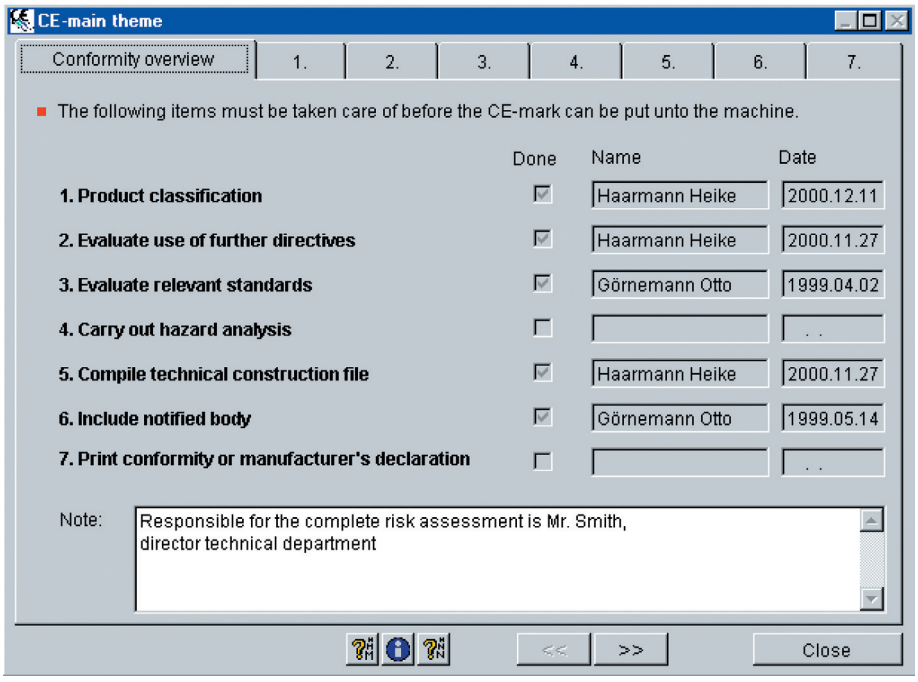
**Save time and costs**
- Re-using solutions saves up to 70 % of time required
- Retain an overview, even with a large number of parallel projects

**More safety**
- Structure for implementing the Machinery Directive
- The status check ensures that no unresolved points are forgotten
- Consistent hazard analysis
- Greater security on liability issues

"By using Safexpert we save up to 70 % on the CE effort and can therefore process a large number of projects in parallel. This situation shortens the total time taken to complete the projects and the machines are available quicker."

*Siemens VDO Automotive*

# CE guidelines



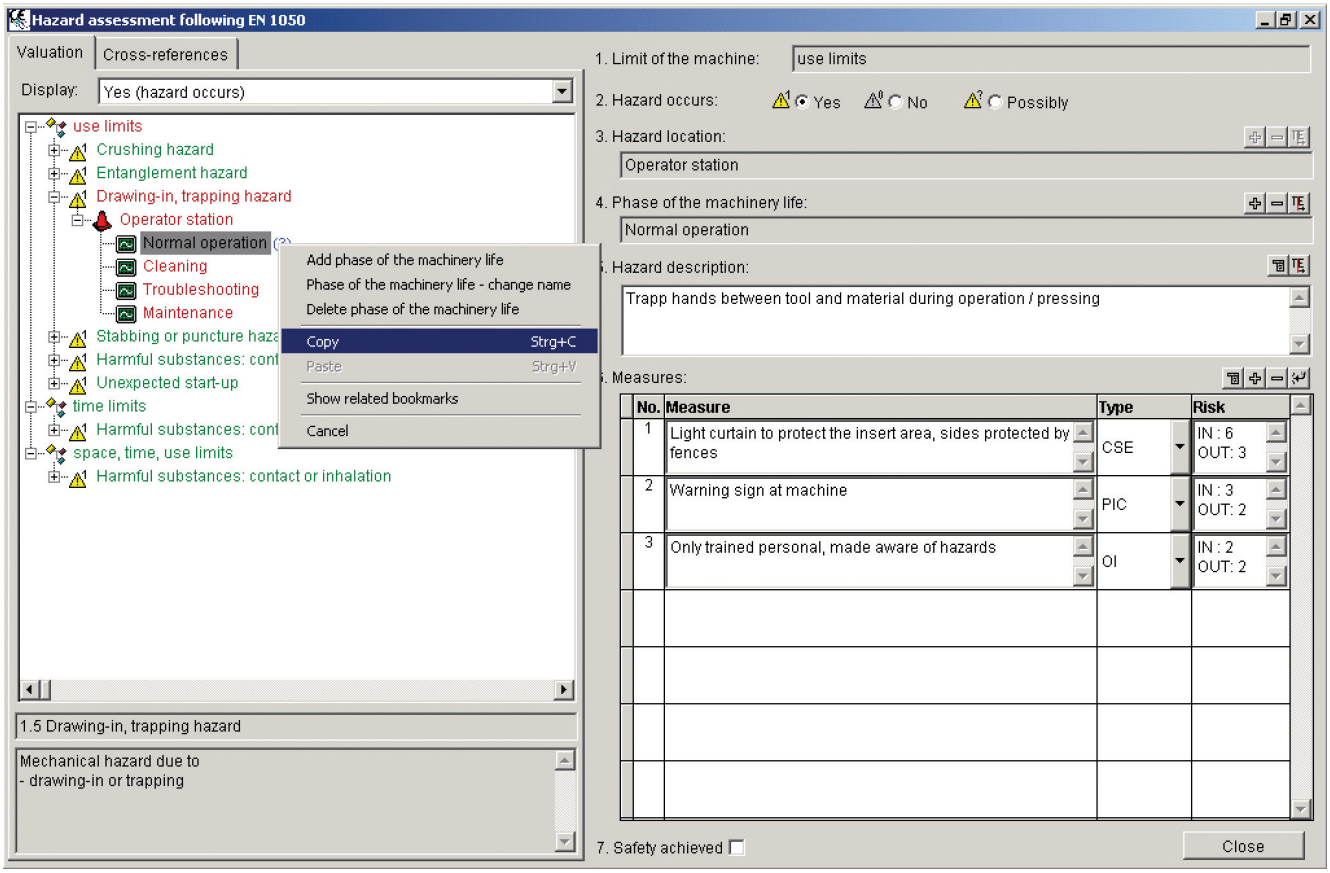

At the end of these 7 steps you can print out the hazard analysis and the declaration of conformity directly.


| Further information | Page |
|---|---|
| → Selection aid | P-2 |
| → Ordering information | P-2 |
| → Services | A-2 |




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# Hazard analysis (HA)




The program mirrors the procedure in the Machinery Directive and in the EN ISO 12100-1/-2 and EN 1050 (ISO 14121) standards. It is also possible to determine the category for safety devices in accordance with EN 954-1.

The decision trees are saved and only need to be clicked on. All information entered is automatically added to the relevant reports.

# System requirements

- Windows 95, 98, 2000, NT, XP
  (Windows is a registered trademark of Microsoft Corporation)
- 32 MB RAM
- Monitor ≥ 800 x 600 pixel

P



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# Selection aid

| Functions | Licences | | |
|---|---|---|---|
| | Basic | Compact | Professional |
| Safety project management | ✔ | ✔ | ✔ |
| CE guidelines - 7 steps to the CE guidelines | ✔ | ✔ | ✔ |
| Hazard analysis incl. hazard list in accordance with EN 1050 | ✔ | ✔ | ✔ |
| Standards and directives information system | – | ✔ | ✔ |
| Collection of graphics characters | – | ✔ | ✔ |
| Example of EU-compliant operating instructions template | – | ✔ | ✔ |
| The “Standard” package of standards with the original texts of 9 standards | – | – | ✔ |

## Add-on modules

The modules can be combined with all licences:

- **Operating instructions assistant**
  The add-on module for the operating instructions with operating instructions template
- **Check and Acceptance assistant**
  The Check and Acceptance assistant provides support in the execution of tests, and the acceptance of machines and plants, with maximum uniformity and concise documentation
- **The “Standard” and “Standard Plus” packages of standards**
  Full text of approx. 50 standards

# Ordering information

## Licenses

| Designation | Description | Part number |
|---|---|---|
| Safexpert 5.0 Basic | ▪ English<br>▪ Single-place license | 2033331 |
| | ▪ English<br>▪ Multi-place license | 2033333 |
| Safexpert 5.0 Compact | ▪ English<br>▪ Single-place license | 2033335 |
| | ▪ English<br>▪ Multi-place license | 2033337 |
| Safexpert 5.0 Professional | ▪ English<br>▪ Single-place license | 2033339 |
| | ▪ English<br>▪ Multi-place license | 2033341 |
| Upgrade to newer versions | ▪ From Safexpert 4.0 to Safexpert 4.2<br>▪ Single-place license | 2031557 |
| | ▪ From Safexpert 4.2 to Safexpert 5.0<br>▪ Multi-place license | 2033342 |

Note: The Basic version cannot be combined with Compact or Professional

## Upgrade

| | | |
|---|---|---|
| Safexpert Master<br>Module for the expansion from Basic to Compact | ▪ English<br>▪ Single-place license | 2031552 |
| | ▪ English<br>▪ Multi-place license | 2031554 |

Note: Expanding for Compact to Professional see next page “Standards“

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## Modules and add-ons

| Designation | Description | Part number |
|---|---|---|
| Operating instructions assistant | ▪ English<br>▪ Single-place license | 2031544 |
| | ▪ English<br>▪ Multi-place license | 2031546 |
| Check and Acceptance assistant | ▪ English<br>▪ Single-place license | 2031548 |
| | ▪ English<br>▪ Multi-place license | 2031550 |

## Standards

### Standards for expanding Compact to Professional

| Designation | Description | Part number |
|---|---|---|
| Safexpert Standard | ▪ English<br>▪ Nine standards: EN 294, EN 349, EN 418, EN 954-1, EN 999, EN 1050, EN ISO 12100-1, -2, EN 60204-1 | 6021373 |

### Further A-type and B-type standards from the “Safe Machinery” area (ICS 13.110) [1)]

| Designation | Description | Part number |
|---|---|---|
| Standard Plus and Standard | ▪ Without Safexpert<br>▪ English | 6022507 |
| Standard Plus as supplement to Safexpert Professional | ▪ English | 6022511 |
| Standard Plus Update | ▪ Update 01-2006<br>▪ English | 2040048 |

[1)] Without preliminary or electrotechnical standards

### Safety of machinery - Basic concepts, general principles for design

| Designation | Description | Part number |
|---|---|---|
| EN ISO 12100-1 | ▪ English | 2031415 |
| EN ISO 12100-2 | | 2031417 |

### C-type standards, single standards and explanations

| Designation | Description | Part number |
|---|---|---|
| EN 692 | ▪ Mechanical presses – Safety<br>▪ English | 6024687 |
| EN 693 | ▪ Hydraulic presses – Safety<br>▪ English | 6024689 |
| EN 775 | ▪ Industrial robots – Safety<br>▪ English | 6024691 |

### Update service for the database of titles of standards and directives

| Designation | Description | Part number |
|---|---|---|
| Yearly update service | ▪ Document register system, Europe<br>▪ English | 6021380 |

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| Term | Explanation |
|---|---|
| **A** | |
| **Actuation duration (reset button)** | Time that a reset button must be operated to reset the safety relay. |
| **Actuator, actor** | Actuator: component, e.g. servomotor, clutch, solenoid valve or similar, for intervening in the process. |
| **ADO** | Application Diagnostic Output<br>Configurable signal output that indicates a specific status of the protective device. |
| **Ambient temperature, max.** | The highest permissible temperature of the ambient air, or another medium, at which the full functionability of an item of equipment is still guaranteed. |
| **Ambient temperature, min.** | The lowest permissible temperature of the ambient air, or another medium, at which the full functionability of an item of equipment is still guaranteed. |
| **ANSI** | American National Standards Institute<br>Promotes and manages American industrial standards.<br>➜ www.ansi.org |
| **AOPD** | Active Optoelectronic Protective Device<br>Text from IEC 61496-2: A device with a sensor function produced by optoelectronic sender and receiver units. A stop signal is generated when an opaque object within the defined protective field interrupts the light emitted by the device.<br>In EN 692 Mechanical presses, EN 693 Hydraulic presses and EN 12622 Hydraulic press brakes the abbreviation AOS is used as a synonym for AOPD. |
| **AOPDDR** | Active Optoelectronic Protective Device responsive to Diffuse Reflection<br>Term from IEC 61496-3: Device with a sensor function produced by optoelectronic sender and receiver elements, that detects the diffuse reflection of light, generated by the device, by an object in a defined two-dimensional protective field. |
| **AS-i** | Actuator-Sensor Interface<br>Open bus system for the lowest automation level. Enables sensors, actuators and integrated systems to be easily connected to the first control level. Master-slave principle, up to 248 binary outputs per network, analogue I/Os possible, electronic address setting over the bus connection, unscreened 2-core ribbon cable, information and power supply on one cable, reverse-polarity protected connection technology.<br>➜ www.as-interface.com |
| **AS-Interface Safety at Work** | Extension of the AS-interface system with safety-related components by using a combination of AS-interface safety monitor and safe AS-interface bus nodes. |
| **AS-Interface Safety at Work Safety Monitor** | One or more safety monitors integrated in the AS-interface system monitor safe AS-interface bus nodes and shut down the protected part of the machine such that the dangerous state of the machine is brought to an end. |
| **A-type standards** | (Basic safety standards) contain basic terminology, principles of design, and general aspects that apply to all machinery, devices and systems. |
| **B** | |
| **Beam coding** | Beam coding ensures that the receiver only detects and evaluates light from the sender allocated to the receiver. |
| **Beam separation** | Distance between the centres of the beams on a multi-beam photoelectric safety switch. |
| **Blanking** | An optional function on an AOPD unit that permits the presence in the protective field of an object, larger than the detection capability or physical resolution of the AOPD, without the OSSDs switching to the off state. The object is therefore blanked. With fixed position blanking, the position of the blanked object does not change during operation. With floating blanking the blanked objects can move in the protective field during operation. In both cases the ability of the AOPD unit to detect objects in the remaining protective field is unchanged. |

Continued on next page




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| Term | Explanation |
|---|---|
| **Blanking (continued)** | Blanking of a specific section of the protective field for a safety light curtain. This section is then inactive. There are two types of blanking:<br>▪ Fixed blanking permits a specific, fixed part of the protective field to be blanked. This function is selected, e.g. if a fixed part of a unit protrudes into the protective field.<br>▪ Floating blanking permits a specific number of light beams from the safety light curtain to be interrupted without the output of a stop signal. This function is selected if the permitted interruption of the protective field does not relate to a fixed position in the protective field, e.g. if a cable or hose is moved through the protective field. |
| **Blind zone** | Zone in front of a sensor in which an object or a reflector is not detected. The blind zone always starts at 0 mm. |
| **BSI** | British Standards Institution<br>Standards institute in the UK<br>➜ www.bsi.org.uk |
| **B-type standards** | (Group safety standards) address a safety aspect or a type of safety-related equipment that can be used for a wide range of machinery, devices and systems.<br>▪ B1-type standards address special safety aspects, e.g. the electrical safety of machinery (IEC 60204), the calculation of safety distances (ISO 13855).<br>▪ B2-type standards address safety equipment, e.g. two-hand controls, interlocking equipment, pressure-sensitive protective equipment, guards, electrosensitive protective equipment<br>(IEC 61496 parts 1, 2 and 3) |
| **Bus system, bus** | Common cable for the transmission of data and control information between different components and systems using a defined protocol. A differentiation is to be made between parallel and serial buses.<br>▪ Parallel bus systems have a large number of wires on which data, address or control information can be transmitted as parallel bits. They are used as plug-in bus systems for the connection of plug-in modules and as peripheral buses for connecting computers to their local I/O devices.<br>▪ Serial bus systems transmit data between components distributed over a wide area in a system as serial bits using a common medium (two-core or multi-core cable, coaxial cable or fibre-optic cable) and as a result drastically reduce the wiring effort compared to conventional wiring. Familiar examples are: DeviceNet, PROFIBUS, Interbus, CAN, AS-i et al. |
| **C** | |
| **Cascadable** | Describes the feature, particularly on light curtains, that allows a basic device (host) to be connected by a cable to a following device (guest). |
| **CDS** | Configuration & Diagnostic Software<br>Configuration and diagnostics software for SICK safety systems. |
| **CE label** | This label on products comprises the letters CE and indicates conformity with all EU directives that apply to the labelled product. The label states that the person or legal entity that applied the label, or had it applied, has ensured that the product complies with all the Union's directives for complete harmonization and has been subjected to all the stipulated conformity assessment procedures. |
| **CEN** | Comité Européen de Normalisation<br>European Committee for Standardisation. Promotes technical harmonization in Europe in collaboration with European partners, e.g. CENELEC and globally active bodies. Is specifically responsible for the area of non-electrical standards.<br>➜ www.cenorm.be |
| **CENELEC** | Comité Européen de Normalisation Electrotechnique<br>European Committee for Electrotechnical Standardisation. Responsible for the harmonization of electrotechnical standards within the European Union and the entire European Economic Region, EER.<br>➜ www.cenelec.be |
| **Concurrence monitoring** | Simultaneous operation of the start buttons is monitored and is stipulated for two-hand controls. The output contacts are only switched if the state of both start buttons changes within 0.5 s. |





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| Term | Explanation |
|---|---|
| **Contamination control** | Prior to the failure of the sensor, indicates an unsatisfactory signal reserve due to maladjustment or contamination (for optical sensors). |
| **Cross-circuit/short-circuit detection** | Detection of cross-circuit/short-circuit, or a reduction in the insulation resistance between contact and contact, or short-circuit between core and core, or more than one single conductor cable. |
| **CSA** | Canadian Standards Association<br>The Canadian Standards Association prepares standards for improving public safety and health, protecting the environment and easing trade.<br>CSA tests and certifies the electrical properties and the safety of products. It is designated by ➜ OSHA as a national, recognised test laboratory for testing all products that fall under the responsibility of OSHA.<br>➜ www.csa.ca |
| **C-type standards** | (Machinery safety standards) contain all safety requirements for a specific machine or a type of machine. If this standard exists, it has priority over the A-type or B-type standard. Nevertheless, a C-type standard can refer to a A-type standard or an B-type standard. If there is no C-type standard for a machine, conformity can be achieved based on the A-type or B-type standard. In all circumstances the requirements of the Machinery Directive must be met. |
| **D** | |
| **Dangerous state** | State that can result in injuries to people. Safety sensors prevent this hazard if the protective device is used correctly. |
| **DeviceNet™** | Simple CAN-based communication system for networking industrial automation equipment with higher-ranking control equipment. The transmission medium is two twisted, screened pairs of wires inside one cable. One pair is used for communication and the other for the supply of power to the equipment connected.<br>➜ www.odva.org |
| **E** | |
| **EDM** | External device monitoring<br>Term from IEC 61496-3: A means with which the item of electrosensitive protective equipment (ESPE) monitors the status of the parts of the control outside the ESPE.<br>➜ Monitoring function for downstream devices |
| **EFI** | Enhanced Function Interface<br>Safe SICK device interface for the transmission of safety relevant signals. A bus interface to a safe fieldbus is possible using the SICK UE1000 device family. |
| **EMC** | Electromagnetic Compatibility<br>Ability of an item of equipment to work satisfactorily in its electromagnetic environment and at the same time not to excessively interfere with this environment, in which there are other items of equipment. |
| **Enclosure ratings** | Enclosure ratings describe a machine's or sensor's level of protection against physical contact and penetration of foreign bodies and water.<br>The enclosure rating code starts with the letters IP (ingress protection); the first digit indicates the level of protection against accidental contact and foreign bodies.<br>The second digit describes the protection against the penetration of water. The higher the digit, the greater the protection provided. In industry, enclosure ratings from IP 65 have become established as the standard.<br>SICK sensors predominantly have an enclosure rating of IP 67. |
| **Entry/Exit** | Innovative muting alternative for access protection: Muting sensors and muting lamps are no longer required. Additional protection measures (e.g. hinged doors) are not required as a rule. |



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| Term | Explanation |
|---|---|
| **ESD** | Electrostatic Discharge<br>Electrostatic discharge: Equalisation of charge between differently electrostatically charged fixed, gaseous or liquid media. The currents generated during discharge can damage or destroy electronic components, or impair the function of electronic devices. These effects on devices are covered by legislation on electromagnetic compatibility. When handling electronic components, assemblies and devices, discharges from the body during e.g. transport, mounting, testing, repair and service, are of significance.<br>➜ www.darc.de/gesetze/pdf/emvg.pdf |
| **ESPE** | ElectroSensitive Protective Equipment<br>Text from IEC 61496-1: Electrosensitive protective equipment (ESPE). These items of equipment can be based on the following physical principles: optoelectronics, ultrasonics, inductive sensor systems, infrared movement sensors, etc.<br>ESPE comprise the following elements: a sensor function, a control/monitoring function, switching outputs (OSSD).<br>They are used to protect people at machines and systems on which there is a risk of injury. They cause the machine or system to adopt a safe state before a person can be exposed to a hazardous situation. |
| **External device monitoring** | ➜ EDM |
| **F** | |
| **Fieldbus** | Bus system in close proximity to the process for the direct connection of intelligent sensors and actuators. On a fieldbus, smaller quantities of data are transmitted digitally between sensors and actuators and control equipment. The data must be transmitted as quickly as possible, i.e. the data should be transmitted close to real time. In addition, a fixed minimum and maximum response time must be guaranteed. |
| **FPLC** | Fail-safe Programmable Logic Controller |
| **FSD** | Final Switching Device<br>The component in the safety-related control system on the machine that interrupts the circuit to the Machine Primary Control Element (MPCE) if the switching output (OSSD) changes to the off state. |
| **G** | |
| **Guards** | A fundamental differentiation is made between “fixed” and “movable” guards.<br>▪ Fixed guards are used for hazardous points where it is unnecessary, or only seldom necessary, to make changes. As a rule, they are fixed in place and can only be removed with tools.<br>▪ Movable guards are used if it is necessary to make changes at the hazardous point to operate the machine, to rectify malfunctions or during setup. These guards are monitored using ➜ safety switches. |
| **H** | |
| **Hazardous area** | Text from ISO 12100-1: A hazardous area is any area in a machine and/or around a machine in which a person can be subjected to a hazard. |
| **I** | |
| **Interbus** | Bus system with technical characteristics specifically designed for use in industrial sensor/actuator systems and homogeneous networking from the control level to the last position switch.<br>➜ www.interbusclub.com |
| **Interface** | Connection point between two devices or systems. The devices/systems on each side of an interface are connected together using an interface cable via which data, addresses, and control signals are exchanged. In this context, the term interface covers the entirety of the functional, electrical and design conditions (coding, signal level, pin assignments) that characterise the connection point between the devices or systems.<br>Depending on the type of data transmission, a differentiation must be made between parallel (e.g. Centronics, IEEE 488) and serial interfaces (e.g. V.24, RS-422, RS-423, RS-485), which are designed for different transmission speeds and transmission distances. |





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| Term | Explanation |
|---|---|
| **IP enclosure rating** | IEC 60529 describes standardised degrees of protection with which the housing of a product complies if the product is correctly installed.<br>➜ enclosure rating |
| **ISO** | International Organization for Standardization<br>Worldwide federation of national standards institutes in 148 countries. The term ISO is not an acronym for the name of the organisation, but comes from the first three letters of the Greek word “isos”, which roughly means “equal” in the sense of equivalence.<br>➜ www.iso.ch |
| **L** | |
| **Laser** | Light Amplification by Stimulated Emission of Radiation<br>Amplifier for electromagnetic waves in the visible light spectrum |
| **Laser protection class** | Categorisation of laser equipment into classes. In the classes 1 to 4, limits are set for photochemical hazards for the accessible radiation. |
| **LED** | Light Emitting Diode (luminescence diode). |
| **Light curtain** | An AOPD with a resolution ≤ 116 mm. (A resolution ≤ 40 mm is suitable for finger and hand protection). |
| **Light spot** | Light spot dimension, determining the sensor’s resolution. |
| **Locking device monitoring** | Identifies whether the locking device is monitored and can therefore be incorporated in the safety circuit. |
| **Locking force** | Maximum force with which a guard can be safely locked. |
| **M** | |
| **Machinery Directive** | The Machinery Directive 98/37 EC is addressed at the designers of new machines. It defines the tasks for complying with the health and safety requirements for new machines so that they can be sold and freely marketed in the European Union’s member states, and so that operators are guaranteed a high degree of protection.<br><br>The harmonized European standards define the possible ways and means of implementing these objectives. The Machinery Directive is integrated in national law and therefore binding. The standards are, however, not binding. On the other hand, it is assumed that a machine built in accordance with the harmonized standards will meet the essential requirements in the directive.<br><br>As required by European law, the directive and its amendments must be implemented in every member country. The directive came into force on 1 January 1995 for machines and on 1 January 1997 for safety components. |
| **Manipulation** | Manipulation is the conscious deactivation or bypassing of protective devices and their components.<br>Safety switches and equipment must be designed so that functions used to provide protection cannot be changed or bypassed manually or using simple means. Simple means are, e.g. screwdriver, ball-point pen, nail, piece of wire, adhesive tape, etc. Means that are not simple are those that require more than one work step with tools. The removal of parts, turning away of safety switches from their protective position, the use of a second actuator or bridging the contacts is not bypassing with simple means. The intentional and conscious deactivation of protective devices is considered gross negligence in case of accidents, and will thus result in serious consequences. During design, consideration should be given to the feasibility of straightforward, correct operation of machines and system despite the protective devices. If this aspect is not considered, the safety measures may be bypassed. |
| **Master** | Central bus user that controls bus access. All other bus users work as slaves. |
| **Master/slave principle** | The master element defines the instructions, slave elements follow the instructions from the master. For example, with decentralised bus control an automation device, as the master element, assigns the access rights for the other components (slave elements). |




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| Term | Explanation |
|---|---|
| **Mechanical installation conditions for proximity sensors** | A proximity sensor can be installed flush if any attenuating material can be placed around the active face without affecting the key device features.<br>A proximity sensor cannot be installed flush if a specific clear zone is required around its active face.<br>Quasi-flush applies to sensors that have the appearance of a flush sensor (i.e. not the typical plastic cap on the sensor with clear zone), but still have clear zone switching distances. These sensors can mostly not be installed 100 % flush or even recessed, but need a small clear zone (protrusion). |
| **Mechanical unlocking mechanism** | Is used to unlock a safety switch from the outside. |
| **Minimum shutdown time** | Minimum time necessary to detect an infringement of the protective field on the input circuit on the relay. At values below this minimum figure, an incorrect situation will not be detected, or the relay will switch to the error state. |
| **Minimum switch-off time** | The time for an internal check on the relay contacts. |
| **Minimum switch-on time** | Minimum time that a signal must be present on the input circuit before a reset can be performed (change from LOW to HIGH). |
| **Monitoring function for downstream devices** | The external monitoring device (➜ EDM) must provide the necessary means for the connection to the signals from the external devices (e.g. MPCE(s), FSD(s), muting devices) so that the EDM can unambiguously monitor the status of such devices.<br>The safety device must change to the interlocked state if an incorrect state is detected in one of the devices to be monitored by the EDM. |
| **Mounting of safety switches** | The mounting and mounting method for safety switches are crucial for the safe monitoring of guards, their function and operational safety. Guards and their components, e.g. safety switches, must be seen in direct relation to the feasibility of manipulation. Therefore precautions should be taken in the design to exclude this possibility as far as possible.<br>Along with due consideration of general regulations, such as mounting all components related to safety in guards, a further reduction in the risk can be achieved by preventive design measures:<br>▪ Mounting safety switches behind the guards or inside the system.<br>▪ Locking the actuator insertion openings on the safety switches (for type 2) when the guard is opened (lockout bar).<br>▪ Moving the actuator in a so-called C-rail. This prevents the use of a “second” actuator. |
| **MPCE** | Machine Primary Control Element<br>Text from IEC 61496-1: Element in the main circuit: The element that interrupts the main circuit to stop the machine. |
| **Muting** | Text from IEC 61496-1: Muting function: Time limited bridging of the protective function with additional sensors to differentiate between people and objects. |
| **Muting of an AOPD** | Bridging a protective device for a time can be relevant for safety. For example, the standard EN 415-4 (1993) for packaging machines addresses the problem of palletisers and de-palletisers (machines in which all work on the pallet load is performed automatically and only by the machine). At the entry and exit to the chamber (where under normal operating conditions there is a hazard), it is necessary to bridge the AOPD when the pallet moves past. On the other hand it is also necessary to detect the entry of people. The muting system must be able to differentiate between the pallet and the operator.<br><br>The muting conditions that are defined in the standard EN 415-4 state that:<br>▪ Muting is only allowed to be activated during the period of time in the working cycle when the loaded pallet blocks access to the hazardous area.<br>▪ Muting must be automatic.<br>▪ Muting must not be dependent on a single electrical signal.<br>▪ Muting must not be entirely dependent on software signals.<br>▪ Muting signals occurring during an invalid combination must not permit any muting state, and it must be ensured that the protective function is retained.<br>▪ The muting state is lifted immediately after the pallet has passed through and the protective device is reactivated. |

Q


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| Term | Explanation |
|---|---|
| **Muting-dependent manual bridging** | An optional function on an ESPE, also called override. This function permits activation of the muting function, and thus the bridging of the ESPE, by the manual operation of a control switch for the purpose of, e.g. clearing blockages in the muting area on a roller conveyor. The override function must only be able to be activated when at least one muting sensor is active. The manually initiated override is deactivated automatically after either a correct muting sequence or a pre-set time.<br>Source: IEC 61496-1: 2001 FDIS; A.7.1.5 |
| **N** | |
| **NC** | Normally Closed<br>N/C contact |
| **NO** | Normally Open<br>N/O contact |
| **No load current** | Current that is drawn by a sensor with 3 or 4 connections without a load connected. |
| **Number of beams** | Number of beams of a multi-beam photoelectric safety switch. |
| **Number of protective fields** | Number of the switchable protective fields of an AOPDDR |
| **O** | |
| **Operating range** | The scanning range is the maximum possible distance (specified detection distance) between sender and receiver (through-beam photoelectric switch) or between sensor and reflector (photoelectric reflex switch) at which stable function can be guaranteed. |
| **Operating voltage, max.** | The maximum operating voltage is the upper limit for the voltage used to supply the equipment with power for operation. The specified maximum operating voltage must not be exceeded, especially not by the maximum peaks on any residual ripple. |
| **Operating voltage, min.** | The minimum operating voltage is the lower limit for the voltage used to supply the equipment with power for operation so that the equipment continues to function. The voltage must not drop below the specified minimum operating voltage, especially not by the minimum peaks on any residual ripple. |
| **OSHA** | Occupational Safety & Health Administration<br>Authority for health and work safety. Responsible for work safety regulations in the USA. OSHA has the task, by means of the preparation and implementation of directives, to safeguard the health and safety of the American worker, to provide means for training and further training, and to promote the continuous improvement of health and work safety.<br>➜ www.osha.gov |
| **OSSD** | Output Signal Switching Device<br>The part of the item of electrosensitive protective equipment (ESPE) that is connected to the machine control, and that changes to the off state when the sensor section is triggered during correct operation. |
| **Output current, max.** | Maximum permissible load current on the output. |
| **Output current, min.** | Minimum load current necessary on the output. |
| **Output signal switching device** | ➜ OSSD |
| **Output switching element OSSD** | ➜ OSSD |
| **Outputs, safe** | ➜ OSSD |
| **Override** | ➜ Muting-dependent manual bridging |
| **P** | |
| **PDF** | Proximity Device with defined behaviour under Fault conditions |
| **PDF category** | Describes the behaviour of a proximity device under fault conditions. |



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| Term | Explanation |
|---|---|
| **PELV** | Protective Extra Low Voltage<br>Protective extra low voltage with safe isolation (see DIN VDE 0100-410/01.97, section 410). The protective measure PELV differs from ➜ SELV (Safety Extra Low Voltage) only in the type of connection to earth. A PELV circuit is present if, for example, the secondary side is earthed for operational reasons. The highest permissible nominal voltage for the protective measures SELV and PELV is max. 50 V AC and 120 V DC. |
| **Positively driven opening on safety switches** | Positively driven opening on safety switches signifies that there must be positive, shape-based transmission of force between actuator and switching element. The actuating mechanism must be so designed that even on mechanical failure, e.g. on the fracture of a spring or contact welding, the contacts open reliably and remain open in the actuated state.<br>➜ Further stipulations are defined in the standards IEC 947-5-1, EN 60947, VDE 0660 part 200. |
| **Power-up delay** | Time that the safety module requires to become ready for operation after application of the supply voltage. |
| **PROFIBUS**<br>**PROFIBUS-DP** | In complex manufacturing processes, the total costs for sensors and actuators depend not only on the purchase price, but crucially also on the installation costs.<br>Using decentral automation systems with bus technology, these costs can be significantly reduced.<br>Universal fieldbus terminals and couplers enable SICK sensors to be rapidly adapted to all common system environments.<br><br>It is possible to integrate, among others, photoelectric proximity switches, photoelectric reflex switches and through-beam photoelectric switches, color sensors, contrast and luminescence scanners, distance measuring systems, as well as bar-code reading systems.<br>For safety engineering, SafetyBUS p® provides a bus solution for the bidirectional communication between safety systems – such as the C4000 light curtain or the S3000 laser scanner – and the controls on machines. While bus systems like PROFIBUS-DP, Interbus, DeviceNet and CANopen cover the higher field level in automation structures, AS-i, the Actuator-Sensor interface, is suitable for use at the lowest field level in decentral control concepts. Instead of complex parallel wiring, numerous different sensors and actuators can be simply, rapidly and cost-effectively connected together. It is possible to integrate the AS-i bus in a higher level control, e.g. a PLC or a computer, without problems. Up to 31 slaves can be connected to a two-core cable, and up to four binary users can be connected to each slave. It is therefore possible to supply up to 124 sensors with one bus. All sensors with AS-i support, for example SICK's photoelectric switches and photoelectric proximity switches, contain an application-specific integrated circuit, the AS-i chip. This component is also fitted in an external AS-i module with a dedicated address and support for four conventional sensors and actuators so that standard components can also be incorporated. |
| **PROFIsafe** | Profile for safety-related data transmission via the PROFIBUS network |
| **Protective field** | The area in which the test object specified by the manufacturer is detected by the item of electrosensitive protective equipment (ESPE).<br>▪ Safety light grid/light curtain: The protective field lies between the sender unit and receiver unit. The field is defined by the protective field height and the protective field width.<br>▪ Safety laser scanner: the protective field secures the hazardous area on a machine or vehicle. The field is defined by the scanning range, scanning angle, response time and resolution of the device used (see technical specifications). The size and shape of the protective field can be configured with the aid of the ➜ CDS. |
| **Protective field height for safety light curtains** | Height of the active protective field along the longitudinal axis of the light curtain. |
| **Protective field range** | On devices with separate sender unit and receiver unit, this is the distance between the sender and receiver; on reflex devices, the distance between the sensor and reflector. |
| **Protective field width for safety light curtains** | Is given by the length of the light path between sender and receiver. To guarantee the safe protective function, the maximum permissible protective field width must not be exceeded. |



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| Term | Explanation |
|---|---|
| **PSDI control** | An optional function on an item of ESPE with which the ESPE triggers the dangerous machine movement as well as its protective function. The following types of actuation are common:<br>▪ In the single break PSDI mode the machine movement is started by interrupting and clearing the protective device's protective field.<br>▪ In the double break PSDI mode the machine movement is started by interrupting and clearing the protective device's protective field twice in succession. |
| **PSDI mode** | This term refers to manual intervention at hazardous points during the machine working cycle. Hereby the protective measures must achieve a high level of safety for monitoring the protective device and for signal processing. If these conditions are met, the start command can be given in this operating mode if the protective device returns correctly to the protective setting. |
| **R** | |
| **Radiation source** | Source for beam generation using semiconductor LEDs or conventional gas discharge lamps. |
| **Reactivation delay** | Delay until a sensor's protective function is effective (response time of all relays). |
| **Reduced resolution** | An optional function on ESPE (particularly light curtains) with which several objects up to a certain size, that occasionally cause interruptions, can be tolerated in the protective field without OSSDs switching to the off state, provided a certain number of neighbouring light beams remain clear. |
| **Reflector distance, min.** | Minimal permissible distance between photoelectric reflex switch and reflector |
| **RES** | Reset inhibit<br>➜ Restart interlock |
| **Reset time** | Time between operating the reset (in the "safe" state) and the "enabled" state. The time starts:<br>▪ with manual reset on release of the reset button (except UE23-2 MF safety relay).<br>▪ with automatic reset on closing of the input circuits (e.g. closing the protected door). |
| **Response delay time** | Time by which the response of the safety contacts is delayed. The times can be adjusted on switching devices with response delay. |
| **Response time** | The maximum time between the occurrence of the event that caused the triggering of the sensor and the achievement of the off state at the output switching elements (OSSDs). |
| **Response time ESPE** | The maximum time between the occurrence of the event that results in the triggering of the sensor and the achievement of the off state at the switching outputs (OSSDs) |
| **Restart interlock** | Text from IEC 61496-1:<br>A device for preventing an automatic machine restart after triggering of the sensor function during a dangerous part of the machine cycle, or after a change in the operating mode or the actuation method for the machine, or after a change to the start control equipment on the machine.<br><br>▪ Operating modes include:<br>inching, single stroke, automatic.<br>▪ Start control equipment includes:<br>Foot switch, two-hand control, single break PSDI triggering or double break PSDI trig-gering by the ESPE's sensor function.<br>▪ Restart interlock (RES):<br>The machine stops and the restart interlock (RES) is engaged on interruption of at least one light beam. This interlock ensures that the machine can only be restarted if the light path is clear and the reset button has been pressed and released again. |





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| Term | Explanation |
|---|---|
| **Risk assessment** | Compliance with category of the safety-related parts of the machine control system.<br>While the essential requirements of the directive are aimed at a high level of safety, the resources must nevertheless be proportional to the risk involved.<br>The protection of an operator who manually inserts and removes parts in a metal press must not be considered in the same way as the protection of an operator who works on a machine where the worst-case risk is the trapping of a finger.<br>Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different measures can be adopted for different parts of the safety-related control for a machine.<br>Against this background, the standard ISO 13849-1 aids designers in the definition of the categories for the various parts of the safety-related control based on the following parameters:<br>▪ The possible severity of injury<br>▪ The frequency and/or duration of exposure to the hazard<br>▪ The possibility of preventing the hazard<br>The behaviour of the safety-related control in case of a fault is defined for each category. If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies.<br>The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements.<br>Nevertheless, the AOPDs and their interface must comply with the requirement of the category of the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop). |
| **Risk estimation** | It is necessary to estimate the risk to determine the measures required to achieve the protection objectives and the resulting solutions.<br>The necessary safety solutions are defined taking into account the risk parameters and the severity of the hazard. |
| **S** | |
| **Safe outputs** | → OSSD |
| **Safety operating devices** | These switches are manually operated control switches designed for work in the hazardous areas of machines and systems. In the “manual operating mode” the protective action of movable guards is lifted under certain conditions.<br>Authorised personnel enter hazardous areas with the safety operating device to carry out programming, setup, observation, repair, test or service work. |
| **Safety switches** | Safety switches are items of safety equipment for monitoring movable guards. On opening, they must safely open the circuit and keep it open until the guard is closed again.<br>Safety switches with solenoid locks are locking devices that, in conjunction with the control, forcibly keep movable guards in the protective position until the dangerous states are brought to an end. |
| **Safety switches category 1** | Safety switches on which switching element and actuating element form a single unit. |
| **Safety switches category 2** | Safety switches on which switching element and actuating element do not form a single design unit, though on operation they are moved together or separated by the function. |
| **SCC** | Standard Council of Canada<br>The Canadian Standard Council is a federal authority with the task of effectively and efficiently promoting standardisation. The organisation reports to Parliament via the Minister of Trade and Commerce and monitors national Canadian standards.<br>→ www.scc.ca |




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| Term | Explanation |
|---|---|
| **SDL** | Safety Data Link<br>SICK safety interface (connection for OSSDs and EFI) |
| **Selection of several protective fields** | An AOPDDR can have several switchable protective fields. |
| **Self-monitoring** | Text from ISO 12100-1: Self-monitoring ensures that safety functions implemented by protective measures are also executed if the functionality of a component or element is reduced, or the process conditions have changed such that there are hazards.<br>Self-monitoring detects a fault either immediately or performs periodic checks so that the fault is detected before the safety function is called up again. In both cases, the protective measure can be triggered immediately or delayed until a specific event occurs. (e.g. the start of a working cycle on the machine). |
| **SELV** | Safety Extra Low Voltage<br>Protection by safety extra-low voltage (see DIN VDE 0100-410/01.97).<br>The protective measure SELV, differs from ➜ PELV (Protective Extra Low Voltage) only in the type of connection to earth. SELV circuits must not be earthed on the secondary side or connected to other voltage systems. The maximum permissible nominal voltage for the protective measures SELV and PELV is 50 V AC and 120 V DC. To ensure that this is the case, it must be demonstrated during the voltage measurement that the maximum values are not exceeded, and that there is adequate insulation resistance between all conductors and earth. |
| **Sensor detection capability (resolution)** | The limit for the sensor parameter defined by the manufacturer that causes the item of electrosensitive protective equipment (ESPE) to trigger. |
| **SIL** | Safety Integrity Level<br>Requirement class in relation to the functional safety of control systems as per IEC 61508. There are four levels specifying the requirements for the safety integrity of the safety functions allocated to an electromechanical, electronic or programmable electronic safety system (E/E/PE).<br>▪ Lowest level SIL1: Not more than one hazardous failure of the safety function in 10 years.<br>▪ Highest level SIL4: Not more than one hazardous failure of the safety function in 10,000 years. |
| **Single break/double break PSDI mode** | This operating mode is advantageous if parts must be manually inserted or removed periodically. In this mode the machine cycle is automatically re-initiated after the protective field becomes clear again after one or two interruptions.<br>The reset device is to be operated under the following conditions:<br>▪ On machine start<br>▪ On restart if the AOPD is interrupted during a dangerous movement<br>▪ To initiate a restart after a period of more than 30 s (cf. IEC 61496)<br>➜ Further information e.g. EN 692<br><br>Nevertheless, it is necessary to check that the operator cannot be placed at risk during the working process. This situation limits use to small machines on which the hazardous area cannot be entered and there is point-of-operation protection. All other sides of the machine must also be protected using suitable measures.<br>If this operating mode is used, the resolution of the AOPD must be less than or equal to 30 mm (cf. ISO 13855, EN 692, EN 693).<br>In general the following errors must be excluded when mounting protective devices: Reaching over, reaching under, reaching around, standing behind. |
| **Slave** | Participant in a network that can participate in the exchange of data only after contact from the master. |
| **Standard housing** | Defines whether the housing for a position switch complies with DIN 43693. |
| **Standards** | During the design of the safety equipment and the related components, specific regulations, standards, directives and recommendations must be taken into account. |
| **Switch-off delay** | Time by which the shutdown of the output contacts is delayed. This time is either fixed or adjustable depending on the device type. |
| **Switching element function** | Design of the switching element as normally closed contact, normally open contact, positive action normally closed contact or changeover contact. |





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| Term | Explanation |
|---|---|
| **Switching elements** | The switching elements on safety switches have actuating elements driven by a shaped fitting. The switching element related to the safety function must be positively driven or, in the case of spring-action switching elements, must guarantee safe opening of the normally closed contacts when the positive separation point is reached. A differentiation is made as follows depending on the switching behaviour:<br>▪ Slow-action switching element that opens or closes depending on the speed of its actuation.<br>▪ Snap-action switching element that opens or closes independent of the speed of its actuation. |
| **Switching frequency** | Number of sensor switching operations in a defined time interval. |
| **Switching principle of safety switches** | ▪ Slow-action switch: has a switching element that opens and closes depending on the speed of its actuation.<br>▪ Snap-action switch: has a switching element that opens and closes independent of the speed of its actuation. |
| **Switching voltage OSSD HIGH, max.** | Maximum switching voltage of the OSSD in the status HIGH. |
| **Switching voltage OSSD LOW, min.** | Minimum switching voltage of the OSSD in the status LOW. |
| **Synchronisation** | To avoid mutual interference between neighbouring sensors a synchronisation input is used to start a measuring cycle. |
| **Synchronisation time monitoring** | The switching of the input circuits within a defined time is monitored (only on automatic reset). Enabling takes place only if input circuit 2 closes at most 0.5 s *after* input circuit 1. If input circuit 2 closes *before* input circuit 1, the control is not active. |
| **T** | |
| **Time function** | The time function can be useful for improving provision of the acquired signal to other connected devices:<br>▪ Activation delay: Rapid bursts are suppressed.<br>▪ Release delay: Lengthens the signal by the set period of time.<br>▪ One shot delay: The signal provided has a defined signal length irrespective of the length of the input signal. |
| **Transmission medium** | Medium via which the interface transmits the data. |
| **TÜV** | Technischer Überwachungsverein ➜ www.tuev.de |
| **Type** | The machine or system manufacturer must perform a risk analysis as per the Machinery Directive.<br>The standard ISO 13849-1 will help the manufacturer to define the control category for the safety-related parts of the control. Each of the safety sensors shown meets the particular requirements of the defined control category in accordance with ISO 13849-1. |
| **Type of electrical connection** | Mechanical design of the electrical connection on the item of equipment. Designed as plug-in connection, soldered connection, crimp connection, screw connection, spring-action terminal, wire-wrap connection, cable entry via gland or plug. |


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| Term | Explanation |
|---|---|
| **V** | |
| **VDE** | Verband der Elektrotechnik, Elektronik und Informationstechnik e. V.<br>➜ www.vde.de |
| **VDMA** | Verband Deutscher Maschinen- und Anlagenbau e. V.<br>➜ www.vdma.org |
| **Voltage type** | Design of the sensor as DC, AC or AC/DC. |
| **W** | |
| **Warning field output on safety laser scanners** | The part of the electrosensitive protective equipment (ESPE) that is connected to the machine control and that changes to the off state when the warning field for the sensor section is triggered during correct operation. |
| **Warning field with safety laser scanners** | The warning field can be placed in front of the protective field and thus in front of the actual hazardous area. Objects in the warning field trigger, e.g. a warning signal. The size and shape of the warning field can be configured with the aid of the ➜ CDS. |





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**The following table gives an overview of the possible combinations between sensors and safe control solutions.**

**Combination:**
- ● recommended
- □ possible
- ○ on request
- – not possible

| Connection via | S3000 Professional | S3000 Advanced | S3000 Standard | S3000 Professional CMS | S3000 Remote | S300 Professional | S300 Advanced | S300 Standard | S200 | V4000 Press Brake | C4000 Advanced | M4000 Advanced Curtain | C4000 Standard | C4000 Micro | C4000 Basic | C4000 Basic Plus | C4000 Entry/Exit | C4000 Palletizer | C4000 Eco | C2000 Standard | C2000 RES/EDM | C2000 Cascadable | LGT | M4000 Advanced | M4000 Advanced A/P | M4000 Advanced with UE403 | M4000 Standard | M4000 Standard A/P | M4000 Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Safety relays** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE10-3OS | Signal inputs | □ | □ | ● | □ | – | □ | □ | ● | ● | □ | □ | □ | □ | ● | □ | ● | □ | □ | □ | □ | ● | □ | ○ | □ | □ | ● | ● | ● | □ |
| UE23-2MF | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE42-2HD | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE43-2MF | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE43-3MF | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE43-6MF | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE44-3SL | Signal inputs | ○ | ○ | ○ | ○ | – | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| UE45-3S1 | Signal inputs | ○ | ○ | ○ | ○ | – | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| UE48-2OS | Signal inputs | □ | □ | ● | □ | – | □ | □ | ● | ● | □ | □ | □ | □ | □ | ● | □ | □ | □ | ● | ● | □ | ● | ○ | □ | □ | ● | □ | □ | □ |
| UE48-3OS | Signal inputs | □ | □ | ● | □ | – | □ | □ | ● | ● | □ | □ | □ | □ | □ | ● | □ | □ | □ | ● | ● | □ | ● | ○ | □ | □ | ● | □ | □ | □ |
| UE49-2MM | Signal inputs | □ | □ | ● | □ | – | □ | □ | ● | ● | ○ | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | □ | □ | □ | ● | □ | □ | ○ | ● | ● | ● |
| UE49-3MM | Signal inputs | □ | □ | ● | □ | – | □ | □ | ● | ● | ○ | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | □ | □ | □ | ● | □ | □ | ○ | ● | ● | ● |
| LE20 | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | ● | ● | ● | – | – | – | – | – | – | – | – |
| LE20 Muting | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | ● | ● | ● | – | – | – | – | – | – | – | – |
| UE10-4XT | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE11-4DX | Signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Safety controllers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE410 Flexi MU | Signal inputs | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | □ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| UE410 Flexi XU | Signal inputs | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | □ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| UE410 Flexi 8DI | Signal inputs | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | □ | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| UE440 | Signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | ● | ● | □ | □ | ● | ● | ● | ● | □ | □ | □ | ● | ● | ● | □ |
| | SDL/EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | – | – | – | ● |
| UE470 | Signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | ● | ● | □ | □ | ● | ● | ● | ● | □ | □ | □ | ● | ● | ● | □ |
| | SDL/EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | – | – | – | ● |
| UE4427 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | □ | □ | □ | ● | ● | ● | □ |
| UE4457 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | □ | □ | □ | ● | ● | ● | □ |
| | SDL/EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | – | – | – | ● |
| UE4470 | Signal inputs | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Safety network solutions** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **PROFIsafe** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE4120 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | ○ | □ | □ | □ | ● | ● | □ |
| UE4150 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | ○ | □ | □ | □ | ● | ● | □ |
| | SDL/EFI | □ | □ | ● | □ | □ | □ | □ | ● | ○ | ○ | □ | □ | □ | ○ | ○ | ○ | □ | □ | ○ | ○ | ○ | ○ | – | □ | □ | ○ | ○ | ○ | □ |
| UE4155 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | – | □ | □ | □ | ● | ● | □ |
| | SDL/EFI | ● | ● | □ | ● | ● | ● | ● | □ | ○ | ○ | ● | ● | ● | ○ | ○ | ○ | ● | ● | ○ | ○ | ○ | ○ | – | ● | ● | ○ | ○ | ○ | ● |
| **AS-i Safety at Work** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE3212 | Field signal inputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | □ | – | – | – | – | – | – | – |
| UE4215 | Field signal inputs | □ | □ | ● | □ | – | □ | □ | ● | ● | □ | □ | □ | ● | ● | □ | ● | ● | ● | ● | ● | ● | ○ | □ | □ | ● | ● | ● | □ |
| UE4231, UE4232, UE4233, UE4234 | Only outputs | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **DeviceNet Safety** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE4420, UE4427 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | □ | □ | □ | ● | ● | ● | □ |
| UE4421 | Signal inputs | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| UE4450 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | ○ | □ | □ | □ | ● | ● | □ |
| | SDL/EFI | □ | □ | ● | □ | □ | □ | □ | ● | ○ | ○ | □ | □ | □ | ○ | ○ | ○ | □ | □ | ○ | ○ | ○ | ○ | – | □ | □ | ○ | ○ | ○ | □ |
| UE4455, UE4457 | Field signal inputs | □ | □ | □ | □ | – | □ | □ | □ | ● | ● | □ | □ | □ | ● | □ | ● | □ | □ | ● | ● | ● | ● | ○ | □ | □ | □ | ● | ● | □ |
| | SDL/EFI | ● | ● | □ | ● | ● | ● | ● | □ | ○ | ○ | ● | ● | ● | ○ | ○ | ○ | ● | ● | ○ | ○ | ○ | ○ | – | ● | ● | ○ | ○ | ○ | ● |
| UE4470 | Signal inputs | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Gateways** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE1140 PROFIBUS | EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | ● | – | – | ● |
| UE1840 Ethernet (TCP/IP) | EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | ● | – | – | ● |
| UE1940 CANopen | EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | ● | – | – | ● |
| UE4140 PROFIsafe | EFI | ● | ● | ● | ● | ● | ● | ● | ● | – | – | ● | ● | ● | – | – | – | ● | ● | – | – | – | – | ● | ● | ● | – | – | ● |
| **Other safety relays** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UE402 | EFI | – | – | – | – | – | – | – | – | – | – | ● | – | ● | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| UE403 | EFI | – | – | – | – | – | – | – | – | – | – | – | ● | – | – | – | – | – | – | – | – | – | – | ● | ● | – | – | – | – | – |

Q



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| | M2000 Standard | M2000 RES/EDM | M2000 Cascadable | M2000 A/P Standard | M2000 A/P RES/EDM | L4000/L400 without UE401 | L4000/L400 with UE401 | WSU/WEU26/2 | WS/WE18-3 | WS/WE27-2 | VS/VE18-2 | i10 | i11S | i12S | i16S | i17S | i100S | i110S | i1001 | i1002 | i10 Lock (mechanically locked) | i10 Lock (electrically locked) | i14 Lock (mechanically locked) | i200 Lock (mechanically locked) | i1001 Lock (mechanically locked) | i1002 Lock (mechanically locked) | i10PA | i10RA | i100P | i100R | i110PA | i110RA | i10H | i110H | RE300 without evaluation unit | RE300 with evaluation unit | RE4000 | T4000 without evaluation unit | T4000 with evaluation unit | T4000 Multi | T4000 Compact | IN4000 without evaluation unit | IN4000 with evaluation unit | E100 | i110RP / i150RP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | □ | ● | □ | □ | ● | – | ● | ○ | ○ | ○ | ○ | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | ○ | ○ | – | – | – | – | – | – | – | – |
| | – | – | – | – | – | – | – | – | – | – | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | □ | ○ | □ | □ | □ | □ | ● | ● | ● | ● | ● | ● | ● | ● | – | ○ | ○ | – | ○ | ○ | ● | – | ● | ○ | ● | ● |
| | – | – | – | – | – | – | – | – | – | – | – | ● | ● | ● | ● | ● | ● | ● | ● | ● | □ | ○ | □ | □ | □ | □ | ● | ● | ● | ● | ● | ● | ● | ● | – | ○ | ○ | – | ○ | ○ | ● | – | ● | ○ | ● | ● |
| | – | – | – | – | – | – | – | ○

# RANGE OF EXPERTISE

## INDUSTRIAL SENSORS

Our complete range of sensors provides solutions for any application in the field of automation. Even under rugged ambient conditions, objects are reliably detected, counted and positioned in respect to their form, location and surface finish, as well as their distances.

## INDUSTRIAL SAFETY SYSTEMS

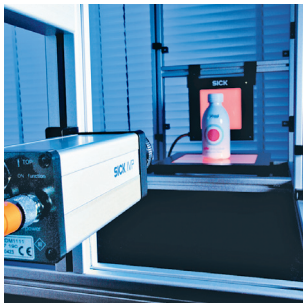
Comprehensive safeguarding of both personnel and machinery! As specialists in safety technology, SICK develops and manufactures pioneering products for providing protection in hazardous zones, dangerous locations and for safeguarding access points. By providing services, which encompass all aspects of machine safety and security, SICK is setting new standards in Safety Technology.

## AUTOMATIC IDENTIFICATION

Whether the tasks involve identification, handling, classification or volume measurement, innovative automatic identification systems and laser measurement systems function extremely reliably, even under rapid cycle times. They conform to the latest standards and can be simply and quickly integrated in all industrial environments and external applications.

## ANALYZERS AND PROCESS INSTRUMENTATION

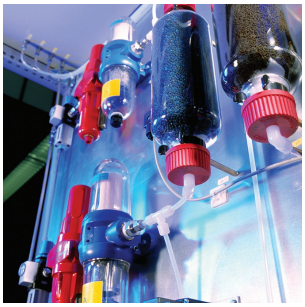
SICK MAIHAK offers solutions for system control, maintaining setpoints, optimizing process control and monitoring the flow of materials. Our analysis and process measurement products are setting the standards for these applications in terms of technology and quality.











Worldwide presence with subsidiaries in the following countries:

**Australia**
**Austria**
**Belgium/Luxembourg**
**Brazil**
**China**
**Czech Republic**
**Denmark**
**Finland**
**France**
**Germany**
**Great Britain**
**India**
**Italy**
**Japan**
**Netherlands**
**Norway**
**Poland**
**Republic of Korea**
**Republic of Slovenia**
**Russia**
**Singapore**
**Spain**
**Sweden**
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**Taiwan**
**Turkey**
**USA/Canada/México**

Please find the detailed addresses and more representatives and agencies in all major industrial nations at **www.sick.com**

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